King County

1200 King County Courthouse
516 Third Avenue
Seattle, WA 98104

Meeting Agenda

Local Services and Land Use Committee

Councilmembers:
Reagan Dunn, Chair;
Rhonda Lewis, Vice Chair;
Teresa Mosqueda, Sarah Perry

Lead Staff: Erin Auzins (206-477-0687)
Committee Clerk: Marka Steadman (206-477-0887)

9:30 AM | **Wednesday, January 21, 2026** | **Hybrid Meeting**

REVISED AGENDA

Hybrid Meetings: Attend King County Council committee meetings in person in Council Chambers (Room 1001), 516 3rd Avenue in Seattle, or through remote access. Details on how to attend remotely and/or provide comment are listed below.

Pursuant to K.C.C. 1.24.035 A. and F., this meeting is also noticed as a meeting of the Metropolitan King County Council, whose agenda is limited to the committee business. In this meeting only the rules and procedures applicable to committees apply and not those applicable to full council meetings.

HOW TO PROVIDE PUBLIC COMMENT: The Local Services and Land Use Committee values community input and looks forward to hearing from you on agenda items.

The Committee will accept public comment on items on today's agenda in writing. You may do so by submitting your written comments to kcccomitt@kingcounty.gov. If your comments are submitted before 8:00 a.m. on the day of the meeting, your comments will be distributed to the committee members and appropriate staff prior to the meeting.

You have the right to submit your comments using our free language access services. Contact Tera Chea, Language Access Coordinator by 8:00 a.m. not less than three business days prior to the committee meeting. Email: tera.chea2@kingcounty.gov or phone: 206-477-9259

Sign language and interpreter services can be arranged given sufficient notice (206-848-0355).
TTY Number - TTY 711.
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CONNECTING TO THE WEBINAR
Webinar ID: 840 9948 4774

By computer using the Zoom application at https://zoom.us/join and the webinar ID above.

Via phone by calling 1-253-215-8782 and using the webinar ID above.

HOW TO WATCH/LISTEN TO THE MEETING REMOTELY: There are several ways to watch or listen in to the meeting:
1) Stream online via this link: http://www.kingcounty.gov/kctv, or input the link web address into your web browser.
2) Watch King County TV on Comcast Channel 22 and 322(HD) and Astound Broadband Channels 22 and 711(HD)
3) Listen to the meeting by telephone – See "Connecting to the Webinar" above.

To help us manage the meeting, please use the Livestream or King County TV options listed above, if possible, to watch or listen to the meeting.

1. Call to Order

2. Roll Call

To show a PDF of the written materials for an agenda item, click on the agenda item below.

3. Approval of Minutes

September 8, 2025 special meeting ***p. 4***

Consent

4. Proposed Ordinance No. 2025-0269 **p. 7**

AN ORDINANCE approving the City of Redmond Water System Plan dated May 2025.

Sponsors: Perry

Erin Auzins, Council staff



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5. Proposed Ordinance No. 2025-0360 **p. 1280**

AN ORDINANCE relating to the King County regional E-911 advisory governance board; amending Ordinance 18695, Section 2, and repealing Ordinance 18139, Section 4, and Ordinance 18695, Section 3.

Sponsors: Dunn

Nick Bowman, Council staff

Discussion and Possible Action

6. Proposed Ordinance No. 2025-0285 **p. 1288**

AN ORDINANCE approving and adopting the updated 2025-2030 King County Regional Hazard Mitigation Plan, as approved by the Federal Emergency Management Agency.

Sponsors: Zahilay

Gene Paul, Council staff

Briefing

7. Briefing No. 2026-B0008 **p. 1707**

Temporary Use and Special Event Report

Mark Rowe, Acting Director, Permitting Division

Other Business

Adjournment



Sign language and interpreter services can be arranged given sufficient notice (206-848-0355).
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King County

1200 King County
Courthouse
516 Third Avenue
Seattle, WA 98104

Meeting Minutes

Local Services and Land Use Committee

Councilmembers:
Sarah Perry, Chair;
De'Sean Quinn, Vice-Chair;
Reagan Dunn, Teresa Mosqueda

Lead Staff: Erin Auzins (206-477-0687)
Committee Clerk: Marka Steadman (206-477-0887)

1:30 PM | **Monday, September 8, 2025** | **Hybrid Meeting**

DRAFT MINUTES - SPECIAL MEETING

1. Call to Order

Chair Perry called the meeting to order at 1:30 p.m.

2. Roll Call

Present: 4 - Dunn, Mosqueda, Perry and Quinn

3. Approval of Minutes

Vice Chair Quinn moved approval of the August 20, 2025, meeting minutes. There being no objections, the minutes were approved.

4. Public Comment

The following individual provided public comment: Alex Tsimerman

Consent

5. Proposed Ordinance No. 2025-0221

AN ORDINANCE revising the corporate boundary of the city of Enumclaw to include the unincorporated portions of Southeast 440th Street right-of-way as provided for in RCW 35A.21.210.

A motion was made by Councilmember Quinn that this Ordinance be Recommended Do Pass Consent. The motion carried by the following vote:

Yes: 4 - Dunn, Mosqueda, Perry and Quinn

6. **Proposed Ordinance No. 2025-0222**

AN ORDINANCE revising the corporate boundary of the city of Snoqualmie to include the unincorporated portion of 384th Avenue Southeast right-of-way as provided for in RCW 35A.21.210.

A motion was made by Councilmember Quinn that this Ordinance be Recommended Do Pass Consent. The motion carried by the following vote:

Yes: 4 - Dunn, Mosqueda, Perry and Quinn

Discussion and Possible Action

7. **Proposed Ordinance No. 2025-0208**

AN ORDINANCE authorizing the executive to enter into interlocal agreements for salmon conservation efforts in the Snoqualmie and South Fork Skykomish Watershed within Water Resource Inventory Area 7, the Lake Washington/Cedar/Sammamish Watershed also known as Water Resource Inventory Area 8, and the Green/Duwamish and Central Puget Sound Watershed also known as Water Resource Inventory Area 9.

Brandi Paribello, Council staff, briefed the committee and answered questions from the members. Janne Kaje, Supervisor, Regional Partnerships Unit, Department of Natural Resources and Parks, answered questions from the members.

A motion was made by Councilmember Quinn that this Ordinance be Recommended Do Pass Consent. The motion carried by the following vote:

Yes: 4 - Dunn, Mosqueda, Perry and Quinn

8. **Proposed Motion No. 2025-0199**

A MOTION accepting the King County Clean Water Healthy Habitat Strategic Plan 2020-2025 in accordance with Ordinance 19881, Section 377.

Andi Micklow, Council staff, briefed the committee and answered questions from the members. Abby Hook, Chief of Staff, Parks Division, Department of Natural Resources and Parks, answered questions from the members.

A motion was made by Councilmember Quinn that this Motion be Recommended Do Pass Consent. The motion carried by the following vote:

Yes: 4 - Dunn, Mosqueda, Perry and Quinn

9. **Proposed Ordinance No. 2025-0171**

AN ORDINANCE authorizing the executive to execute interlocal agreements with school districts for continued collection of school impact fees.

Erin Auzins, Council staff, briefed the committee and answered questions from the members. Vice Chair Quinn moved approval of striking amendment S1. The amendment was adopted.

A motion was made by Councilmember Quinn that this Ordinance be Recommended Do Pass Substitute Consent. The motion carried by the following vote:

Yes: 4 - Dunn, Mosqueda, Perry and Quinn

10. **Proposed Ordinance No. 2025-0268**

AN ORDINANCE related to doctors office/outpatient clinic uses; and amending Ordinance 19881, Section 162, as amended, and K.C.C. 21A.08.045 and Ordinance 16267, Section 30, as amended, and K.C.C. 21A.12.250.

Erin Auzins, Council staff, briefed the committee and answered questions from the members.

A motion was made by Councilmember Mosqueda that this Ordinance be Recommended Do Pass Consent. The motion carried by the following vote:

Yes: 4 - Dunn, Mosqueda, Perry and Quinn

Briefing

11. **Briefing No. 2025-B0132**

Update on Senate Bill (SB) 5290 Implementation by the Permitting Division

Jim Chan, Division Director, Permitting Division, Dept. of Local Services, briefed the committee and answered questions from the members. Leon Richardson, Director, Dept. of Local Services, answered questions from the members.

This matter was Presented

Adjournment

The meeting was adjourned at 2:44 p.m.

Approved this _____ day of _____

Clerk's Signature

King County

Metropolitan King County Council
Local Services and Land Use Committee

STAFF REPORT

Agenda Item:	4	**Name:**	Erin Auzins
Proposed No.:	2025-0269	**Date:**	January 21, 2026

SUBJECT

An ordinance approving the City of Redmond 2024 Water System Plan.

SUMMARY

Proposed Ordinance 2025-0259 would approve the City of Redmond 2024 Water System Plan, meeting the requirement for a water utility to provide water service in unincorporated King County.

BACKGROUND

The City of Redmond is located east/northeast of Seattle at the north end of Lake Sammamish in Council District 3 and 6. The City's water system service area covers the City of Redmond's municipal boundaries as well as the Redmond Ridge and Trilogy Urban Planned Developments within unincorporated King County. The previous water system plan update was approved in 2012 by Ordinance 17341.

King County Utility Comprehensive Plan Criteria. King County Code (K.C.C.) Chapter 13.24 requires the UTRC to review and make recommendations to the Executive and County Council on the adequacy of all water and sewer comprehensive plans and related matters, and to determine whether the plan:

- is consistent with the King County Comprehensive Plan,
- is consistent with local comprehensive plans,
- reflects current supply and demand,
- forecasts future supply and demand,
- provides a capital plan for obtaining, using, storing, and conveying water and sewage, and
- provides sufficient information to demonstrate the utility district's ability to provide service consistent with all applicable laws and regulations.

In addition to satisfying the requirement of K.C.C. Chapter 13.24, the County's approval also provides state regulatory agencies with the determination required under RCW 43.20.260 that the Plan is consistent with the King County Comprehensive Plan and implementing development regulations.

Additionally, King County has adopted a Comprehensive Plan that includes policies that address water policies for facilities and services, calling for consistency with other adopted plans, pursuit of reclaimed water, water conservation, and protection of water resources.

UTRC ANALYSIS OF THE CITY OF REDMOND 2024 WATER SYSTEM PLAN

The UTRC finalized its review of the Plan in June 2025 (see Attachment 4 to this staff report for a more detailed description of the UTRC review). The UTRC found that the Plan meets the requirements of K.C.C. chapter 13.24 and has recommended its approval. Highlights of the Plan, as reviewed by the UTRC, are outlined below.

Service Area. The water system currently has approximately 19,600 water service connections

Supply. The water system includes ten storage facilities, seven supply connections to the regional supply system, and approximately 340 miles of distribution mains.

The water source comes from wells owned and operated by the City as well as water produced from Seattle's Tolt River source. The City's five wells provide approximately 40 percent of its supply. The remaining supply is provided through the City's membership with the Cascade Water Alliance, which delivers regional water supply contracted from Seattle Public Utilities.

The UTRC determined that the Plan demonstrates the ability of the City of Redmond to provide service consistent with the requirements of all applicable statutes, codes, rules, and regulations.

Growth. The Plan demonstrates that the City is able to accommodate both the growth in population and demand within its service area.

System Improvements. The Capital Improvement Program includes approximately $71 million in the 10-year CIP. The improvements include water supply, storage and pumping, water distribution system, and joint use projects, as well as improvements to the maintenance and operations center. The Financial Program's estimated revenues show that the City is sufficiently able to fund the projects in its CIP program over the 10-year planning cycle through its revenue sources.

SEPA. The City completed SEPA review for the Plan in 2023.

INVITED

- Dan Cardwell, Chair, Utilities Technical Review Committee

ATTACHMENTS

1. Proposed Ordinance 2025-0269 (and its attachment)
2. Transmittal Letter

3. Fiscal Note
4. UTRC Matrix - Review of City of Redmond 2024 Water System Plan

1200 King County Courthouse
516 Third Avenue
Seattle, WA 98104

KING COUNTY

Signature Report

Ordinance

Proposed No. 2025-0269.1 **Sponsors** Perry

AN ORDINANCE approving the City of Redmond Water System Plan dated May 2025.

STATEMENT OF FACTS:

1. King County has adopted K.C.C. chapter 13.24, which requires approval of comprehensive plans for water and sewer utilities that provide service in unincorporated King County as a prerequisite for operating in unincorporated King County, receiving approval for annexation proposals, being granted right of way franchises, and being given approval for right of way construction permits. K.C.C. chapter 13.24 prescribes the requirements for approval of such plans, including consistency with state and local planning requirements.

2. The city of Redmond's last water system plan was approved in 2012.

3. The city of Redmond's water system has a service area within unincorporated King County and had adopted a water comprehensive plan update ("the plan").

4. King County has adopted a Comprehensive Plan that includes water supply policies in its provisions for facilities and services, which are policies F-306, F-402, F-406, F-480, F-483, F-494, and F-497 through F-500, that call for consistency with other adopted plans, support for regional water supply planning, pursuit of reclaimed water, water

conservation, timely and reasonable water service, and protection of water resources.

5. K.C.C. chapter 13.24 requires the utilities technical review committee to review the requirements in K.C.C. chapter 13.24, consistency with the King County Comprehensive Plan, and make a recommendation to the King County executive and council on the plan. The utilities technical review committee has reviewed the planning data, service area policies, and system operations and has found:

a. The plan utilizes growth projections reflective of the adopted zoning and growth targets;

b. A portion of the system's service area is in unincorporated King County;

c. The capital facility plan is adequate to meet anticipated facility and service needs;

d. The plan is consistent with applicable Washington state water quality laws; and

e. The plan is consistent with other pertinent county adopted plans and policies.

6. Washington state Department of Health approval is pending upon the King County council's approval of the plan.

7. Under the State Environmental Policy Act, the city completed an environmental check list and issued a Determination of Nonsignificance for the plan on August 1, 2023. There were no appeals.

8. The city's operations and facilities meet multiple existing statutory, administrative, and planning standards. As the city's operations, facilities, and planning meet King County Code requirements and are consistent with the King County Comprehensive Plan, the utilities technical review committee has recommended approval of the plan.

BE IT ORDAINED BY THE COUNCIL OF KING COUNTY:

SECTION 1. The city of Redmond Water System Plan dated May 2025,

Attachment A to this ordinance, is hereby approved as a comprehensive water system plan.

KING COUNTY COUNCIL
KING COUNTY, WASHINGTON

_____

Sarah Perry, Chair

ATTEST:

_____

Melani Pedroza, Clerk of the Council

APPROVED this _____ day of _____, _____.

_____

Girmay Zahilay, County Executive

Attachments: A. City of Redmond 2024 Water System Plan, May 2025

Attachment A.

City of Redmond
2024 Water System Plan

Originally Prepared: July 2024

Revised/Finalized: May 2025

Certificate of Engineer

This Water System Plan for the City of Redmond has been prepared under the direction of the following Registered Professional Engineer.



Jeffrey M. Hansen

05/22/2025

Jeffrey M. Hansen, P.E.
HDR Engineering, Inc.
905 Plum Street SE, Suite 200, Town Square 3
Olympia, WA 98501-1516

Consumer Meeting and City Adoption

An informational meeting for the City's consumers was held as part of a City Planning Commission meeting on June 26, 2024. This meets State requirements at Chapter 246-290-100 (8) (a), Washington Administrative Code.

The Redmond City Council officially adopted the 2024 Water System Plan on November 19, 2024, via ordinance 3183.

City of Redmond 2024 Water System Plan

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Chapter 1: Introduction

City of Redmond 2024 Water System Plan

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1. Introduction

The City of Redmond provides water service to residents and businesses located in and around Redmond, Washington. This 2023 Water System Plan (WSP) describes the City's water production and distribution facilities, operations, and compliance with state and federal drinking water regulations. This WSP also identifies capital improvements needed, as well as the City's financial plan to fund these needs. This Plan is submitted in accordance with State requirements at Chapter 246-290-100 Washington Administrative Code (WAC) and updates the prior WSP issued in 2011.

1.1. System Overview

The City of Redmond has been providing public water supply since the early 1900's. The service area includes everything within Redmond city limits as well as the Redmond Ridge and Trilogy Urban Planned Developments within unincorporated King County. The water distribution system includes four distinct service areas with differing operational characteristics. These areas are: Well Service area, Rosehill Service area, Overlake/Viewpoint Service Area; and the Novelty Hill Service area. Two of the City's four service areas are hydraulically interconnected with the City of Bellevue and City of Kirkland water systems on the south and west (Overlake/Viewpoint and Rosehill respectively). The three cities jointly own storage and pumping stations in those areas.

Water delivered to the City's customers is produced from a combination of sources, including wells owned and operated by the City as well as water produced from Seattle's Tolt River source. Redmond is a member of the Cascade Water Alliance, which delivers regional water supply contracted from Seattle Public Utilities.



Figure 1-1. Location Map

The City serves a residential population of approximately 87,000. During business hours, the population served grows to approximately 132,000. Major employers receiving water from the Redmond system include Microsoft headquarters as well as many other businesses such as SpaceX, Meta, Amazon and King and Prince Seafood. The City's population and business profile has grown rapidly in recent decades, and further growth expected during the 20-year time period covered by this Plan is estimated at approximately 24,000 additional people and 14,000 jobs.

Further information on the City's water service area, facilities and operations is presented in subsequent chapters of this WSP.

1.2. Planning Objectives

This WSP has the following objectives:

- Provide updated estimates of expected water demands in the City's service areas, to support planning for new or expanded facilities.
- Update the City's computerized model of its distribution system infrastructure to reflect construction of new water mains and other facilities. This model is a working tool used to evaluate the adequacy of existing facilities and identify needs for system improvements.
- Update the City's Capital Improvement Plan (CIP) and associated funding requirements.
- Reflect updated plans and programs of the Cascade Water Alliance. Cascade is an inter-local organization formed by seven water systems, including Redmond, to contract and develop regional water supplies for its members.
- Provide updated information on the City's operational programs, including compliance with drinking water quality and water use efficiency requirements; protection of groundwater sources from potential degradation; cross-connection control and water conservation.

1.3. Coordination with Redmond Comprehensive Plan

The Water System Plan update process began in 2020 and is designed to implement Redmond's Comprehensive Plan. The current Comprehensive Plan was adopted in 2011 with amendments adopted in 2022. An update to Redmond's Comprehensive Plan (Redmond 2050) is underway which will set the planning horizon to 2050. That process began in 2022 and is scheduled for adoption in the third quarter of 2024.

Planning staff have been involved in the draft Water System Plan update and Water Engineering staff have in turn reviewed Comprehensive Plan policy updates, especially in relation to utilities and capital facilities. Although the draft Water System Plan includes references to the currently-adopted Comprehensive Plan, it is modeled upon and compatible with anticipated findings of the 2024 update. The Comprehensive Plan's updated growth targets and expected policy revisions do not negatively impact growth forecasts provided in the updated Water System Plan. If the final recommendations of the Comprehensive Plan update significantly change the distribution of jobs and housing units within the City, the water model will be updated after plan adoption to reflect changes.

The City's Public Works department will monitor the Comprehensive Plan update process and update plans and policies as necessary in a timely manner. Redmond's Comprehensive Plan Policy CF-4 specifies the process for minor and major updates to functional plans as follows:

- For minor modifications to existing plans, administratively review changes that are consistent with and do not impede the implementation of the Comprehensive Plan.
- For major updates and new functional plans, use the Comprehensive Plan amendment review process. A major update is characterized by any of the following:
    - Amendments representing more than clarification of existing language or intent;

- Significant changes to anticipated service provision based on new analyses, assumptions or implementation strategies;
- Changes proposed by private parties that are inconsistent with or may impede implementation of the Comprehensive Plan.

1.4. Coordination with Cascade Water Alliance Planning

The Redmond Water System Plan is built, substantially, on water availability and distribution (also called transmission) planning assumptions provided by Cascade Water Alliance (Cascade), of which Redmond is a member. As of publication of this Plan, Cascade is engaged in two exercises that could possibly affect the water it provides to Redmond customers.

Cascade is updating its Transmission and Supply plan to reflect the new supply contract with Tacoma Public Utilities, consider uncertainties with respect to climate change impacts and other factors, and update its water demand forecast. The current schedule is for Cascade to finalize the Transmission and Supply Plan in March 2025. The City's Public Works Department will monitor these efforts by Cascade and update the Water System Plan if Cascade's water supply or distribution assumptions change.

1.5. Local Government Coordination

The City provided the draft WSP to local governments for their review, comment, and approval. Key local governmental bodies who have reviewed and provided comment are:

- City of Redmond Planning Department – to provide determination of consistency with City planning and policies, including Redmond 2050.
- King County
  - Department of Local Services-Permitting, Utilities Technical Review Committee (UTRC) – to provide determination of consistency with County planning and policies.
  - King County Council – to provide final approval of the WSP (per King County Code 13.24).
- Adjacent water purveyors – City of Kirkland, City of Bellevue, Northeast Sammamish Water and Sewer District, Union Hill Water Association, Sammamish Plateau Water, Woodinville Water District, and Dawnbreaker Water Association.
- Washington Department of Health – detailed technical review of all plan elements and final regulatory approver of the WSP.

Local government consistency checklists and comment-response documentation for local governments is in Appendix A.

The City has prepared an Environmental Checklist under provisions of the State Environmental Policy Act (SEPA). Based on the checklist, a Determination of Non-Significance (DNS) has been issued. The Checklist and DNS are in Appendix B.

1.6. Public Participation and Review

The City implemented a multi-pronged strategy to gather public input during the development of the WSP. As an early step, the City launched a dedicated webpage on the LetsConnect platform (https://www.letsconnectredmond.com/water-system-plan-2023). The webpage included an overview of the Water System Plan and described opportunities for input (including via an online comment box). The LetsConnect page, and public input opportunities were shared via e-newsletter announcements to the community, and to a targeted development community listserve (reaching approximately 1,300 recipients). Virtual 'office hours' with the senior City water engineer took place during three sessions in July and August (July 12 and 31, and August 8) 2023. As well, the City hosted an online open house via Teams (August 10, 2023). The City also provided formal opportunities to comment during the environmental review process, Planning Commission deliberations and public hearing held June 26, 2024, and during Council discussion of the document. Through the biennial budget process, community members will have additional opportunities to provide comment on Capital Improvement Program priorities.

1.7. Organization of Plan Document

Following the Executive Summary, this Water System Plan is organized into the following chapters:

Chapter 1: Introduction

Chapter 2: Service Area and Policies

Chapter 3: Water System Description

Chapter 4: Planning Data and Water Demand Forecast

Chapter 5: Water Use Efficiency Program

Chapter 6: Distribution Facilities Design and Construction Standards

Chapter 7: Water Supply Resource Evaluation

Chapter 8: Water Quality Regulations and Compliance

Chapter 9: Wellhead Protection Program

Chapter 10: Source, Storage, and Distribution System Evaluation

Chapter 11: Operation and Maintenance Program

Chapter 12: Capital Improvement Program

Chapter 13: Financial Program

The Appendices to this Plan contain further information related to these topics and are referred to in the text of each chapter where appropriate.

Chapter 2: Service Area and Policies

City of Redmond 2024 Water System Plan

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2. Service Area and Policies

This section provides a general overview of Redmond's water system, including its history, a description of adjacent purveyors, characteristics of the water service area, interlocal agreements, and policies related to water service.

2.1. Ownership and Management

The City owns, operates, and manages the public water system located generally within its municipal corporate boundaries and in the Novelty Hill area northeast of the City. A copy of the City's 2023 Water Facilities Inventory (WFI) Report Form is included as Appendix C. General information required by the Washington State Department of Health (DOH) regarding the Redmond water system is summarized below:

- System Name: City of Redmond Water System
- System Type: Group A Community Public Water System
- System ID Number: 71650B
- Owner Name: City of Redmond
- Owner Type: Local Government
- Owner Number: 4821
- Owner Address: 15670 NE 85th St, Redmond, WA 98052
- Location: King County, Washington

Engineering and operations functions associated with the water system are housed in the City's Public Works Department. In addition, the City's Finance Department handles utility billing.

2.2. System Background

The City of Redmond is located approximately 10 miles east/northeast of Seattle at the north end of Lake Sammamish in King County, Washington. Redmond is bordered by the City of Bellevue to the southwest; the City of Kirkland to the west; unincorporated King County to the north, east, and southeast; and Marymoor Park (King County) and Lake Sammamish to the south. Currently, the Redmond water system provides water service to a residential population of approximately 87,500 via approximately 19,600 individual metered service connections.

Figure 2-1 shows the City's retail service area and adjacent jurisdictions. The City does not currently provide service to all areas within its retail service area, but it is anticipated that the City will serve this area within the 20-year planning period of this Plan.

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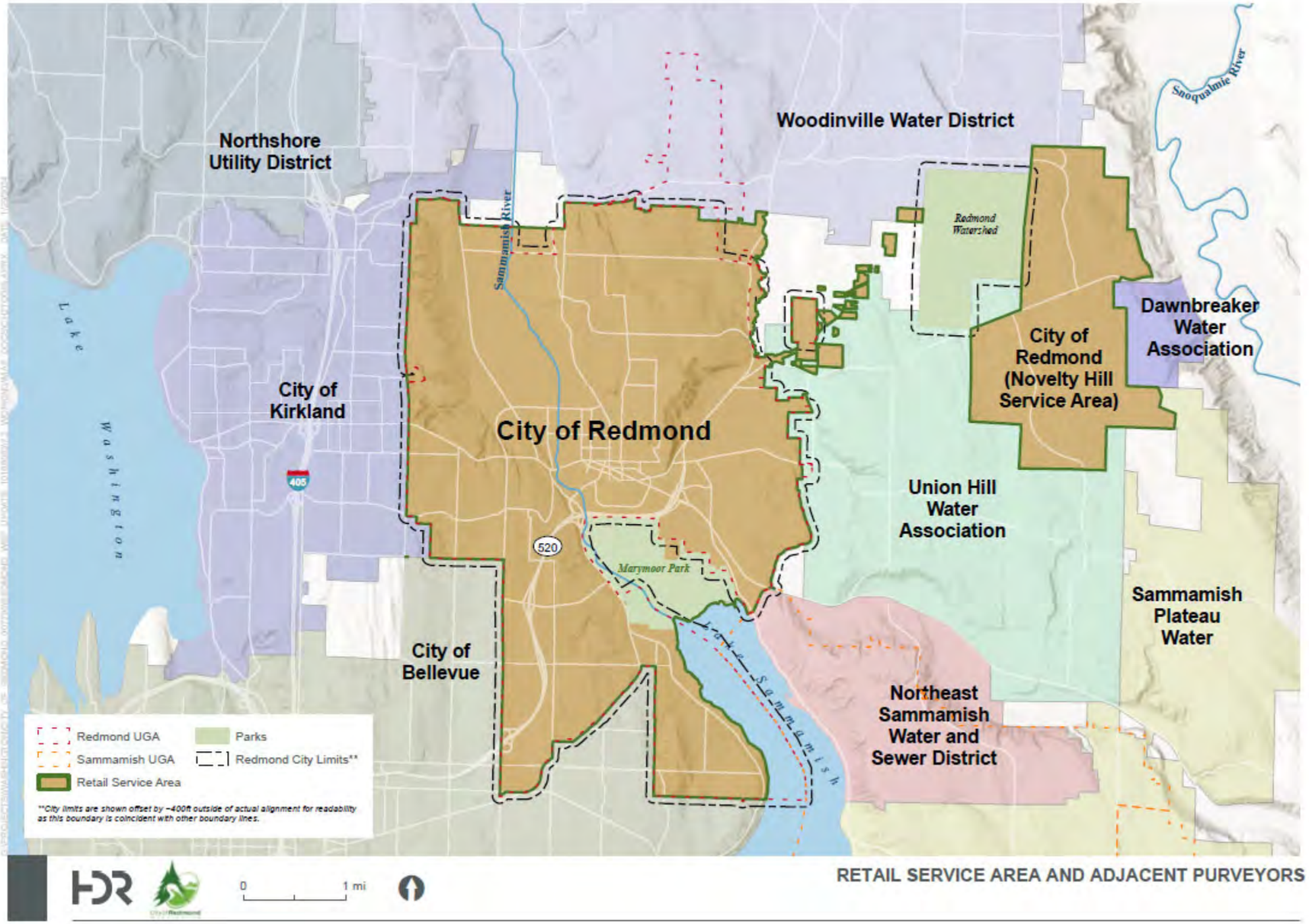


Figure 2-1. Retail Service Area and Adjacent Purveyors

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2.2.1. Water System Overview and Development History

The Redmond water system currently supplies its water customers through four hydraulically distinct but interrelated service areas. These include the Well Service Area, the Rose Hill Service Area, the Overlake/Viewpoint Service Area, and the Novelty Hill Service Area. The three Service Areas located within Redmond's city limits are shown in Figure 2-2. Development of the water system in what is now referred to as the City's Well Service Area dates back to the early 1900s.

The Overlake/Viewpoint Service Area was originally served by a water district that was assumed by Redmond and Bellevue as the cities expanded. Water system development in this Service Area began in the 1950s. Water service was extended throughout Viewpoint in the late 1960's through a local improvement district.

The City's Rose Hill Service Area was served by the Rose Hill Water District until 1994 when ownership and operation of the District water system was assumed by, and divided among, the cities of Bellevue, Kirkland, and Redmond.

Service to the Novelty Hill Service Area began in the late 1990s to serve the Redmond Ridge and Trilogy Urban Planned Developments northeast of the City in unincorporated King County along Novelty Hill Road.

Additional history of the Redmond water system and associated facilities is provided in the following sections.

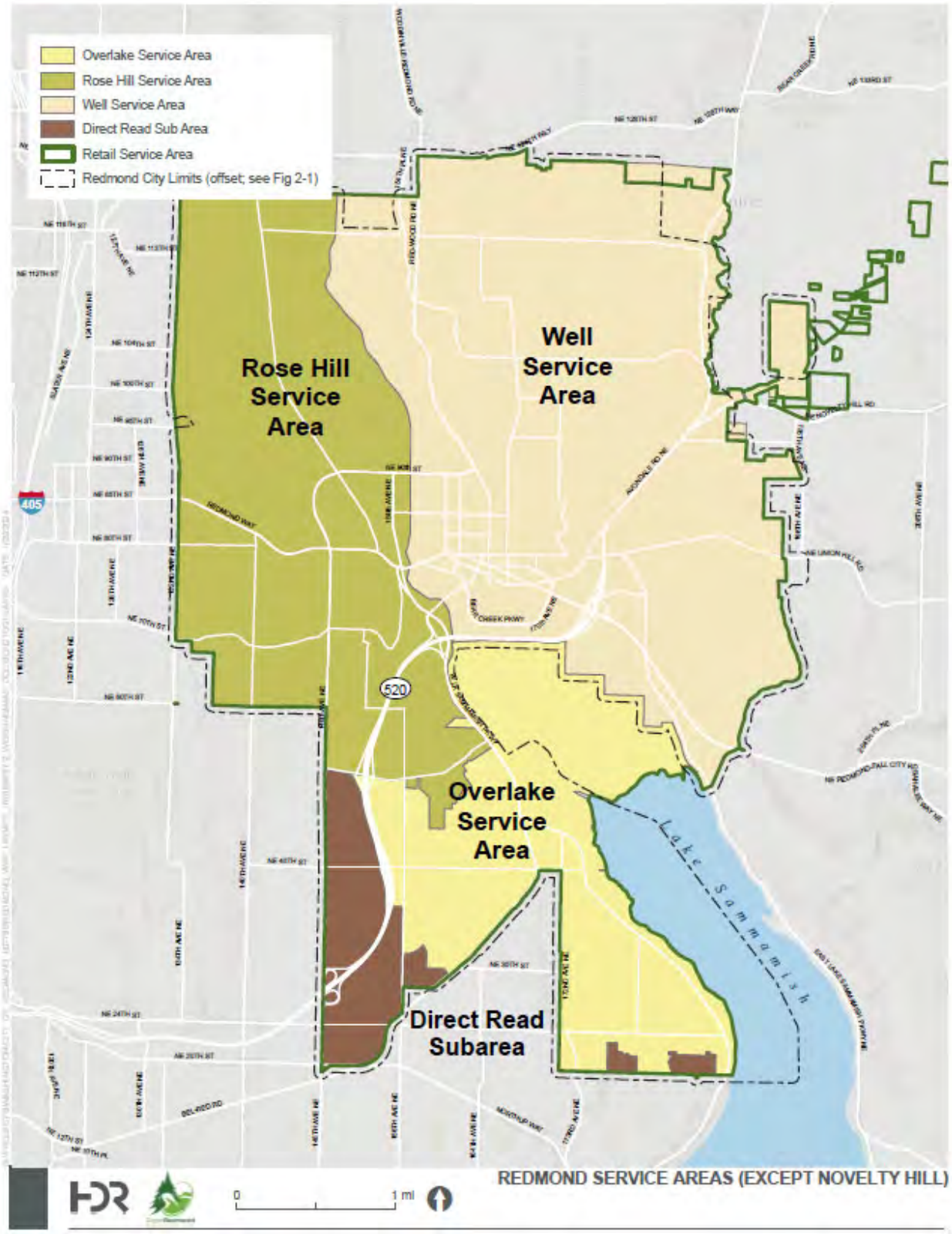


Figure 2-2. Redmond Service Areas (Except Novelty Hill)

Well Service Area

Redmond's earliest water system development was focused in and around what is now the Well Service Area. The City's first official public source of drinking water was Perrigo Springs, acquired and developed in 1914. The early water system included the spring, a dam forming a storage reservoir, and distribution piping consisting of four-inch to eight-inch wood stave pipe serving what is now the downtown area. In 1923, the Town of Redmond acquired 40 acres of watershed above the spring to protect water quality. This property is now the site of Jonathan Hartman Park. The original wood stave pipe was replaced with cast iron pipe in 1933.

In 1926, the town started action towards providing a second source of supply by acquiring approximately 800 acres of watershed on Seidel Creek. Water rights to Seidel Creek were acquired in 1927. Two dams and a pipeline were constructed to augment the spring supply with surface water from the creek. However, the dams washed out and the water quality of the creek source frequently did not comply with health department requirements, so in 1953 the town stopped using the Seidel Creek source and returned to the spring as its primary source of water. The spring and associated facilities continued to serve the community until 1962.

Significant additions were made to the water system in 1952. Well No. 1, with a capacity of 200 gpm, was developed in Anderson Park, and a 0.25-MG wood-stave tank was constructed at the Nike site to provide additional storage. In order to support growth and development on Education Hill, a pump station and additional pipelines were also constructed. Well No. 2 was drilled in 1959 at Anderson Park, adding another 500 gpm of supply capacity to the system.

A variety of major water system facilities were added to the system in 1962. Well No. 3, with a capacity of 350 gpm, was constructed east of Avondale Road NE, a 2.0-MG steel reservoir was constructed on Education Hill, and a 0.5-MG steel reservoir and pump station were constructed at the Perrigo Springs site. Also water service to the higher elevations of Education Hill was enhanced through the construction of a pump station.

In 1972, Well No. 1 was reconstructed, expanding its capacity to 700 gpm, and Well No. 4, with a capacity of 750 gpm, was constructed. The 4.0-MG Reservoir Park concrete reservoir and pump station were constructed in 1975 and 1976. Well No. 5, located in southeast Redmond, was constructed in 1984, adding an additional 1,000 gpm to the City's groundwater supply capacity.

Faced with the need to develop additional source capacity, the City negotiated a short-term wholesale supply contract with the Rose Hill Water District, which was then supplying water within Redmond along the western slopes of the Sammamish River Valley. Two metered interties were developed to connect the Redmond system with the Rose Hill Service Area. The capacity of these two interties was limited to approximately 1,100 gpm due to hydraulic limitations in the Rose Hill service area. These interties were re-designated as meter stations when the City assumed part of the Rose Hill Water District.

In 1988, Well No. 4 was demolished, a second 3.0-MG steel reservoir was constructed at the Education Hill site, and the small pump station serving the higher elevation of Education Hill was refurbished. In 1989, the City of Redmond finalized an agreement with the City of Seattle to purchase water from the Seattle supply system. This agreement initiated construction of Phase 1 of Seattle's Tolt Pipeline No. 2, which went into operation late in the summer of 1990. Redmond's connection to this pipeline was sized initially for 6.0 million gallons per day (mgd) of

supply capacity, and is expandable to approximately 12.0 mgd. Phase 2 of Seattle's Tolt Pipeline No. 2, completed in 2000, provided two stubs for future connections.

In 1989, service to Southeast Redmond was enhanced through the construction of the Southeast Redmond Pump Station. Additional storage capacity was added to that area in 1996 with the construction of a 4.5-MG steel Southeast Redmond Reservoir.

In 1997, a new larger Education Hill Pump Station was constructed to replace the original small pump station that served the higher elevations of Education Hill. In 2000, a third intertie between the Rose Hill Service area and the Well Service Area was constructed.

In 2000, the City began a source improvement project to upgrade all five wells. Well No. 4 was rebuilt in 2003, including upgraded treatment systems. Well Nos. 3 and 5 were upgraded to include new well house structures, pumps, mechanical and electrical equipment, and chemical-feed systems. The Well No. 5 upgrade was completed in 2005, and the Well No. 3 upgrade was completed in 2008. Similar upgrades to Well Nos. 1 and 2 were completed in 2009.

In 2008, the City completed significant maintenance of reservoirs within this service area, including seismic upgrades and painting of the two Education Hill tanks. Both tanks now meet current safety, operational, and seismic requirements. The Perrigo Springs tank was painted and had handrails added. The second Tolt supply station and meter at 172nd Street were finished. In addition, developer extensions added distribution piping north of 116th Street.

In 2014 Well 4 was redeveloped and the casing cleaned in an effort to improve performance of the well and water quality.

In 2020 the Southeast Redmond Reservoir was provided with seismic upgrades and repainted.

Rose Hill Service Area

Water service to the Rose Hill Service Area on the western slopes of the Sammamish River Valley was provided by the Rose Hill Water District until 1994, when the district's water system was assumed by and divided among the cities of Bellevue, Kirkland, and Redmond. Assumption of the Rose Hill Water District significantly expanded the Redmond water system. The Rose Hill Service Area was essentially divided among Bellevue, Kirkland, and Redmond based on their ultimate city limits, with the municipalities assuming ownership of those portions of the system within their respective water service areas and corporate boundaries. Despite the fact that the ownership of the Rose Hill Service Area is now divided, the Rose Hill Service Area remains hydraulically connected and essentially intact. Although each of the three cities maintains responsibility for its portion of the Rose Hill distribution system, the major Rose Hill water system facilities, including the supply, storage, and pumping installations, are owned and operated jointly by the three cities.

The primary source of supply for the Rose Hill Service Area is Seattle's Tolt Eastside Supply Line (TESSL). The Rose Hill Service Area is currently supplied from three metered supply interties (supply stations) to the TESSL: Supply Station No. 1 located at NE 70th Street and 140th Avenue NE, Supply Station No. 2 located at NE 85th Street and 132nd Avenue NE, and Supply Station No. 3 located at NE 116th Street and 132nd Avenue NE.

The system shares two water tanks and two pump stations. The Bellevue/ Kirkland/Redmond 11.2-MG steel South Reservoir and Kirkland/Redmond South Reservoir Pump Station were built

in 1971 and 1968, respectively. The pump station was replaced in 2004 with a new facility capable of providing 5,250 gpm. The North Reservoir was repaired after a floor plate leak that was caused by the 2001 Nisqually earthquake.

The Kirkland/Redmond 14.3-MG steel North Reservoir and the North Reservoir Pump Station were built in 1994. Major modifications were completed in 2010.

The Rose Hill Service Area also includes six metered connections with adjacent service areas: a meter to Bellevue located at NE 60th Street and 140th Avenue NE, placed into service in 1983, a meter to the 520 zone of the Overlake/Viewpoint service area located near NE 51st Street and 156th Avenue NE, a meter to the 335 zone of the Overlake/Viewpoint service area along West Lake Sammamish Parkway NE near NE 51st Street, and the three connections to Redmond's Well Service Area discussed previously.

In 2009, a small area in unincorporated King County and the southwest corner of Redmond's service area was transferred to the City of Kirkland after it was annexed by Kirkland. Another area of Redmond's service area in King County being annexed by the City of Kirkland is the northwest corner, north of NE 124th Street. This area was annexed by Kirkland in 2012 with the water service being transferred to Kirkland shortly after.

Overlake / Viewpoint Service Area

Redmond's Overlake/Viewpoint Service Area is served by joint Bellevue/Redmond facilities with Bellevue's water system and its various connections to the TESSL acting as the primary source of supply since the 1960s. The Redmond Overlake/Viewpoint Service Area is hydraulically interconnected with the Bellevue water system extending to the west and southwest. These areas are identified in Figure 2-2 as the Direct Read Subareas. In general, the majority of the water served in Redmond's Overlake/Viewpoint Service Area is supplied from Bellevue's NE 40th Street connection to the TESSL, located near 140th Avenue NE, although other Bellevue connections with the Seattle system located further to the south also contribute. This area was originally served by small water districts that have long since been assumed by the cities of Redmond and Bellevue.

Areas served by Redmond have been separated from those of Bellevue by three meters within the system: one along NE 40th Street east of SR520, one along 156th Avenue NE at NE 36th Street, and one at 171st Avenue NE and NE 24th Street. On an emergency basis, the area can also be served from the Rose Hill Service Area to the north through a number of piping connections and a meter located at 156th Avenue NE and NE 51st Street. There is also a meter on Bellevue-Redmond Road that allows water to flow back into Bellevue from Redmond.

Storage for the system is provided by the joint Bellevue/Redmond 6.0-MG pre-stressed concrete NE 40th Street Reservoir, which supplies the system through the NE 40th Street Reservoir Pump Station from its location in North Bellevue Community Park between 140th and 148th Avenues NE. Additional storage for Bellevue's portion of the system is provided by tanks located further south at the Lake Hills, Eastgate Park site, and Newport sites.

The Viewpoint area along the shores of Lake Sammamish receives additional supply through a meter to the Rose Hill service area at NE 51st Street and West Lake Sammamish Parkway.

Novelty Hill Service Area

The Novelty Hill area consists of the Redmond Ridge, Redmond Ridge East, and Trilogy urban planned developments (UPDs) northeast of Redmond along Novelty Hill Road. These developments were proposed in the Bear Creek Planning Area of King County in the late 1990s. Both the City and Union Hill Water Association claimed the UPDs within their designated service areas. The King County Utilities Technical Review Committee recommended that City of Redmond be the primary water service provider for the region. Therefore, the City serves water to the Novelty Hill area.

The Novelty Hill Service Area is supplied through a metered connection to the Seattle Tolt Tie Line along 236th Avenue NE. Water can be supplied to this connection from either of two regional pipelines: Tolt Nos. 1 or 2.

The Novelty Hill Pump Station supplies the service area from the Tolt Tie Line should pressures in the Tie Line fall below the level required to supply the 730 pressure zone by gravity. Water storage for the Novelty Hill Service Area is provided by the 3.0-MG and 5.5-MG steel Novelty Hill Reservoirs.

Three metered emergency interties exist between the service area and the Union Hill Water Association water system. Two other metered emergency interties exist between the service area and Woodinville Water District. In addition, water from this service area is wheeled to Sammamish Plateau Water and Sewer District through a metered intertie connection.

2.2.2. Neighboring and Adjacent Purveyors

The City of Redmond's adjacent water purveyors include the cities of Bellevue and Kirkland, the Northeast Sammamish Sewer and Water District, the Union Hill Water Association, Northshore Water District, and the Woodinville Water District. Figure 2-1 identifies each purveyor and its location relative to the Redmond water system. In addition to those shown, several smaller water systems and a number of private wells are in operation in the Redmond vicinity. Also, adjacent to the Novelty Hill service area are the Union Hill Water Association, Sammamish Plateau Water and Sewer District and Dawnbreaker Water Association water systems.

2.3. Related Plans

The City's program to ensure a comprehensive and reliable system for delivering water supply to its customers is embedded in a larger network of plans, policies and agreements that address land use and water supply within King County. This chapter provides a brief description of selected plans that relate to the City's water system.

2.3.1. 2016 King County Comprehensive Plan

As the regional government, King County provides leadership on issues of countywide importance. The King County Comprehensive Plan is the guiding policy document for all land use and development regulations in unincorporated King County, and for regional services throughout the County. The current plan was adopted in December 2016 and updated in July 2020. This plan guides growth and development in the unincorporated areas of King County through 2031.

Key topics in King County's Comprehensive Plan that are relevant to this Water System Plan include: regional planning, land use, utilities, and capital facilities. A summary of these sections and their relevance to and consistency with this Plan is provided below.

Regional Planning

The Growth Management Act requires that counties and cities develop a set of framework policies to guide development of each jurisdiction's comprehensive plan. County-wide planning is conducted by King County in cooperation with the cities to address a wide range of issues that affect the entire county. The Countywide Planning Policies (CPPs), adopted by the Metropolitan King County Council and ratified by the cities within the county, are revised on an ongoing basis to implement the Growth Management Act and to meet the state requirement for countywide planning. The CPPs describe an overall vision for the cities and unincorporated portions of King County and provide general strategies and approaches to be used by local jurisdictions, acting individually and cooperatively, to achieve that vision. Cities like Redmond are responsible for ensuring that their respective comprehensive plans are consistent with the CPPs. The County emphasizes implementation of the CPPs when engaged in planning and negotiating activities with cities and other service providers, such as annexations and interlocal agreements. The most recent CPP update was published in 2021.

The King County CPPs provide projections for household and employment growth between years 2019 and 2044. Per those projections, Redmond is expected to accommodate an additional 20,000 households within the City. Redmond is expected to accommodate 24,000 jobs within the same time period. The City of Redmond, along with the Puget Sound Regional Council, has continually monitored and updated its household and employment projections following adoption and amendment of the King County Comprehensive Plan. Additionally, planning data described in Chapter 4 was developed at the same time as the most recently published CPPs were being prepared. Therefore, the most up-to-date projections used in this WSP (Chapter 4) do not align exactly with those described in the current King County CPPs, as that information was not available at the time of development of Chapter 4.

Land Use

The City considers the King County Comprehensive Plan in its decision making for water service provided within King County unincorporated areas. Land use designations in unincorporated areas and the size and location of the Urban Growth Area (UGA) are determined solely by King County. The UGA and its relationship to the City's water retail service area are shown in Figure 2-1. Figure 2-3 shows the land use designations identified in the King County Comprehensive Plan. Table 2-1 summarizes the vacant and developed acreage by land use type.

The UGA includes all cities within the county, the cities' annexation areas, and land within the unincorporated part of the county characterized by urban-type growth. Cities are then expected to ultimately annex areas within their respective UGAs and to plan for service delivery for these areas.

Table 2-1. King County Land Use in Redmond Area

Land Use Designation	Vacant (acres)	Developed (acres)
Urban Residential, High	10	42
Urban Residential, Medium	83	505
Neighborhood Business Center	0	6
Commercial Business Center	7	43
Industrial	28	44
Parks	92	1,343
Agriculture	59	N/A
Rural Area	59	236
Open Space	317	256

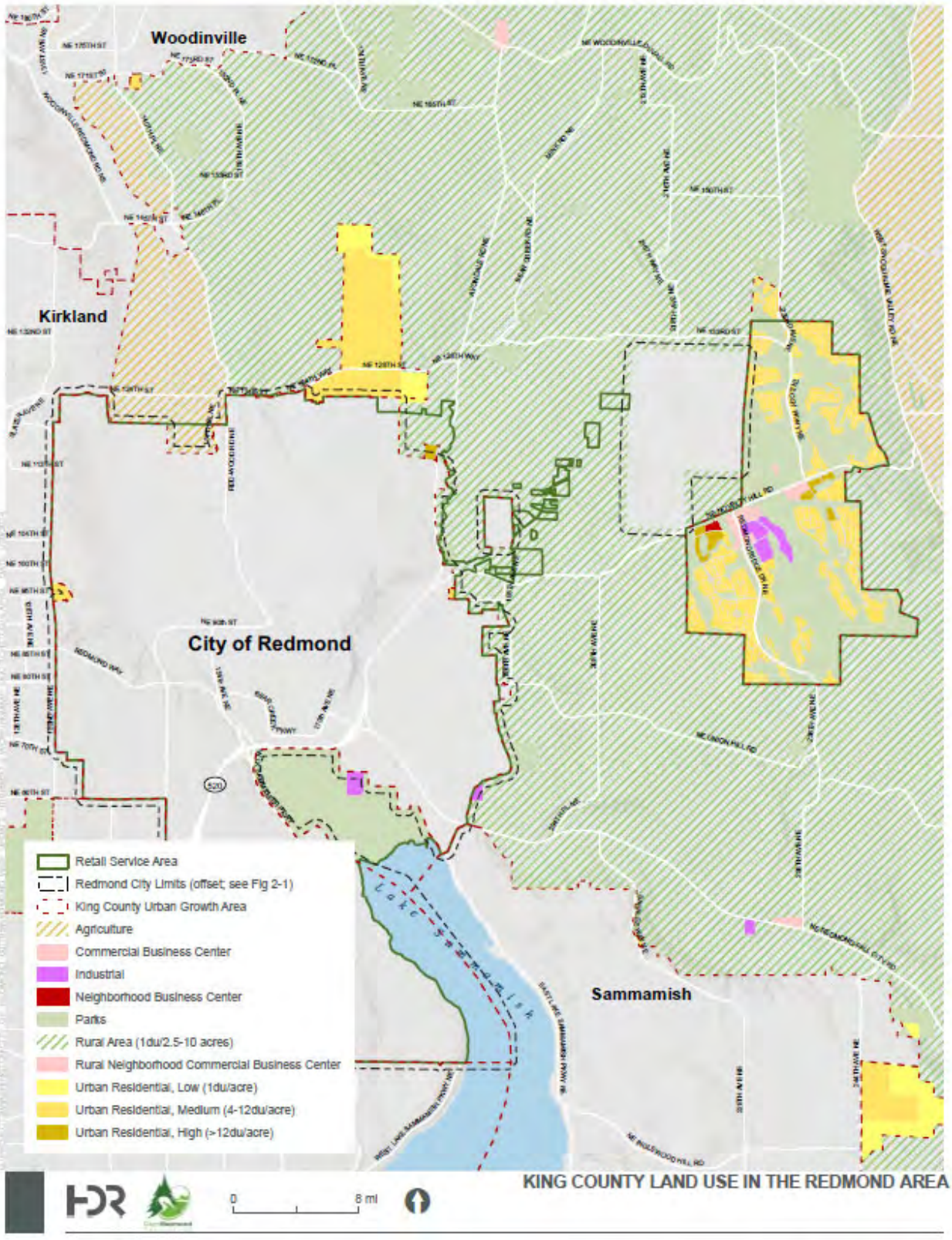


Figure 2-3. King County Land Use in the Redmond Area

King County has set a long-term goal for housing density in urban communities of an average eight homes per acre. The Comprehensive Plan states that single-family homes will continue to account for most of the new development in the County, while a wide range of housing densities and types will be encouraged. Further, the Comprehensive Plan states that King County should apply a minimum density requirement of four units per acre to all urban residential zones, except under limited circumstances such as significant physical constraints or property-specific conditions. In cases where areas are proposed for rezone to increase density, King County will notify cities and utility providers and should work with these service providers on issues raised by the proposal. The Comprehensive Plan states that residential developments within the UGA will connect to the City's system.

King County has developed a coordinated review process for Urban Planned Developments (UPDs). Large land ownerships within the UGA may be designated as UPDs to offer the public and the property owner opportunities to realize mutual benefits. Possible public benefits include greater preservation of public open space, proponent contributions to major capital improvement needs, diversity in housing types and affordability, and the establishment of the specific range and intensity of uses for the entire UPD. A property owner and the public could benefit from the efficiency of combined hearings and land use decision making, as well as the establishment of comprehensive and consistently applied project-wide mitigations guiding the review of subsequent land use approvals.

King County has designated the Bear Creek UPD area near Redmond. The Bear Creek UPD is comprised of Redmond Ridge UPD, Trilogy at Redmond Ridge UPD, and the Redmond Ridge East UPD. The Redmond Ridge, Trilogy and Redmond Ridge East UPD sites have been developed at urban densities and are served by the City's water system as the Novelty Hill Service Area.

The Growth Management Act allows counties to establish a process, as part of the UGA designation, for reviewing proposals to authorize new Fully Contained Communities (FCC). Criteria for approval of FCCs are contained in RCW 36.70A.350. If a county establishes in its comprehensive plan a process for authorizing FCCs, it must adopt procedures for approving FCCs in its development regulations. King County has established a fully contained community, consisting of the Bear Creek UPD area.

The King County Comprehensive Plan promotes annexation of urban unincorporated areas. Much of the County's urban unincorporated area is made up of geographically isolated islands surrounded by cities or adjacent to the urban growth boundary. Because these areas are scattered across the county, the provision of local services is costly. The lack of a substantive urban unincorporated area tax base exacerbates these difficulties and covering the cost of serving these areas reduces the amount of revenue available for regional services and for local services in the Rural Area. Therefore, King County has a strong fiscal interest in seeing the remaining urban unincorporated areas be annexed to cities in the next several years. The Comprehensive Plan further states that cities are the appropriate providers of local public services to all areas within the UGA, and that annexation is a means to achieve that desired service.

Utilities

The King County Comprehensive Plan describes King County's approach to water supply planning, and states that King County is not a water utility and does not provide potable water to customers in the region. However, it plays an important role in the coordination or linking of

water supply and growth. Moreover, the county reclaims water from its wastewater treatment plants. Reclaimed water can be used for many purposes, subject to protections for surface and groundwater, such as irrigation outside of critical aquifer recharge areas, and industrial use, which currently utilize potable water sources.

The King County Plan states that, over the past several years, King County has been working cooperatively with many of the larger water utilities in the region to gather information about regional water demand and supply.

Water utility service areas in King County are described in Coordinated Water System Plans (CWSPs) developed under the Public Water System Coordination Act (chapter 70.116 RCW) and individual water system plans (WSPs) such as this Plan. CWSPs describe future service areas for water utilities within which they are provided the exclusive right to serve future customers, and are to include the means for meeting those needs in the most efficient manner possible.

Under state law (RCW 43.20.260), the water utility is required to provide service within its retail service area, provided it can meet the conditions prescribed in state law, including the ability to deliver such service in a timely and reasonable manner. Individual WSPs must include the water utility's retail service area, which includes existing customers and areas where the utility plans future service. The planned provision of service must be consistent with local government comprehensive plans, land use plans, and development regulations. The Comprehensive Plan states that other service providers may serve within the future service area of a designated water utility if the designated water utility is unable to provide service in a timely and reasonable manner.

The King County Comprehensive Plan includes policies F-232 through F-237, which relate to potable water systems serving unincorporated areas within the UGA.

As part of its resource management and land use planning responsibilities, the King County Utilities Technical Review Committee reviews water system plans for those water utilities serving unincorporated King County or otherwise subject to the planning requirements of K.C.C. 13.24 and ensures the inclusion of elements related to reclaimed water, water use efficiency, and water conservation in the plans as may be called for under state law, the King County Code, or the King County Comprehensive Plan.

The King County Comprehensive Plan includes policies F-251 and F-252 related to ensuring consistency with WSPs.

2.3.2. City of Redmond Comprehensive Plan

The City's Comprehensive Plan, updated in 2011 and most recently amended in 2022, provides a framework for decisions on growth, land use, transportation, public facilities and services, parks and recreation, resource lands, and critical areas through the year 2030. The Comprehensive Plan was developed pursuant to the State Growth Management Act (GMA). During development of this Water System Plan, the City was updating its Comprehensive Plan to correspond to the publication of the Puget Sound Regional Council VISION 2050 plan. The VISION 2050 plan provides regional planning guidance for a four-county region in the central Puget Sound, which includes King County. City planning is using VISION 2050 and the King County CPPs to guide development of the next City Comprehensive Plan, due in 2024. The City recognizes that the new Comprehensive Plan will contain updated growth projections and the

City will incorporate those updated projections into the WSP after the updated Comprehensive Plan is complete.

Key topics addressed by the Comprehensive Plan that are relevant to the City's water system include land use, housing, capital facilities, and utilities. A summary of these Comprehensive Plan elements and their relevance to and consistency with this Plan are provided below.

Land Use

The land use element of the Redmond Comprehensive Plan (see Figure 2-4) is designed to help Redmond achieve its vision for a city that has gracefully accommodated growth and change, while ensuring that the community's high quality of life, cherished natural features, and distinct places and character are retained. The land use element provides the basis for planning for this growth, including needs for water service and infrastructure.

The Comprehensive Plan recognizes that resource and rural lands adjacent to urban areas historically have experienced pressure to develop at higher densities. Proximity to the City or potential annexation areas can raise property owner expectations that more intense development may be allowed and may discourage investments in resource or rural land uses. Extension of public facilities can encourage conversion of agricultural or rural lands. In light of these pressures for change, potential adverse impacts, and the City's strong interest in long-term preservation of these areas, the City's land use policies are designed to assure preservation of rural areas and agricultural areas adjacent to the City.

The Comprehensive Plan indicates that these land use goals are reflected in the city's land use regulations and zoning code. The Comprehensive Plan identifies six main categories of land use: Residential, Commercial, Urban and Local Centers (e.g., Downtown/Overlake), Other Employment (business park/manufacturing), Design District (Bear Creek and Southeast Redmond), and Urban Recreation/Semirural. Each of these is subdivided into land use designations, which are further defined by the City's zoning code.

Figure 2-5 shows the City's zoning.

Housing

The housing element of the Redmond Comprehensive Plan combines community values, legislative directives, and regional cooperation to form a set of policies that will ensure that Redmond grows gracefully, retaining elements of its past while preparing for the future. The housing element focuses on Redmond's housing supply including policies regarding the jobs/housing balance and design standards. It also focuses on housing diversity with policies regarding innovative zones, affordability, and incentive programs.

The King County CPPs establish job and housing targets for each sub-region in King County (see Section 2.3.1). The CPPs state that, between 2019 and 2044, Redmond expects to accommodate 20,000 additional housing units. As mentioned in section 2.3.1, these projections do not directly align with the growth projections used in this WSP due to using actual growth data and updates of demographic projections for specific purposes.

While many neighborhoods in Redmond are nearly fully developed, other areas such as North Redmond, Southeast Redmond, and portions of the Willows/Rose Hill neighborhood still contain large undeveloped parcels of land. For the more fully developed neighborhoods, infill, redevelopment, and remodeling of existing homes will be the primary force affecting

neighborhood quality. Redmond's Comprehensive Plan describes the City's abilities to achieve its share of the sub-region's housing target as highly dependent on the City achieving the mix of offices and housing that is planned for the mixed-use areas of Downtown, Marymoor and Overlake.

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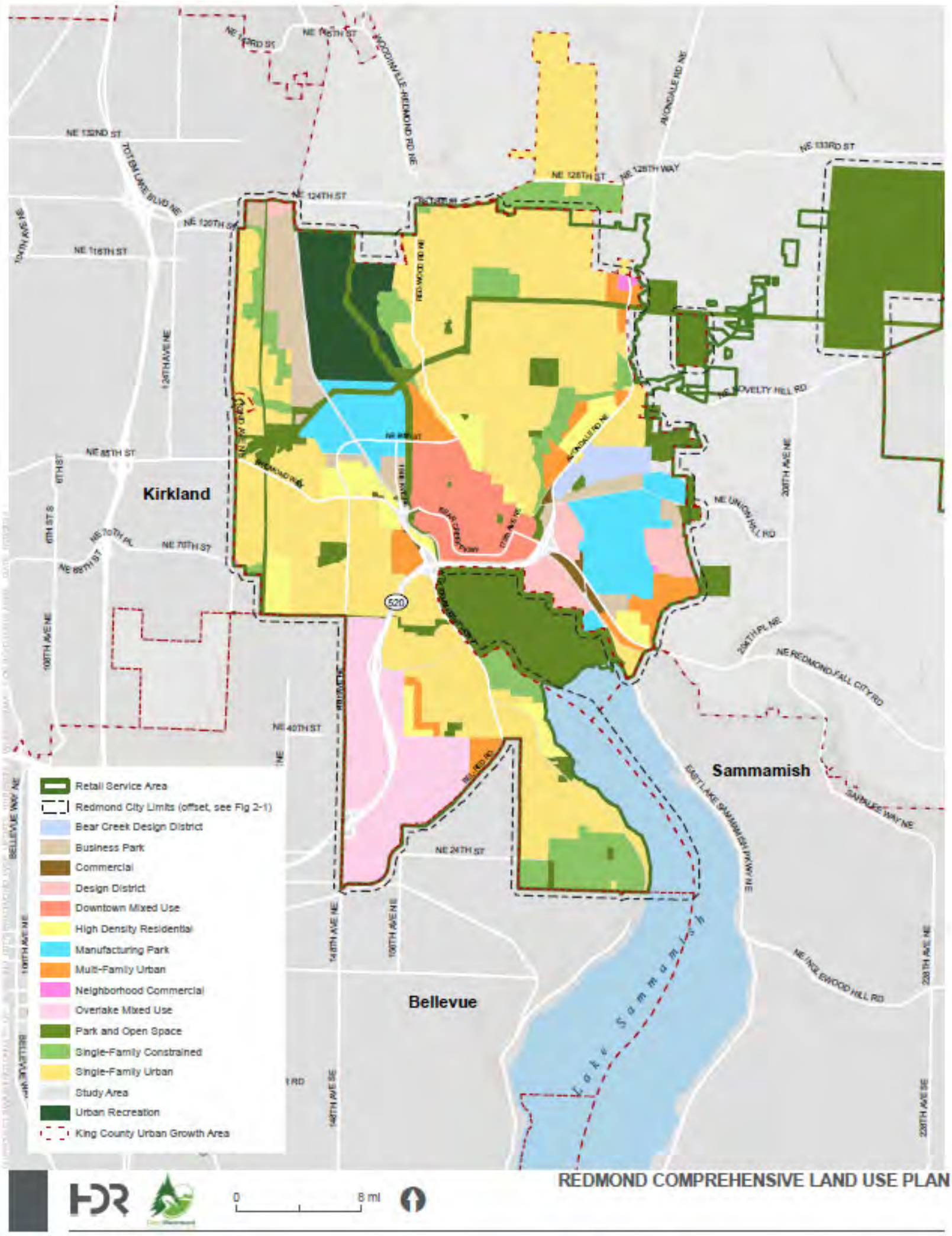


Figure 2-4. Redmond Comprehensive Land Use Plan

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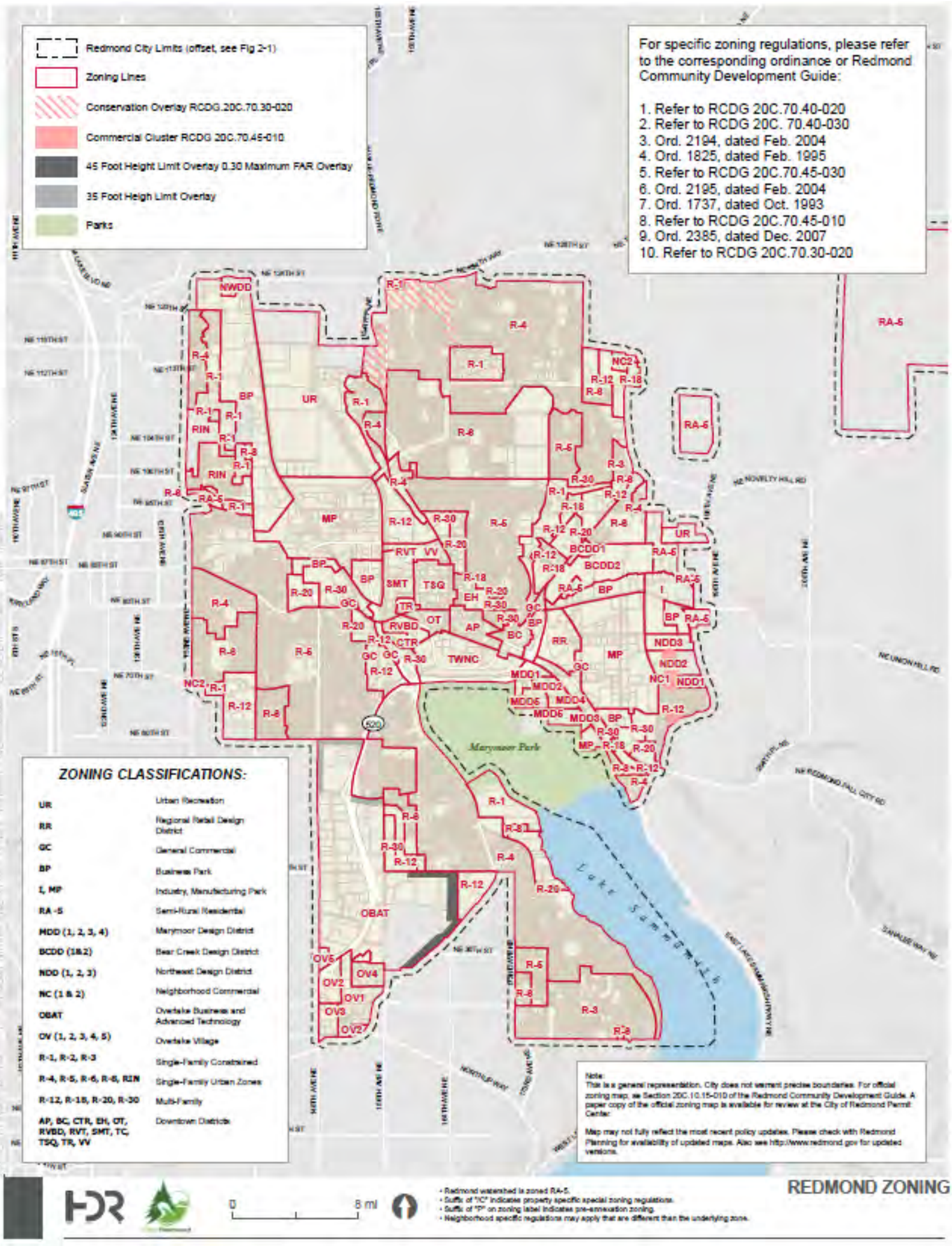


Figure 2-5. Redmond Zoning

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Capital Facilities

Redmond's Comprehensive Plan states that the City must plan for capital facilities in order to meet the need created by future growth and to maintain current levels-of-service. Capital facilities include water service infrastructure, as well as fire and police facilities, roads, sewers, stormwater facilities, and more. Each type of facility is designed or built to provide a certain level-of-service to the community, as noted in the capital facilities element. This element takes stock of capital facility inventory, establishes a capital facilities plan, and sets policy on how the City can finance capital facilities in the long term.

The Comprehensive Plan recognizes that the cost of maintaining Redmond's quality services and facilities must be borne equitably. Redmond continues to draw from diverse revenue streams in order to finance capital facility projects. The public facility costs associated with new growth are recovered in part using impact fees that reflect up to date costs, including those related to land and construction. In addition, the City continues to seek grants and other outside funding in order to maintain its high quality of life. Redmond relies on the analysis of needed capital improvements completed as part of this Plan (see Chapter 12) to inform the City's capital facilities plan.

The following Comprehensive Plan policies guide the City's planning for capital facilities (these are abbreviated from the full text contained in the Comprehensive Plan):

- **CF-1:** Develop and regularly update functional plans that assess capital facility needs and strategies for addressing such needs. Provide opportunities for public involvement appropriate to the nature of the update. Use functional plans to guide the development of capital priorities and investment decisions.
- **CF-2**: Include in the functional plans, at a minimum, the features necessary for maintaining an accurate account of long-term capital facility needs and associated costs to the City, and consistency with the Comprehensive Plan and the Redmond Zoning Code.
- **CF-3**: Adopt by reference sections of functional plans that respond to Growth Management Act requirements as components of the Capital Facilities Element of the Comprehensive Plan.
- **CF-4**: Require that new functional plans and updates to existing functional plans adhere to appropriate review processes described in the Comprehensive Plan.
- **CF-5**: Require that properties, when they develop or redevelop, construct or contribute to improvements as identified in adopted plans.
- **CF-6**: Establish capital facility service standards that help determine long-term capital facility and funding requirements.
- **CF-7**: Develop and maintain a strategic plan for implementing capital projects in support of the City's land use vision as described by the Comprehensive Plan.
- **CF-8**: Ensure the Capital Investment Strategy fits the standards described in the Comprehensive Plan.
- **CF-9**: Define "plan-level financial balance" as the financial capability to construct adequate capital facilities at the time that they are required, in support of growth anticipated by the adopted Comprehensive Plan through the planning period to 2030, and beyond to the build-out year.

- **CF-10**: Biennially evaluate the City's ability to achieve "plan-level-financial balance." Take one or more of the following actions if the financial capacity to provide necessary capital facilities for all or part of the City is found to be insufficient.
- **CF-11**: Adopt the City's Six-Year Capital Improvement Program (CIP) as the short-term budgetary process for implementing the long-term Capital Facility Plan (CFP). Ensure that project priorities, funding allocations, and financing strategies incorporated in the CIP are consistent with the long-term CFP.
- **CF-12**: Use capital facilities to attract growth by prioritizing projects that provide service to Redmond's urban centers and/or increase mobility to/from urban centers.
- **CF-13**: Prepare a long-range revenue forecast to promote consistency and stability in capital planning and programming, as well as to inform the Budgeting by Priorities process and Capital Investment Strategic Plan.
- **CF-14**: Follow the principle that growth shall pay for the growth-related portion of capital facilities.
- **CF-15**: Aggressively pursue funding from other levels of government and private agencies to accomplish the City of Redmond's capital investment program while optimizing use of City resources.
- **CF-16**: Consider exempting from payment of impact fees certain developments that have broad public purpose when adopting an impact fee ordinance.
- **CF-17**: Require school districts that propose to have the City of Redmond impose impact fees for them to prepare Capital Facility Plans.
- **CF-18:** Identify lands useful for public purposes in functional plans and in the appropriate elements of the Comprehensive Plan.
- **CF-19:** Identify shared needs and the lands the may be used to meet these needs with nearby cities, King County, neighboring counties, the State of Washington, the PSRC, school districts, special purpose districts and other government agencies.

Utilities

The utilities element describes the planning of utilities needed to support the community's vision for the location and amount of future growth. Utility planning for future annexation areas and higher growth areas such as Downtown and Overlake has advanced achievement of the vision. The City provides certain utilities in support of the desired location and pace of growth. For those utilities provided by private companies, the City has encouraged the necessary and desired services by allowing private companies to use public facilities, ensuring sufficient areas for placement of those facilities, and providing for a reasonable regulatory climate. For example, cell service carriers have installed infrastructure on top of reservoirs as these tend to be good locations for cellular infrastructure. The City and the service carriers stay in contact to coordinate access to the facilities.

The Comprehensive Plan recognizes the importance of design standards that ensure new water facilities will be compatible with the City's overall water system and have a reasonable economic life. The utilities element reflects this in policies that require new development to construct water system improvements necessary to serve the development and to provide a reliable integrated distribution system, and to maintain adequate storage facilities to meet equalizing and fire demand volume and emergency supply.

The following Comprehensive Plan policies guide the City's planning for utilities (these are abbreviated from the full text contained in the Comprehensive Plan):

- **UT-1**: Ensure that adequate public utilities and facilities are planned for, located, extended, and sized consistent with the planned growth described in the Vision and Goals, Annexation and Regional Planning, and Land Use Elements.
- **UT-2**: Design public utility facilities to meet service standards identified in the Capital Facilities Element.
- **UT-3**: Encourage the use of innovative technologies to provide, improve and maintain utility services, reduce negative impacts of additional utility service demands, improve the existing service and reduce, where appropriate, the overall demand on utility systems.
- **UT-4**: Prevent extension of City-provided urban utilities to rural areas outside the Urban Growth Area except to meet State Department of Health or other applicable health, safety, and welfare codes. Design such extensions to rural standards and do not condition the extension with other urban development standards such as street widening, sidewalks, or street lighting.
- **UT-5**: If utility extension to an unincorporated area becomes necessary and immediate annexation is not possible, condition extension with an agreement to annex in a timely manner and an agreement to design the extension to City development standards.
- **UT-6**: Conduct City business in a manner that leads by example through activities such as recycling, water conservation, energy conservation, and low-impact development processes whenever possible.
- **UT-7**: Require development to pay for or construct the growth-related portion of infrastructure needs.
- **UT-8**: Create equity in financing of capital facilities among City residents and those outside the City by reflecting the full cost of providing service outside City limits.
- **UT-9**: Promote the efficiency of utility placement both in cost and timing through methods such as co-locating public and private facilities in shared utility corridors; coordinating facility planning; providing timely notice and permitting for construction and repair of utilities, providing a reasonable regulatory climate and expeditious permitting; designing new public infrastructure to allow for future utilities, encouraging joint use of utility corridors for utilities and recreation.
- **UT-10**: Determine utility infrastructure necessary for a given development concurrently with site plan entitlement.
- **UT-11**: Balance the need for provision of utilities at a reasonable cost with the need to protect the environment and natural resources.
- **UT-12**: Design, locate, and construct facilities to reasonably minimize adverse impacts to the environment and to protect environmentally sensitive areas. Take into account both individual and cumulative impacts. Minimize impacts through actions such as locating utility corridors in existing cleared areas and outside of sensitive areas such as wetlands and fish-bearing watercourses, using engineering techniques to minimize erosion on steep slopes and minimizing corridor widths.
- **UT-13**: Require undergrounding of all new utility distribution lines, except where undergrounding would cause greater environmental harm than alternatives or where the

Washington Utilities and Transportation Commission tariff structure is not consistent with this policy. Consider new technologies such as wireless transmission as they become available.

- **UT-14**: Promote the undergrounding of existing utility lines by means such as requiring undergrounding of utility lines as a condition for redevelopment projects, undergrounding utility distribution lines or providing for future undergrounding as street projects occur, funding undergrounding and requiring service lines to be undergrounded when significant site improvements are made.
- **UT-15**: Require reasonable screening or architecturally compatible design of above-ground utility facilities. Promote high quality design of utility facilities through measures such as use of varied and interesting materials, color, artwork and superior landscape design.
- **UT-16**: Continue to utilize, protect, and sustain the Redmond well system to maximize the efficiency of the system as long as water quality is in accordance with or can be treated to meet State and federal drinking water regulations.
- **UT-17**: Protect groundwater sources by maintaining and monitoring a Wellhead Protection Program which guides land use decisions, development regulations, stormwater facility requirements, coordination with other agencies and other measures necessary to protect Redmond's well system.
- **UT-18**: Participate with the Cascade Water Alliance to acquire additional sources of supply for future needs.
- **UT-19**: Reduce average annual and peak day water use by participating in Cascade Water Alliance's conservation program.
- **UT-20**: Design water delivery and storage systems to provide efficient and reliable service, to balance short- and long-term costs, and to comply with State and federal regulations through methods including but not limited to: use of gravity feed whenever feasible, development of a looped system and standardization of transmission facilities sizing and materials.
- **UT-21**: Require new development to construct water system improvements necessary to serve the development and to provide a reliable integrated distribution system.
- **UT-22**: Maintain adequate storage facilities to meet equalizing and fire demand volume and emergency supply.
- **UT-23**: Pursue the creation of emergency interties with adjacent purveyors.
- **UT-24**: Prohibit the creation of new water systems within the City of Redmond to ensure that Redmond is the primary provider of water service. Facilitate the City being the sole provider by encouraging the connection to City water for those properties on existing private well systems.
- **UT-25**: Require connection to the City water system for all new development permitted by the City.
- **UT-26**: Require connection to the City water system for existing uses when redevelopment such as a short plat, subdivision or other significant land use action occurs to that property.

2.3.3. East King County Coordinated Water System Plan

East King County's Coordinated Water System Plan (1996) is another regional planning document that provides Redmond with guidelines for regional water use and planning. At a minimum, the City must meet the planning and design guidelines set forth in this document. Also presented in this Plan are the ways in which service area boundaries are determined, how boundary disputes are resolved, and the existing boundary for each of the utilities according to the East King County Regional Water Association.

Although changes have been made to Redmond's service area boundary since the last East King County Plan, all changes to Redmond's boundary have been consistent with guidelines set forth, and boundary dispute decisions made by, the East King County Regional Water Association. The East King County Plan has not yet been updated to reflect changes in service area boundaries and regional water supply and delivery that have resulted from the formation of Cascade Water Alliance (see Section 2.3.4). The individual water system plans of all purveyors in the CWSP area act as supplements to the adopted CWSP and new information regarding service area boundaries and regional water supply supersede those in the original plan.

2.3.4. Cascade Water Alliance Contracts and Planning Documents

The City of Redmond is a Member of Cascade Water Alliance. Cascade was formed by a group of eight water systems to jointly plan, develop and operate a regional water system for its members.

The Joint Municipal Utilities Services Agreement dated March 28, 2012 ("Joint Agreement"), among the now-seven (upon the departure of Covington Water District) members describes Cascade's purposes, funding and governance structure (see Joint Agreement, Article 3). Cascade's 2012 Transmission and Supply Plan, as updated by the 2019 Transmission and Supply Plan Extension, describes Cascade's programs and water supply projects. Currently Cascade has entered into wholesale water supply agreements with two other regional water supply systems: Seattle Public Utilities (SPU) and Tacoma Public Utilities (TPU).

Under its agreements with SPU, Cascade has access to water supplies from SPU's Cedar River and Tolt River supply systems. The total quantity of water available on an average day basis is 33.3 million gallons per day (mgd) through year 2039. The contract extends through 2064 with a declining supply commitment beginning in 2039. This supply is currently delivered to several members of Cascade, including Redmond, through connections to SPU's regional transmission system. These amounts are increased during periods of peak demand up to 66.6 mgd.

Under its agreement with TPU, Cascade has access to water supplies from TPU's Green River supply system. The total quantity of water available on an average day basis is 10 mgd through 2026, and declining to four mgd by 2031. Based on recent data on Member demands, it appears the SPU supply, including the new Supplemental Water, is adequate to meet near-term needs for several years before the Tacoma supply will be needed.

In the long run, Cascade plans to develop one or more additional sources to meet its Members' needs, particularly once the SPU supply begins to decline under the contract described above. Cascade has purchased the former hydroelectric facility at Lake Tapps to become a regional water source. Facilities purchased include the lake, canals, power plant and water rights. Cascade's water rights related to this project were issued in 2010 by the Washington State

Department of Ecology. Future development of Lake Tapps for municipal supply will require a variety of permitting actions and construction of a water treatment plant and transmission pipeline.

Cascade is currently working with SPU and TPU to negotiate water blocks to provide demand through the late 2060's and postpone development of Lake Tapps. If extended water blocks are not in place, construction of Lake Tapps would need to begin in 2033.

Under the Joint Agreement, Redmond retains ownership and control of its own groundwater sources. Cascade commits to meeting Redmond's water supply needs exceeding the capacity of Redmond's local sources. In the event Cascade's supplies are not fully sufficient at any given time to meet the full need of all its members, the Joint Agreement specifies that shortages will be shared among all its members.

Cascade also provides water conservation services to Redmond and other Cascade members. Activities covered by Cascade are described in the 2019-2022 Regional Water Efficiency Program.

2.3.5. City of Bellevue Water Comprehensive Plan

Bellevue is one of Redmond's adjacent purveyors with shared joint-use facilities, serving the Overlake and Viewpoint neighborhoods in the southern third of Redmond's retail service area. Bellevue's 2016 Water Comprehensive Plan is important to Redmond because of the joint ownership of a 6.0-MG storage reservoir and pump station within Bellevue's water service area that provides water to Bellevue and Redmond customers. Redmond is working with Bellevue on possibly constructing a new shared reservoir and pump station in the Overlake area. Redmond and Bellevue have interlocal agreements to address maintenance and operation of jointly-owned facilities and water supply requirements (see Section 2.6). Sections of Bellevue's plan that are of interest to Redmond include the storage analysis, operations and maintenance, and any capital improvement projects that pertain to jointly owned facilities.

2.3.6. City of Kirkland Comprehensive Water System Plan

Kirkland and Redmond share a service area boundary, and the two cities have joint ownership of supply and storage facilities that serve the Rose Hill areas of Redmond and Kirkland. The Rose Hill Water District was assumed in 1994 and portions of the district were incorporated into the water service areas of Kirkland, Bellevue and Redmond. This joint ownership means that Redmond has an interest in the sections of Kirkland's Water Comprehensive Plan that pertain to the shared supply, storage, and distribution facilities that serve the Rose Hill service area. Redmond and Kirkland have interlocal agreements to address maintenance and operation of jointly-owned facilities and water supply requirements (see Section 2.6).

2.3.7. Sammamish Plateau Water and Sewer District Water Comprehensive Plan

Redmond and Sammamish Plateau Water and Sewer District have an interlocal agreement under which Redmond provides access to the District for water from Cascade Water Alliance, through an intertie. The District's Water Comprehensive Plan documents this supply arrangement. The District's service area (Cascade View Zone) abuts a portion of Redmond's Novelty Hill Service Area, and this is also reflected in the District's Water Comprehensive Plan.

2.3.8. King County Reclaimed Water Planning Efforts

An element of King County's program is the capacity for production of reclaimed water at the Brightwater Treatment Plant located in Snohomish County. A "backbone" distribution system has been developed to convey reclaimed water to the area south of the Brightwater Treatment Plant, including portions of the Sammamish River Valley north of Lake Sammamish. Existing reclaimed water users near the City of Redmond include the Willows Run Golf Course and the 60 Acres Soccer Complex, where this resource is used for irrigation and the York Fill Station. These locations are located outside of Redmond's CARA.

Redmond Municipal Code 13.07.085.A.2 and Redmond Zoning Code 21.64.050.C.1.p and 21.64.050.C.2.b limits the use of reclaimed water within Redmond's critical aquifer recharge area (CARA) to only uses that discharge to the sanitary sewer. Redmond and King County have worked collaboratively on protecting the City's shallow alluvial aquifer through a series of Memorandums of Understanding (MOU). The MOUs restrict certain uses with the Redmond's CARA and King County has agreed to honor those restrictions within the portions of Redmond's CARA that extends into King County. Additionally, King County and Cascade Water Alliance entered into an MOU that applies to service areas of Cascade Water Alliance members. The MOUs are listed below:

- Agreement to Coordinate Reclaimed Water between King County and Cascade Water Alliance. Adopted January 1, 2019.
- Memorandum of Understanding between King County and Redmond regarding Marymoor Park. Adopted September 25, 2018.
- 2017 Memorandum of Understanding between King County and The City of Redmond Regarding Reclaimed Water regarding York Reclaimed Water Truck Fill Station. Amended July 29, 2021.

The composition of Redmond's unconfined aquifer yields high infiltration rates, low organic content, and shallow depth to groundwater. Redmond's alluvial aquifer has consistently been identified as highly susceptible to surficial contamination. The Redmond-Bear Creek Valley Groundwater Management Plan (Redmond-Bear Creek Ground Water Advisory Committee 1999) identified the vast majority of Redmond's alluvial aquifer as highly susceptible to surficial contamination due to surficial infiltration potential of the soils. The 1997 Source Water Assessment designated four out of the five City operated drinking water supply wells as highly vulnerable to surface contamination due to the lack of a confining layer in the aquifer that would prevent the migration of surface contamination, shallow supply well screens, and type and intensity of land use in proximity to the wells. For this reason, the City has consistently applied caution when evaluating and regulating risk to the water quality of the drinking water aquifer.

The limitations put on reclaimed water use within the City's CARA were adopted by City Council as recently as 2019 because there is insufficient data to determine that Brightwater reclaimed water effluent does not pose health risks to use within a shallow, unconfined, alluvial aquifer system. From the limited 2019 sampling in the reclaimed water from the Brightwater York Pump Station, 20 polybrominated diphenyl ethers chemicals, 10 Per- and Polyfluoroalkyl Substances, and 20 pharmaceutical and personal care product chemicals were detected. The Growth Management Act requires that the City of Redmond designate and protect its CARA. The City obtains approximately 40% of its drinking water from City groundwater wells within the CARA. The City has put additional protections in place within the CARA to protect the City's drinking water source from potential degradation caused by reclaimed water use since there is

insufficient data to determine health risk of reclaimed water use over a vulnerable aquifer. Data must conclusively show there is no risk of contamination from the use of reclaimed water on a shallow, unconfined, alluvial aquifer system, before the City will remove limitations on reclaimed water use within the CARA and risk contamination of its drinking water supply.

The relation of these County reclaimed water planning efforts to the City's evaluation of reclaimed water opportunities is addressed in Section 7.4.

2.4. Retail Service Area Characteristics

This section characterizes the City's retail water service area. The City's retail service area includes both areas where Redmond currently provides water service, and areas where the City intends to make service available within the 20 year planning period covered in this Plan.

2.4.1. Retail Service Area Boundaries

The City's existing city limits and retail service area, and King County's urban growth area boundaries are depicted along with adjacent water purveyors in Figure 2-1. As shown in the figure, the City's retail service area generally conforms to the city limits, with the exception of the Novelty Hill service area northeast of the City along Novelty Hill Road, the areas served through the assumption of Rose Hill Water District, Marymoor Park, and small areas to the north and northeast in the Well Service Area that are contiguous with the greater City service area.

The City does not anticipate any major changes to its retail service area in the immediate future, although the service area may be expanded to provide service to areas annexed into the City in the future that are not currently served by another purveyor (see Section 2.3.1). Changes to the retail service area would require the City to produce a plan amendment describing the service area change and receive approval from the relevant regulatory agencies. It should also be noted that the Redmond water system does provide water service to a small number of isolated customers along NE Redmond Road (see Figure 2-1). These customers were connected to the original pipeline from Seidel Creek known as the "Country Route" pipeline. Eventually the City would like to abandon this facility east of Farrel McWhirter Farm Park. At this time the City plans to continue maintaining the system and providing water to existing customers. The City is discussing this area with Union Hill Water Association and Woodinville Water District to seek an appropriate solution that avoids unreasonably costly infrastructure improvements. The City does not plan to provide any additional services from this line in the future. Therefore, while those parcels served are shown as within the retail service area, no other parcels adjacent to the Country Route pipeline and outside of the retail service area will be provided water service. No meter/service upgrades or new services will be approved for this area.

Small service area changes have occurred at the northwest corner of the service area (area transferred to Kirkland). Customers in the northeast corner of the service area (area outside the City's Urban Growth Area) have received water meters and are fully integrated into the City's retail service area. This area is designated as rural in the King County comprehensive plan and service is provided per policy UT-4 in the City's comprehensive plan.

The City serves several areas outside the city limits, including: Marymoor Park, 60 Acres Park, portions of the Rose Hill water service area, and the Novelty Hill Urban Planned Developments in unincorporated King County. For the portions of the City's system in unincorporated King County, the City has franchise agreements with the County. Two franchise agreements were adopted in 2022, replacing prior franchise agreements, one for the Novelty Hill utility and one for

the City utility. These agreements authorize use of County right-of-way over large areas of unincorporated King County near the City of Redmond, but do not represent a commitment to serve water to customers within all of those areas.

The City's service area has changed over the past few years due to annexations and service to areas within the UGA. The service area is no longer consistent with that shown in the East King County Coordinated Water System Plan. The service area boundary shown in the East King County Plan should be changed when it is next amended to be consistent with this Plan.

2.4.2. Geography, Zoning, and Land Use

The Redmond Comprehensive Plan and the Redmond Zoning Code designate neighborhood-planning areas around the City for the purpose of describing the intended land use and local development characteristics.

Figure 2-4 and Figure 2-5 show land use and zoning designations in Redmond and adjacent unincorporated areas of King County. Detailed information regarding zoning and land use for these areas is available in the Redmond Comprehensive Plan and the Redmond Zoning Code.

Policies in the Downtown/Overlake Urban Center are intended to increase densities and direct the majority of the City's housing and employment growth to these two areas. This has been the case since the prior plan and has the potential to impact water demand and infrastructure needs in these areas. Significant growth is also proposed in the Marymoor Village area that will be served by a new light rail station in the future.

2.5. Service Area Policies and Conditions of Service

This section provides a summary of selected provisions from Title 13 of the Redmond Municipal Code (RMC) that affect the City's water system, and City policies regarding annexation and associated water service extension.

2.5.1. Duty to Serve

The 2003 Municipal Water Law gives utilities a duty to serve all new connections within the utility's defined retail service area. Four threshold factors are considered for providing service in the retail service area:

- The municipal water supplier has sufficient capacity to serve water in a safe and reliable manner.
- The service request is consistent with adopted local plans and development regulations.
- The municipal water supplier has sufficient water rights to provide service.
- The municipal water supplier can provide service in a timely and reasonable manner.

The City makes determinations on provision of service to new customers in accordance with RMC Title 13 and through its Utilities Availability Application process.

Applicants for water service located within the City's retail service area complete and submit to the City's Development Services Center the City's Utilities Availability Application Form. As of the writing of this document, this form is available online at:

https://www.redmond.gov/DocumentCenter/View/16507/Utilities-Availability-Application-Form-PDF. Once reviewed and approved, the City issues the applicant a Utilities Availability Certificate, which is subject to various conditions stated on the form, including being valid for one year from date of issuance.

Applicants for water service located outside City Limits follow the process outlined in RMC 13.36 (Utility Extensions Outside City Limits), which includes detailed requirements defining conditions of service and the materials and process needed to apply for service.

Details regarding the City's policies and procedures related to water service applications are provided in the Redmond Zoning Code (RZC). Water Permits are classified as Type 1 permits and follow the procedure outlined in RZC 21.76.050. The established time frame for responding to an application for service is 14 days, as is stated on the Utilities Availability Application Form. The appeals process related to water service applications is detailed in RZC 21.76.050F.

The City acknowledges that the King County Utilities Technical Review Committee (UTRC) has the authority to serve as an appeal body for timely and reasonable service appeals (as related to the City's duty to serve), after all local appeals have been exhausted. This authority is described in King County Code 13.24.090.

As described in Section 2.3.2, City policies UT-24 and UT-25 require that all new developments be connected to the City's water system. No new permit exempt wells are allowed within the City Limits. King County Code Chapter 13 states that a permit exempt well may be approved if connection to the respective Group A system (i.e., the City) is not timely or reasonable conditioned upon a requirement for a certificate of future connection. The City does not anticipate this will occur; hence, the above-mentioned policies requiring connection to the City's water system. However, if the City cannot meet its duty to serve based on the factors above and consistent with RMC Title 13, the City acknowledges that the applicant requesting service may drill an exempt well, according to King County Code.

2.5.2. Wholesale Water

The City has no current plans to provide water to other water systems on a wholesale supply basis. However, the City may be willing to participate in regionally coordinated water supply efforts.

The City currently holds a wheeling agreement with Sammamish Plateau Water and Sewer District. This agreement allows the District to access Cascade Water Alliance's water supply via Redmond's transmission system.

2.5.3. Annexation

As described in Section 2.3.2, the City's Comprehensive Plan identifies areas of potential annexation and uses land use policies and zoning to encourage the concentration of growth in these areas. These policies include the extension of utility service to areas within the UGA where growth is anticipated to occur. The City may provide water service to areas or properties that have not been annexed, either in anticipation of future annexation, or otherwise on a case by case basis.

2.5.4. Direct Connections and Satellite Systems

For any new connections to the City's water system, the City requires that a service meter be installed and that an installation charge be paid to the City (RMC Chapter 13.08). There are currently no satellite systems served by Redmond and the City has no plans for adding or managing any satellite systems in the future.

2.5.5. Extension

As described in Section 2.4.1, the City's retail service area includes both areas currently served and areas where extension of the water system is anticipated within the 20 year planning period covered by this Plan. Policies related to extension of water service are included in RMC Chapter 13.11. Other key policies are summarized below:

- Subdivision and Short Subdivision Regulations – provide criteria, regulations and standards to govern the subdividing of land within the City, and to provide for water service and other public requirements (RZC 21.74)
- Review and Approval Criteria – each proposed subdivision or short subdivision shall be reviewed to ensure it will be adequately served with City approved water and other utilities appropriate to the nature of the subdivision. No final plat or short subdivision shall be approved unless it contains a dedication to the public of all common improvements, including water supply systems which were a condition of approval, and that city approved water facilities will be available to each lot created by the division of land (RZC 21.74.030)
- Easements – public easements for the construction and maintenance of utilities and public facilities shall be granted to provide and maintain adequate utility service to each lot and adjacent lands (RZC 21.74.020(C)(1-5)).
- Water Supply – All lots shall be served by a water system approved by the City of Redmond. Any common water system serving more than one lot shall be provided by the applicant and dedicated to the appropriate water purveyor. Such water supply systems shall be designed and constructed according to all applicable provisions of the Development Guide, the standards and specifications of the water purveyor and the applicable rules and regulations of the state (RZC 21.74.020(D)).
- Water Standards – All City water facilities shall be designed in compliance with the "Design Requirements Water and Sewer System Extensions" document, and shall be constructed in compliance with the standards and specifications available from the Utility Division of the Public Works Department (RZC Appendix 3).
- Adequate Public Facilities and Services Required – requires that public facilities and services are adequate to support development or will be provided in a timely manner consistent with the Public Facilities and Services goal of the Growth Management Act (RZC 21.17.010).
- General Requirements – all new development proposals requiring City approval shall be adequately served by water supply prior to the time of occupancy, recording, or other land use approval (RZC 21.17.010(B)).
- Utility Availability Certificate – prior to approval, applicant is required to provide a utility availability certificate from the Public Works Department. If a certificate was approved as part of a subdivision or site design process, a new certificate will not be required for a

subsequent building or development permit, unless changes result in water impacts not considered when the proposal was first approved (RZC 10.17.010).

- Adequate Water Supply – All uses shall be served by an adequate water supply system. The applicant must demonstrate that the proposed development can be connected to the City's water system or another system approved by the City, that the water system can provide sufficient flows to serve the proposed uses and fire flows, and that the system has sufficient storage capacity to serve the proposed uses and fire flows. The applicant may receive conditional approval and/or be required to make improvements to the system prior to approval. Before occupancy or recording, a final inspection will be conducted to ensure that the system will adequately serve the proposed building or use (RZC 21.17.010(D))
- Adequate Fire Protection – all new developments shall be served by adequate fire protection (RZC 21.17.010(G)).
- Construction Standards, Specifications, and Drawings – the Public Works Department shall prepare and approve design standards and construction specifications for water systems (RZC 21.17.010(H)).
- Extensions Outside City Limits. Applicants for extensions outside of the city limits must complete and submit a utility extension agreement to be approved by the City. An applicant must agree the development to be served will meet the requirements of the City's comprehensive plan, zoning code and building regulations; and must pay all costs of extending service. In addition extension outside City Limits cannot be granted without approval from the Redmond City Council (RMC 13.36).

In some cases, property owners who are served by an extension are required to pay an "equitable share of the costs." These charges are in addition to any other connection costs required by the City's Municipal Code.

In cases where the City already provides service to customers in unincorporated King County, fire service requirements reflect the standards that were in effect at the time service was granted or substantial system upgrades were made. In cases where the City agrees to provide service to new customers outside City Limits in the future, the City will consider the proposed fire flow provisions and the City Council will determine whether those provisions are suitable for granting service. Typically if the area to be served lies within the City's Urban Growth Area, the City would require that City fire-flow requirements be met.

2.5.6. Customer Inquiries

The City manages its customer inquiries through the Q-Alert system. Customers with water-related inquiries should call the numbers listed in Table 2-2, based on the particular issue or concern.

Table 2-2. Contacts for Customer Inquiries

Topic	Telephone Number
Utility Billing	(425) 556-2152
Water System Repair and Operation	(425) 556-2800
Development Services	(425) 556-2876
Water Quality	(425) 556-2847

The Maintenance and Operations Center (MOC) uses the facilities maintenance and management program Lucity to do most record keeping, which includes work orders that originate from customer inquiries. Records of customer inquiries and requests are kept on file at the MOC. These records include the customer name and address, date, nature of the call, and final disposition.

Utility Billing (a division of the Finance Department) receives two major types of inquiries: either a problem with a service meter, or a question or concern about a customer's water bill. Any problem with a meter is written up in a service order and given to the MOC to investigate and correct. Once the problem has been addressed, the service order is returned to Utility Billing and a comment is added to the customer's account. Issues with a customer's bill are typically handled on a case-by-case basis and can be resolved in a timely manner.

2.6. Interlocal Agreements

The City shares boundaries and water service facilities with a number of neighboring water purveyors. Table 2-3 lists interlocal agreements that are relevant to either the City's retail service area or its water supply. Additional details of selected key agreements with neighboring utilities are described below. Copies of the interlocal agreements described below are provided in Appendix D.

2.6.1. Northeast Sammamish Water and Sewer District

Redmond's southeast service area boundary is adjacent to Northeast Sammamish Sewer and Water District. The City shares a metered intertie with the district for emergency purposes. The intertie is located at 187th Avenue NE and NE 55th Street and links pressure zones that are at a 300-foot hydraulic gradient for both the City and the district.

2.6.2. Woodinville Water District

Woodinville's service area borders Redmond's northern retail service area boundary for both the in-City and Novelty Hill service areas. The City and Woodinville Water District have an interlocal agreement that describes how water service will be managed along their common boundaries. There have been many addenda to this agreement, addressing individual properties.

2.6.3. Union Hill Water Association

Union Hill borders Redmond's service area boundary and lies between the Well Service Area and the Novelty Hill Service Area. Novelty Hill is adjacent to Union Hill's eastern border. There are three existing emergency interties between Union Hill and the City's Novelty Hill water system.

Redmond previously had an interlocal agreement with Union Hill as a wholesale provider. This agreement expired in 2006. The existing interties at 95th Street are now used for emergency purposes only, which is governed by an interlocal agreement.

2.6.4. Sammamish Plateau Water

The Sammamish Plateau Water Comprehensive Plan was updated in 2018. Redmond's Novelty Hill area is immediately north of Sammamish Plateau Water and Sewer District's Cascade View Zone. A small portion of Redmond's southeastern border is contiguous with Sammamish Plateau's future service area boundary in the Plateau zone. Redmond and the District have an interlocal agreement under which Redmond provides the District access to water supply from Cascade Water Alliance via an intertie with the Redmond system.

Table 2-3. Interlocal Agreements

Agreement	Parties to Agreement	Date Issued or Amended	Description
Agreement for Water System Interties (Redmond Ridge)	Union Hill Water Association	2001	Provides interties between Union Hill Water Association and Redmond for emergency purposes.
Interlocal Agreement and Amendments	Woodinville Water District	Various	Interlocal Agreement designating the common service boundary between Woodinville Water District and Redmond (with multiple addenda since 1988.)
Joint Municipal Utilities Services Agreement	Cascade Water Alliance	2012	Contract among Cascade members to establish the Cascade Water Alliance and facilitate its purposes. Replaced the original 2002 Interlocal Agreement.
Agreement for Water System Intertie	Sammamish Plateau Water	2005	Provides an intertie between the Sammamish Plateau Water and Redmond to allow the District access to the Cascade Water Alliance water supply.
Agreement for Water Distribution	City of Bellevue	1990, 2005, 2022	Provides for responsibilities and obligations of Bellevue and Redmond related to jointly-owned water system facilities (distribution/ transmission mains).
Agreement and Amendment to Interlocal Operation and Maintenance Agreement	City of Kirkland and City of Bellevue	1997, 2005	Assumption Agreement where Redmond assumed Rose Hill Water District, stating that water will be supplied by Cascade Water Alliance.
Interlocal Operation and Maintenance Agreement	City of Kirkland and City of Bellevue	1997	Provides for responsibilities and obligations of Bellevue, Kirkland and Redmond for the operation and maintenance of jointly-owned water supply facilities.
Agreement for Water System Intertie (95th Street)	Union Hill Water Association	2007	Provides intertie between Union Hill Water Association and Redmond for emergency purposes.
Agreement for Water System Intertie	Northeast Sammamish Sewer and Water District	1996	Provides intertie between Northeast Sammamish Sewer and Water District and Redmond for emergency purposes.

Chapter 3: Water System Description

City of Redmond 2024 Water System Plan

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3. Water System Description

This section provides a general overview of Redmond's water system, including its history, a description of adjacent purveyors, characteristics of the water service area, interlocal agreements, and policies related to water service. In addition, this section includes a description of the City's water facilities and infrastructure.

3.1. Systems and Pressure Zones

The City of Redmond water system currently supplies its water customers via four distinct but interrelated areas: the Well Service Area, Rose Hill Service Area, Overlake/Viewpoint Service Area, and Novelty Hill Service Area. Figure 3-1 displays the pressure zones and key water system facilities for the City's retail service area. Figure 3-2 through Figure 3-5 show hydraulic profiles of each of the service areas that illustrate operation of the water system.

Service elevations within the Redmond water system range from approximately 30 to 500 feet in and adjacent to the City; and from 320 to 610 feet in the Novelty Hill Service Area. To provide water under appropriate service pressures to customers regardless of location, each of Redmond's service areas is divided into a number of distinct pressure zones. These pressure zones and their boundaries have been established in accordance with area topography and service elevations, natural and physical barriers, and the limits of the City's water service area boundaries. Topographic considerations are significant because the City seeks to maintain operating pressures throughout the system between 30 and 80 psi (40 and 80 psi for new service areas). The nominal hydraulic grade lines (HGLs) and range of service elevations for each of Redmond's various service areas and pressure zones are summarized in Table 3-1.

Table 3-1. Pressure Zones

Pressure Zone	Operating Hydraulic Grade Line	Minimum Service Elevation (ft)	Maximum Service Elevation (ft)	Minimum Static Service Pressure (psi)	Maximum Static Service Pressure (psi)[1]
Well Service Area					
238	239	30	152	31	86
285	283	103	133	40	55
300	379	85	171	55	125
315	314	120	224	39	84
335	335	47	210	54	124
350	351	66	266	36	121
390	391	32	266	52	153
470	470	60	400	25	124
565	636	314	423	54	103
Rose Hill Service Area					
285	286	28	182	44	110
335	335	47	210	54	124
395	376	116	312	28	111
425	426	76	338	37	148
545	545	148	464	33	170
650	711	395	501	91	136
Overlake/Viewpoint Service Area					
335	333	34	243	38	127
415	416	160	321	41	110
435	435	228	275	63	84
465	465	277	328	60	82
520	520	150	396	41	116
Novelty Hill Service Area					
625	625	366	506	51	111
670	670	414	564	39	103
730	730	505	607	48	92

[1] Individual pressure-reducing valves are required for customers in areas with static pressures greater than 80 psi.

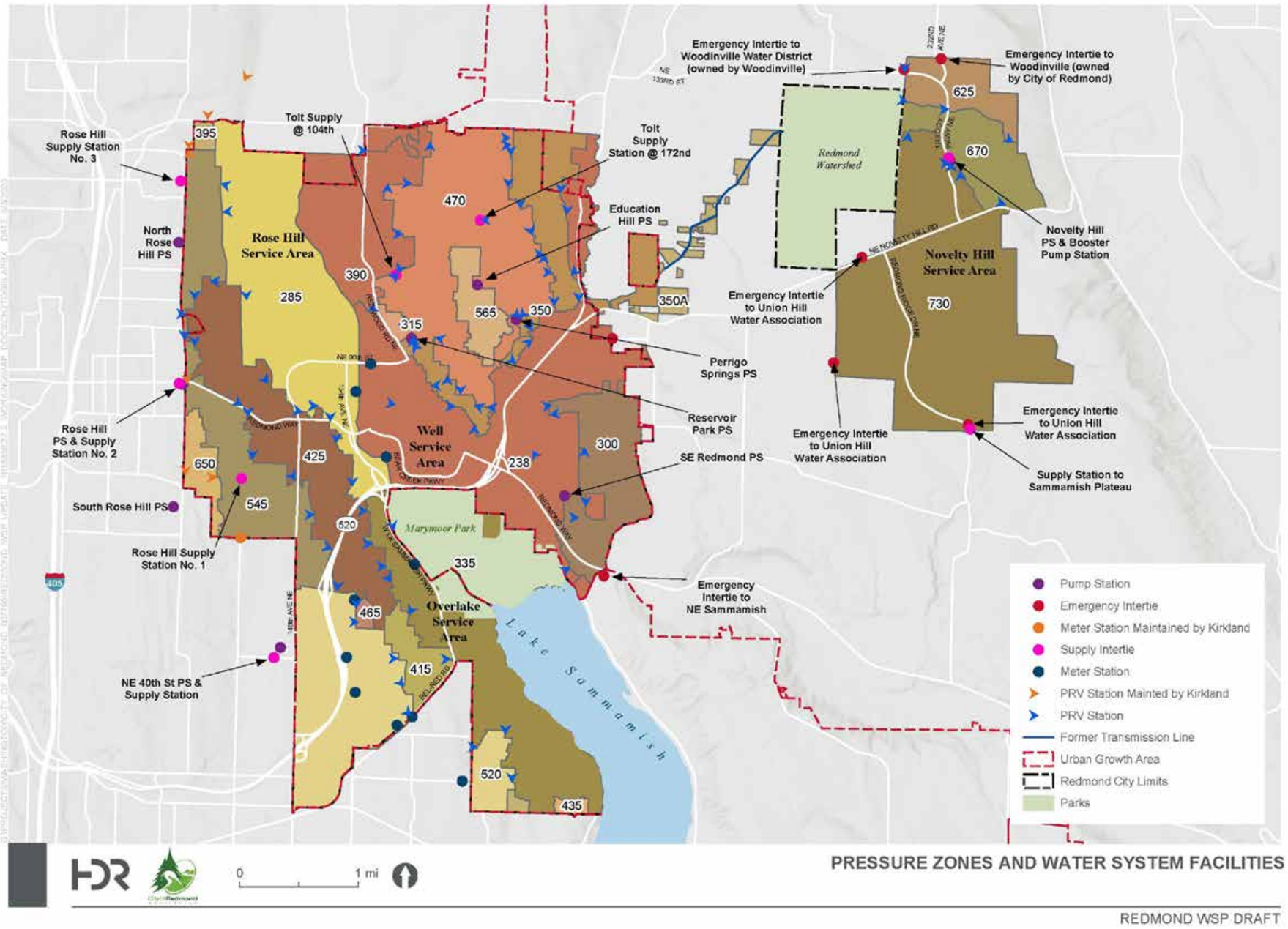


Figure 3-1. Pressure Zones and Water System Facilities

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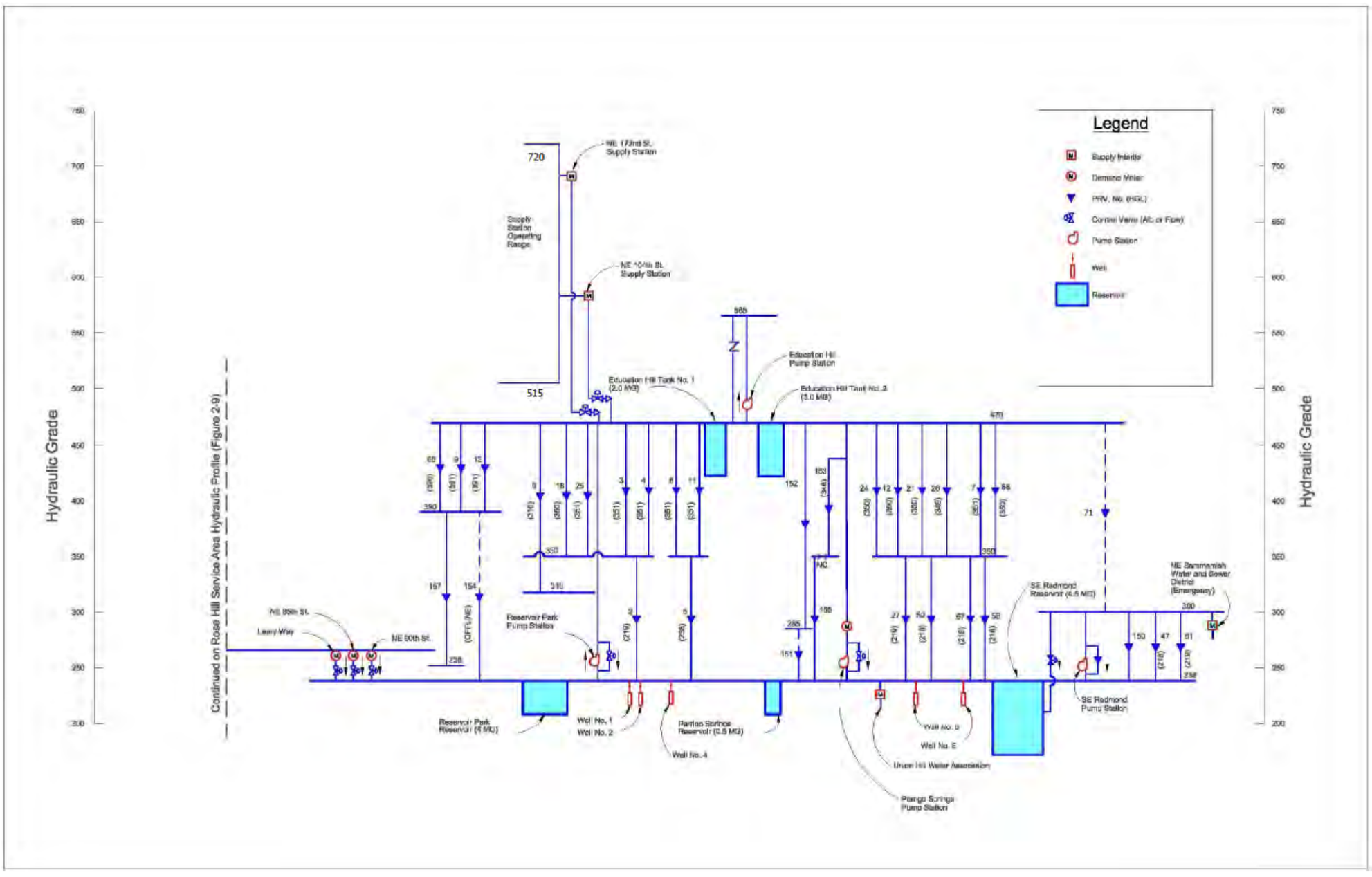


Figure 3-2. Well Service Area Hydraulic Profile

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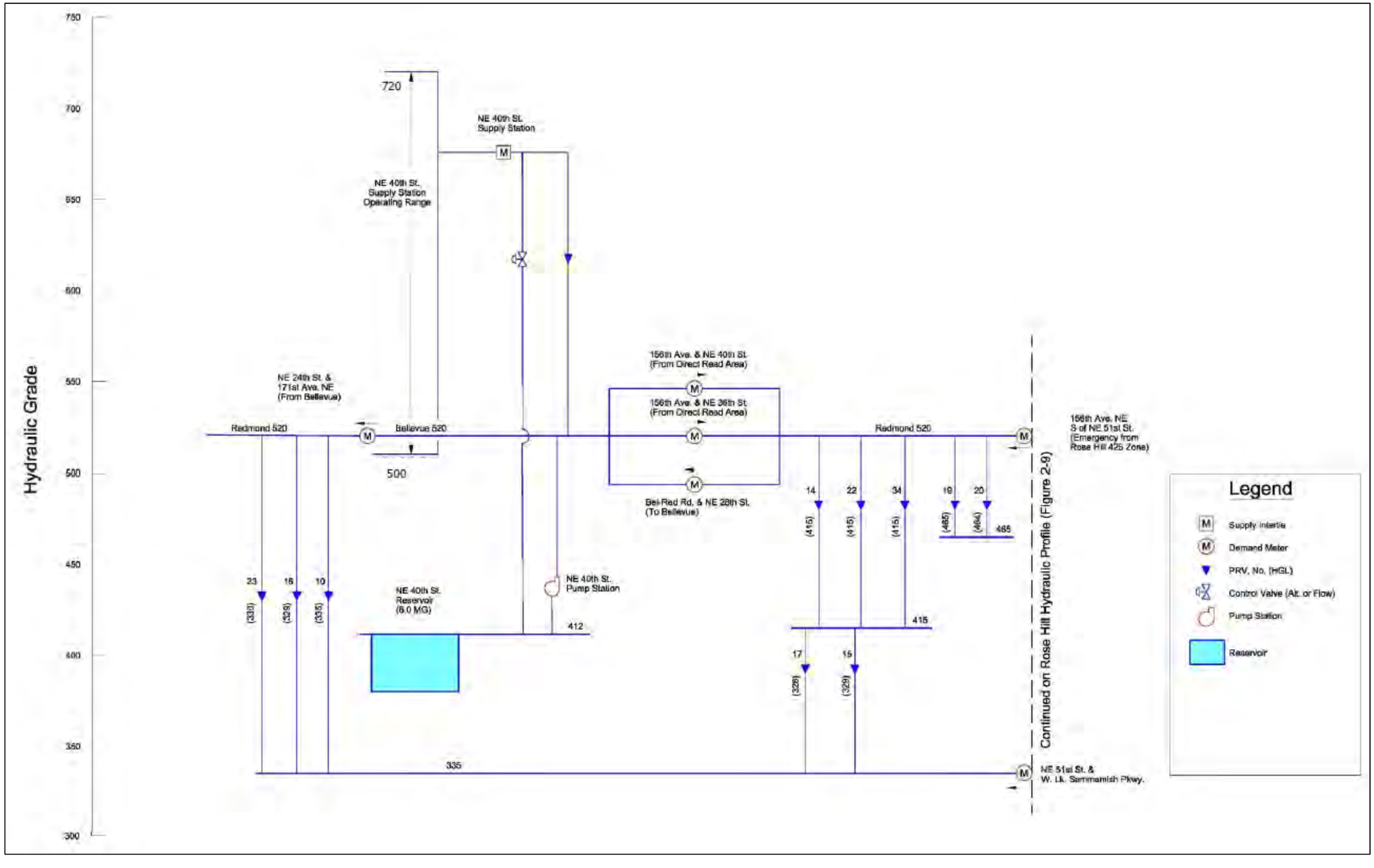


Figure 3-3. Overlake / Viewpoint Service Area Hydraulic Profile

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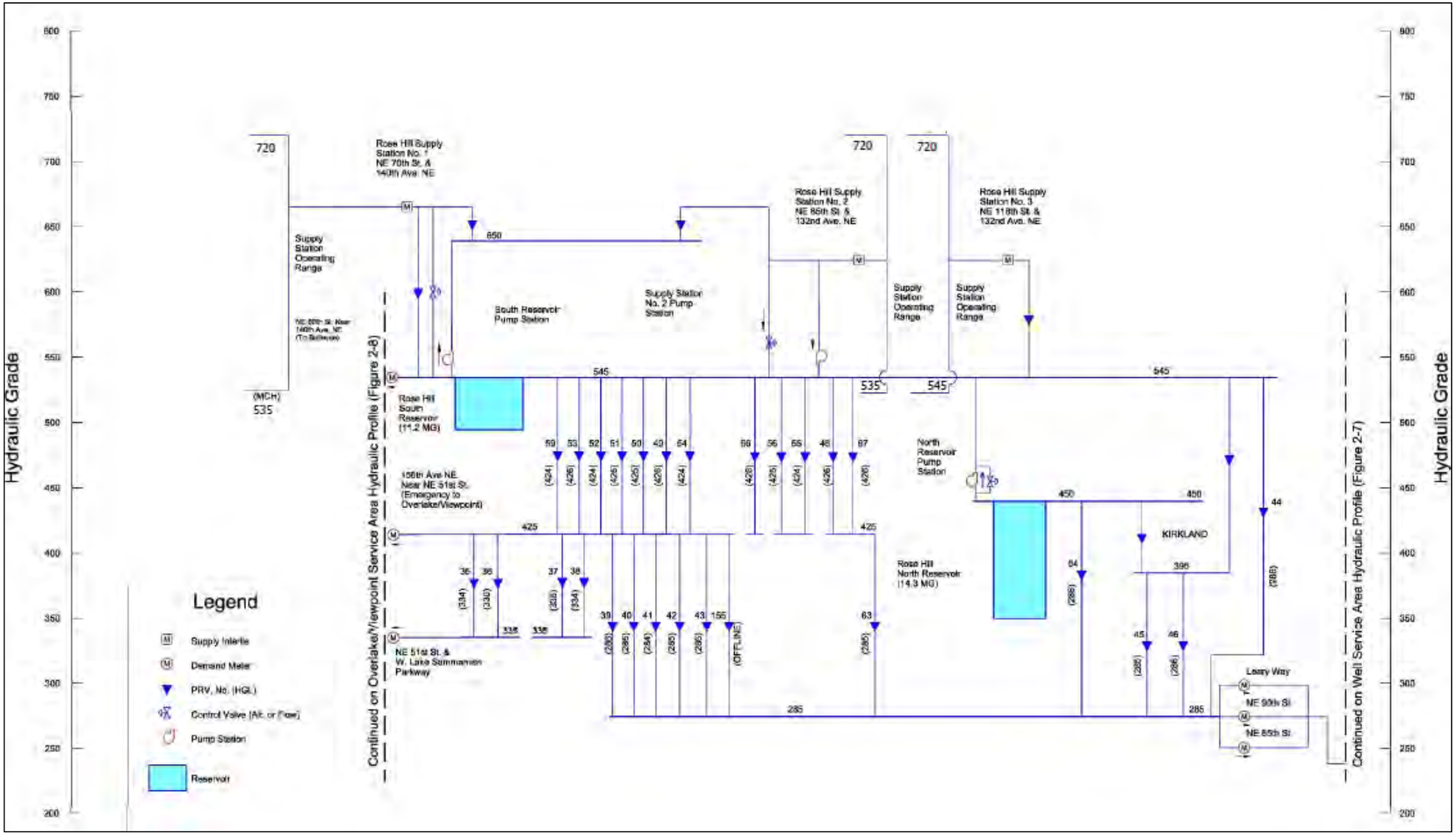


Figure 3-4. Rose Hill Service Area Hydraulic Profile

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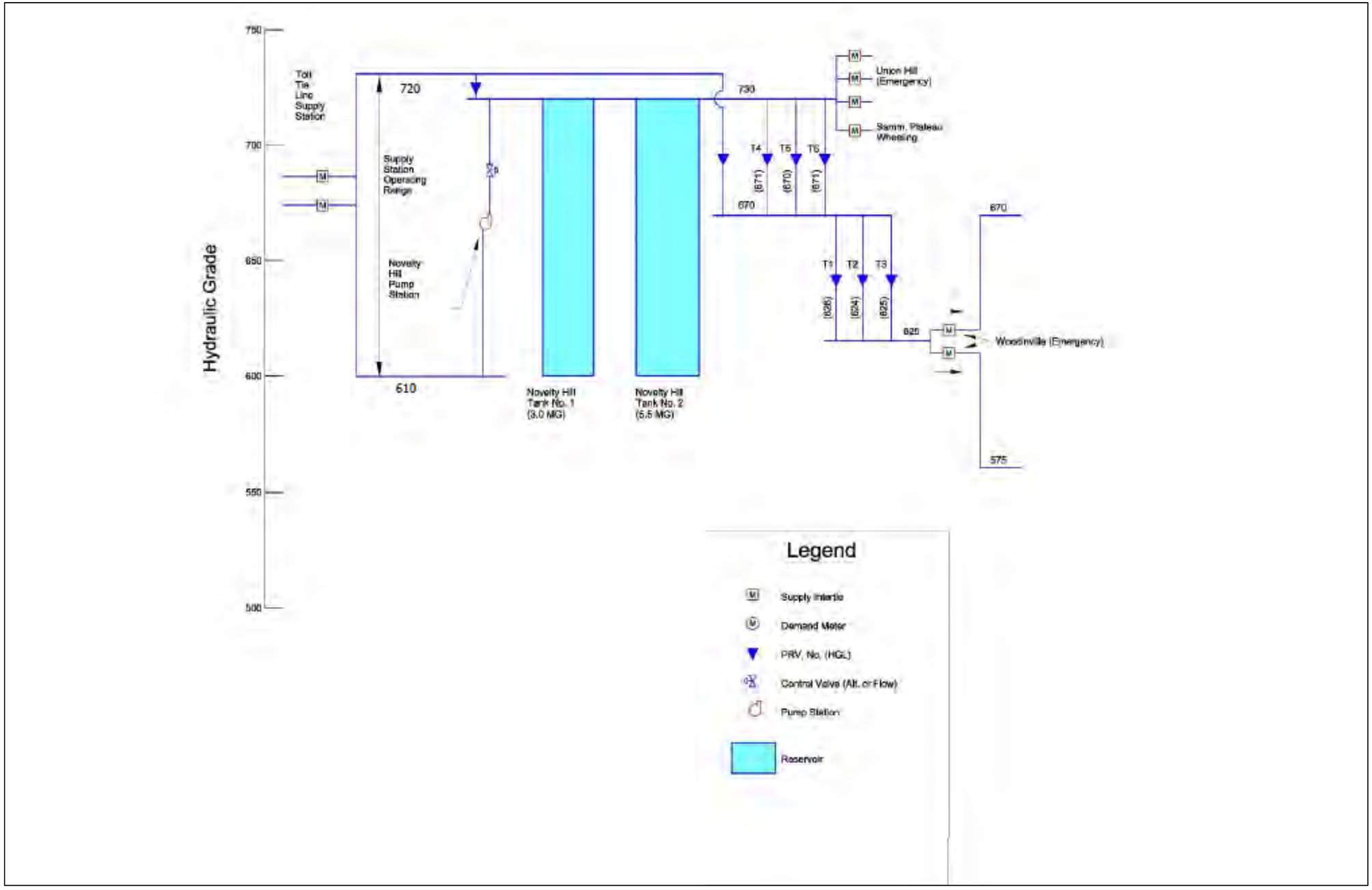


Figure 3-5. Novelty Hill Service Area Hydraulic Profile

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3.1.1. Well Service Area

The Well Service Area generally includes those portions of the City's water system east of the Sammamish River and west of Bear and Evans Creeks as shown in Table 2-3 and includes the following neighborhoods:

1. Bear Creek
2. Downtown
3. Education Hill
4. North Redmond
5. Sammamish Valley
6. Southeast Redmond

Supply for the Well Service Area is provided by the City's groundwater wells and two connections to Seattle Tolt Pipeline No. 2, one along NE 104th Street and the other on NE 172nd Street. In addition, three connections with the Rose Hill Service Area can be used to supplement the supplies within the Well Service Area.

The Well Service Area is divided into nine pressure zones with nominal static hydraulic grade line elevations of 238, 285, 300, 315, 335, 350, 390, 470, and 565. The following sections summarize the major pressure zones and water system facilities within Redmond's well service area. Information regarding the major water system facilities including source, storage, and transmission installations are also tabulated toward the end of this section.

238 Pressure Zone

The City's groundwater supply wells, Well Nos. 1, 2, 3, 4, and 5, supply the 238 pressure zone, as shown in Figure 2-3.

Well No. 4 was rebuilt on the City Campus in 2003 to include an upgraded caustic soda storage and delivery system, a sodium fluoride dry chemical mixing unit, and on-site generation of low strength sodium hypochlorite.

In that same timeframe, Well Nos. 3 and 5 were also upgraded, with all new well house structures, pumps, mechanical and electrical equipment, piping, and chemical-feed systems. Each facility includes both well and booster pumps, with an intermediate clearwell to establish appropriate chlorine contact time before water enters the distribution system. Caustic soda addition for pH adjustment was replaced with a packed tower for stripping carbon dioxide from the groundwater. In a similar manner to Well No. 4, on-site generation of sodium hypochlorite and a dry chemical mix system for sodium fluoride were added. The Well No. 5 upgrade was completed in 2005 and the Well No. 3 upgrade was completed in 2008.

In 2009 the City completed upgrading and refurbishing Well Nos. 1 & 2 to match the upgrades of Well Nos. 3 and 5. The well houses (both located in Anderson Park) were rebuilt and designed to pump untreated water to a new treatment facility located approximately 400 feet north of the Park. The new treatment facility provides the same treatment scheme as the upgraded Well Nos. 3 and 5, before booster pumping treated water into the distribution system.

The chlorination systems for all wells were upgraded in 2021/2022, with the on-site sodium hypochlorite generation systems replaced with newer systems that are more readily maintained with available replacement parts.

The 238 pressure zone can also receive water from the Rose Hill Service Area through three metered motorized butterfly flow control stations connecting this zone to the 285 pressure zone along the Sammamish River: one at NE 90th Street, one at NE 85th Street, and one at Leary Way NE. Water from the 300, 350, 390, and 470 pressure zones can also be delivered to the 238 pressure zone through a number of PRVs.

Storage for the 238 pressure zone is provided in three existing tanks: a 4.0-MG prestressed-concrete reservoir at the Reservoir Park site, a 0.5-MG steel reservoir at the Perrigo Springs site, and the 4.5-MG Southeast Redmond Reservoir.

The 238 pressure zone supplies the 300 pressure zone through the Southeast Redmond Booster Pump Station, and the 470 pressure zone through the Reservoir Park and Perrigo Springs Booster Pump Stations.

285 Pressure Zone

The 285 pressure zone was created when a portion of the 350 zone experienced pressures that exceeded 100psi on the lower east side of Education Hill. The high pressures were reduced by splitting the 350 zone into two parts via closing a valve and adjusting one of the PRVs feeding the area from the 470 zone. Closing the valve reduced the supply into each of the zones from two sources to one. This zone is not equipped with a storage tank, and HGL in the zone is maintained by the associated PRV. This zone also has the capability to augment pressures and supply in the 238 pressure zone below through a PRV.

300 Pressure Zone

The 300 pressure zone serves the higher elevation areas of Southeast Redmond through the Southeast Redmond Booster Pump Station. The 300 pressure zone does not include a storage tank. The 300 zone, originally supplied only through the southeast Redmond Booster Pump Station, is supplied by the southeast Redmond transmission main. This pump station can serve as the zone's source if the transmission main is interrupted.

335, 350, and 390 Pressure Zones

The 335, 350, and 390 pressure zones serve the lower elevations of Education Hill and are all served from the 470 pressure zone above through PRVs. None of these zones are equipped with storage tanks, and the HGLs in each of these zones are maintained by the associated PRVs. Most of these zones also have the capability to augment pressures and supply in the 238 pressure zone below through a number of additional PRV installations.

470 Pressure Zone

The 470 pressure zone serves the intermediate elevation of Education Hill and is supplied from the 238 pressure zone via the Reservoir Park and Perrigo Springs Pump Stations. Storage in the 470 pressure zone is provided by the 2.0-MG steel Education Hill Reservoir No. 1 and the 3.0-MG steel Education Hill Reservoir No. 2.

Additional supply to the 470 pressure zone is available from two metered supply connections to Seattle's Tolt Pipeline No. 2, located along NE 104th Street and NE 172nd Street. The supply connections are equipped with flow- and pressure-reducing control valves, which maintain pressures and supply flow rates appropriate for the 470 pressure zone. The guaranteed 531-foot HGL of Seattle's Tolt Pipeline No. 2 (525 feet on City of Seattle datum) provides sufficient pressure to fill the City's Education Hill reservoirs.

The 470 pressure zone supplies the 238, 335, 350, and 390 pressure zones through a number of PRVs and supplies the 565 pressure zone via the Education Hill Pump Station.

565 Pressure Zone

The 565 pressure zone, which serves the higher elevations on Education Hill, is supplied from the 470 pressure zone below by the Education Hill Pump Station. The zone, which is not equipped with a tank, can also be supplied directly from the 470 pressure zone at a reduced pressure through a check valve located along NE 104th Street. Fire flow to the 565 pressure zone is limited to 1,500 gpm.

3.1.2. Rose Hill Service Area

In 1994 the Cities of Bellevue, Kirkland and Redmond each assumed portions of the former Rose Hill Water District water system. The distribution system in this area serves sizable areas of all three cities and each municipality acquired ownership of those portions of the system within its own water service area and corporate boundaries. The system, which remains hydraulically connected, includes a number of jointly owned and operated supply, storage, and pumping facilities.

The Rose Hill Service Area, as shown in Figure 2-3, provides water service generally to those areas of Redmond east of NE 132nd Avenue, west of the Sammamish River, and north of NE 51st Street, along the western slopes of the Sammamish River Valley, including the following Redmond neighborhoods:

1. Grass Lawn
2. Sammamish Valley
3. Willows
4. A small area north of NE 124th, adjacent to the Willows neighborhood, in a future annexation area for the City of Kirkland

Water supply to the Rose Hill Service Area is provided by three metered supply connections to the Tolt Eastside Supply Line: Supply Station No. 1, located at NE 70th Street and 140th Avenue NE; Supply Station No. 2, located at NE 85th Street and 132nd Avenue NE; and Supply Station No. 3, located at NE 116th Street and 132nd Avenue NE. Supply Station No. 1 is jointly owned by the cities of Bellevue, Kirkland and Redmond, while Kirkland and Redmond alone share ownership of Supply Station Nos. 2 and 3. These supply stations are described in more detail later in this section.

The Redmond portion of the Rose Hill Service Area is divided into several pressure zones (the 650, 545, 425, 395, 335, and 285 zones). The following sections summarize the major pressure zones and water system facilities within the Redmond Rose Hill service area. Information regarding Redmond's major water system facilities, including source, storage, and transmission installations, are also tabulated toward the end of this section.

650 Pressure Zone

The 650 pressure zone is supplied from metered connections to the TESSL at Supply Station Nos. 1 and 2. The supply stations serve the 650 pressure zone through PRVs, which maintain pressures and supply flow rates appropriate for the pressure zone.

The 650 pressure zone can also receive water from the 545 pressure zone through the 650 Zone Pump Station when adequate supply flows or pressures are not otherwise available from Supply Station Nos. 1 and 2. The 650 pressure zone is not equipped with a storage reservoir, and the HGL in the zone is maintained by the South Reservoir Pump Station and/or the PRVs associated with the supply stations.

545 Pressure Zone

The 545 pressure zone is supplied from the TESSL via Supply Station Nos. 1, 2 and 3. These metered supply stations each serve the 545 pressure zone through flow-and pressure-reducing control valves, which maintain pressures and supply flow rates appropriate for the pressure zone.

Water storage for the 545 pressure zone is provided by the Bellevue/ Kirkland/Redmond 11.2-MG steel South Reservoir located at 132nd Avenue NE near NE 65th Street. Water from the South Reservoir and the 545 pressure zone can also be delivered to the 650 pressure zone through the South Reservoir Pump Station.

The 545 pressure zone supplies the Kirkland/Redmond 14.3-MG steel North Reservoir at a 450-foot HGL through an altitude valve. The North Reservoir serves Kirkland's 450 pressure zone directly, and also serves the 545 pressure zone through the North Reservoir Pump Station, which allows water to be transferred from the lower North Reservoir to the South Reservoir through the 545 pressure zone.

The 545 pressure zone also supplies the Rose Hill 425, 395, 335, and 285 pressure zones through a series of PRVs. It supplies the Bellevue 545 pressure zone through a metered connection at NE 60th Street and 140th Avenue NE, which in turn supplies the Bellevue/Redmond 520 pressure zone through two PRVs.

395 Pressure Zone

The Rose Hill North Reservoir has an overflow of 450 feet, and serves a significant portion of Kirkland's system by gravity. No Redmond customers are served directly from the 450 zone. However, there are two PRVs that supply Redmond's 395 zone from the Kirkland 450 zone.

425 Pressure Zone

The 425 pressure zone is supplied through PRVs from the 545 pressure zone above, and in turn supplies the 335 and 285 pressure zones through a series of PRVs. The 425 pressure zone does not include a storage tank, and the HGL of the zone is maintained by the associated PRVs. The 425 pressure zone also includes an emergency intertie connection with the Bellevue/Redmond 520 pressure zone to the south along 156th Avenue NE near NE 51st Street.

335 Pressure Zone

The 335 pressure zone is supplied through PRV connections to the 425 pressure zone above. The 335 pressure zone is not equipped with a storage tank, and the HGL of the zone is maintained by the associated PRVs.

285 Pressure Zone

The 285 pressure zone is supplied through PRV connections from the 545, 450, 425, and 395 pressure zones above, and includes three metered PRV connections with the 238 pressure zone in the Well Service Area to the east across the Sammamish River: one at Leary Way, one at NE 85th Street, and one at NE 90th Street. The 285 pressure zone does not include a storage tank, and the HGL of the zone is maintained by the associated PRVs. A new intertie with Kirkland was constructed recently, adding a feed to the 285 zone at the intersection of Willows Road and NE 124th Street. This intertie will be connected to the Redmond system when Redmond completes a watermain extension in Willows Road to tie into the existing system. As part of the interlocal agreement to allow this intertie, Redmond has committed to work with Kirkland to determine the best way to operate this zone that is currently operated by both cities.

3.1.3. Overlake/Viewpoint Service Area

The Overlake/Viewpoint Service Area generally includes those portions of the City's water system west of Lake Sammamish, south of NE 51st Street, and north of the Bellevue-Redmond City Limits as shown in Figure 2-2.

Redmond's Overlake/Viewpoint Service Area is interconnected with and supplied from the City of Bellevue water system to the west through a number of metered connections, joint facilities, and distribution lines. Water supply to the Bellevue system is in turn provided through two metered supply connections to the Tolt Eastside Supply Line that supply Redmond: the NE 40th Street supply connection near 140th Avenue NE, and the NE 8th Street supply connection east of 148th Avenue NE. In addition, three connections with Redmond's Rose Hill Service Area can be used to supplement the supplies within the Overlake/Viewpoint Service Area.

Redmond's Overlake/Viewpoint Service Area is divided into five pressure zones with nominal static hydraulic grade line elevations of 335, 415, 435, 465, and 520 as shown in Figure 2-3. The following sections summarize the major pressure zones and water system facilities within the Redmond Overlake/Viewpoint Service Area. Information regarding Redmond's major water system facilities, including source, storage, and transmission installations, are also tabulated toward the end of this section.

520 Pressure Zone

The Bellevue/Redmond 520 pressure zone is supplied primarily through Bellevue's two metered connections to the TESSL as discussed previously. The NE 40th Street supply connection serves the 520 pressure zone through flow- and pressure-reducing control valves which maintain pressures and supply flow rates appropriate for the pressure zone. This supply connection is also equipped with a pump, installed in Bellevue's 670 pressure zone pump station at NE 40th Street, which can supply the 520 pressure zone from the TESSL should supply-line pressures fall to levels insufficient to provide gravity supply.

The NE 40th Street connection also directly supplies the Bellevue/Redmond 6.0-MG prestressed concrete NE 40th Street Reservoir at an HGL of 412.5 feet through an altitude valve. The NE 40th Street Reservoir, located in North Bellevue Community Park between 140th and 148th Avenues NE, serves the Bellevue/Redmond 520 pressure zone through the NE 40th Street Pump Station.

The NE 8th Street supply connection is similarly configured and serves the central portion of Bellevue's 520 pressure zone from the TESSL through flow- and pressure-reducing control valves, which maintain pressures and supply flow rates appropriate for the pressure zone. Each of these supply connections is also equipped with pumps to supply the 520 pressure zone from the TESSL should supply-line pressures fall to levels insufficient to provide gravity supply.

Supplemental supply to the Bellevue/Redmond 520 pressure zone can also be provided as needed from PRV connections to Bellevue's Rose Hill 545 pressure zone, and through the metered emergency intertie connection with the Redmond Rose Hill 425 pressure zone along 156th Avenue NE near NE 51st Street.

Water storage for the Overlake/Viewpoint Service Area is provided through the Bellevue/Redmond 6.0-MG NE 40th Street Reservoir.

Four meter stations, internal to the 520 pressure zone, measure flows between the Bellevue and Redmond systems. One is located on NE 40th just east of SR 520, another is on 156th Avenue NE at NE 36th Street, the third is at 171st Avenue NE and NE 24th Street, and the fourth is located along Bellevue-Redmond Road. The 520 pressure zone also serves Redmond's 465, 415, 435 and 335 pressure zones through a series of PRVs.

465 Pressure Zone

The 465 pressure zone is served from the 520 pressure zone above through PRVs. The zone is not equipped with storage tanks, and the HGL is maintained by the associated PRVs.

415 Pressure Zone

The 415 pressure zone is served from the 520 pressure zone through PRVs, and in turn, supplies the 335 pressure zone below through a series of additional PRVs. The 415 pressure zone does not have a tank, and the HGL within the zone is maintained by the associated PRVs.

435 Pressure Zone

Redmond's small 435 Pressure zone is served from the adjacent Bellevue Lake Hills 435 pressure zone. Redmond's 435 zone is not equipped with storage tanks, and the HGL is maintained by three associated PRVs located in Bellevue's service area. Recently, a 4-inch AC pipe in the 435 pressure zone was abandoned due to multiple breaks occurring over a few years. The pipe connected the waterline in NE 20th Place to one in NE 20th Street and was difficult to repair because it ran between 4 houses. Each break caused damage to the crawl spaces and landscaping of these homes. The abandoned pipe reduced fire flow in the area, so a new 150-foot long 8-inch DI waterline was constructed in 183rd Ave NE from NE 20th Street to a City of Bellevue pipe. The new waterline was completed in the Fall of 2022 and increased fire flows in the pressure zone and provided better redundancy in the area for both cities.

335 Pressure Zone

The Redmond 335 pressure zone serves areas along the shore of Lake Sammamish through PRV connections to the 415 and 520 pressure zones above and through a metered connection to the Rose Hill 335 pressure zone along West Lake Sammamish Parkway NE near NE 51st Street. The zone does not include a tank, and its HGL is maintained by the associated PRVs.

3.1.4. Novelty Hill Service Area

The Novelty Hill Service Area provides water service to the Redmond Ridge, Redmond Ridge East, and Trilogy developments northeast of Redmond along Novelty Hill Road. The Novelty Hill Service Area is supplied through a metered connection to the Seattle Tolt Tie Line along 236th Avenue NE. Water can be supplied to this connection from either of two regional pipelines: Tolt Nos. 1 or 2.

The Novelty Hill Service Area currently has three pressure zones with nominal static hydraulic grade line elevations of 730, 670, and 625 as shown in Figure 2-3. The following sections summarize the major pressure zones and water system facilities in the Novelty Hill service area. Information regarding the major water system facilities, including source, storage, and transmission installations, are also tabulated toward the end of this section.

730 Pressure Zone

The Trilogy Parkway supply connection serves the 730 pressure zone through a flow-and pressure-reducing control valve, which maintains pressures and supply flow rates appropriate for the pressure zone. The Novelty Hill Pump Station's function is to supply the 730 pressure zone from the Tolt Tie Line should pressures in the Tie Line fall below the level required to supply the 730 pressure zone by gravity. The pump station can operate in three different modes: 1. Pump from the Tolt Tie Line to the tanks using flow control based on a level indicator. 2. Pump from the Tolt Tie Line to the distribution system using a variable flow to maintain pressure. 3. Pump from the tanks to the distribution system using a variable flow to maintain pressure.

Water storage for the Novelty Hill service area and the 730 pressure zone is provided by the 3.0-MG and 5.5-MG steel Novelty Hill Standpipe Reservoirs. The pressure zone supplies the 670 and 625 pressure zones through a series of PRVs and includes two existing and one future metered emergency interties serving the Union Hill Water Association water system. The interties are located at Novelty Hill Road and 224th Avenue NE (future), Redmond Ridge Drive and NE 80th Street, and NE 92nd Street and 218th Avenue NE. In addition, water from this zone is wheeled to Sammamish Plateau Water and Sewer District through a metered connection.

670 and 625 Pressure Zones

The Novelty Hill 670 and 625 pressure zones all receive supply from the 730 zone through a series of PRVs. These pressure zones are not equipped with storage tanks, and the HGLs of the zones are maintained by the associated PRVs. The 670 zone can be fed directly off the Tolt Tie Line through a PRV located in the pump station.

There are two metered emergency interties with Woodinville Water District in the 625 pressure zone. One, owned by Woodinville, is located at NE 133rd Street and 277th Avenue NE. The other, owned by Redmond, is located at 232nd Avenue NE and NE 135th Street.

3.2. Supply Wells

The City has five wells, which provide approximately 40 percent of its total supply. Supply provided by these wells serves only the Well Service Area. All five wells were refurbished and updated over the past 20 years. Treatments for all wells include fluoridation, disinfection, and pH adjustment. Fluoride is used to help with dental hygiene and on-site generation of sodium hypochlorite is used for disinfection at all five wells. Wells 1, 2, 3, and 5 use aeration to elevate pH for compliance of the Lead and Copper Rule. Well 4 adds caustic soda to elevate pH. Also, Well 4 uses a blended phosphate to sequester iron and manganese levels below SMCLs. No additional treatments are needed or planned because all water quality objectives are being met. The physical characteristics of the City's wells are presented in Table 3-2. Information on water rights is provided in Chapter 7.

3.3. Pump Stations

Redmond has a total of nine pump stations that pump water from the City's sources of supply to higher pressure zones and the storage facilities that serve those pressure zones. Table 3-3 shows the physical characteristics of each of the City's pump stations.

3.4. Pressure-Reducing Valves

Operation of the distribution system is controlled largely by pressure-reducing valves, which separate and feed lower pressure zones from higher zones. The City has 84 PRV stations (most of which consist of two valves) in the distribution system inventory including two that are owned by Kirkland, which regulate the flow throughout its water service area. The PRVs, their locations, elevations, pressure settings, and the pressure zones served are listed in Table 3-4.

Table 3-2. Redmond Supply Wells

	Well Information				Well Pump Information				Clearwell Pump Information			
Well (Location)	Casing Diameter (in)	Well Depth (ft)	Static Water Elevation (ft)	Nominal Capacity (gpm)	Pump	Rated Flow (gpm)	Rated Head (ft)	Motor Power (hp)	Pump	Rated Flow (gpm)	Rated Head (ft)	Motor Power (hp)
Well No. 1	24	75	26.5 (winter) 18.5 (summer)	900	Byron Jackson 11MQH 2-Stage Vertical Turbine	900	113	40	Byron Jackson 11MQH 5-Stage	900	289	100
Well No. 2	24	75	27.0 (winter) 19.0 (summer)	500	Byron Jackson 10MQH 3-Stage Vertical Turbine	500	123	30	Byron Jackson 11MQH 5-Stage	900	289	100
Well No. 3	12	47.4	47.83 (winter) 40.83-42.83 (summer)	480	Byron Jackson 10GM 3-Stage Vertical Turbine	533	102	20	Byron Jackson 10MQL 7-Stage	500	246	50
Well No. 4	16	44	41	650	Byron Jackson 11 MQL 5-Stage Vertical Turbine	800	230-260	75	NA	NA	NA	NA
Well No. 5	20	44.2	36.72 (winter) 27.22 (summer)	1,000	Byron Jackson 12MQL 1-Stage Vertical Turbine	1,000	55	25	Byron Jackson 12MQLH 4-Stage	1,200	215	100

Table 3-3. Redmond Pump Stations

Facility	Year Built or Renovated	Supply HGL	Pressure Zone Served	Nominal Pumping Capacity (gpm)	Pump No.	Pump	Rated Flow (gpm)	Rated Head (ft)	Speed (rpm)	Motor Power (hp)	Auxiliary Power
Reservoir Park[5]	2011	238	470	3,000[3]	1	Peerless M12 HXB 7-Stage Vertical Turbine	1,500	260	1,770	125	Hook-up for portable generator
					2	Peerless M12 HXB 7-Stage Vertical Turbine	1,500	260	1,770	125	
					3	Peerless M12 HXB 7-Stage Vertical Turbine	1,500	260	1,770	125	
Perrigo Springs	1962 (2000)	238	470	615	1	Byron Jackson 10-GL3M4 7-Stage VST	615	266	1,760	50	Hook-up for portable generator
					2	Byron Jackson 10-GL3M4 7-Stage VST	615	266	1,760	50	
Education Hill	1997	470	565	2,600[3]	1[4]	PACO 2512-3 Centrifugal	200	135	1,760	15	Yes
					2[4]	PACO 4012-7 Centrifugal	450	135	1,770	40	Yes
					3[4]	PACO 4012-8 Centrifugal	450	135	1,770	40	Yes
				(1500 – Fire Flow)	4	PACO 6012-3 Centrifugal	1,500	135	1,775	75	Yes
				(1500 – Fire Flow)	5	PACO 6012-4 Centrifugal	1,500	135	1,775	75	Yes

Table 3-3. Redmond Pump Stations, Continued

Facility	Year Built or Renovated	Supply HGL	Pressure Zone Served	Nominal Pumping Capacity (gpm)	Pump No.	Pump	Rated Flow (gpm)	Rated Head (ft)	Speed (rpm)	Motor Power (hp)	Auxiliary Power
SE Redmond	1990	238	300	3320[3]	1	Peerless Pump 2AE11	210	70	1,745	10	Yes
				(2,500 – Fire Flow)	2	Peerless Pump 5AE14	680[1]	80	1,190	33.3	Yes
							1,060[2]	185	1,785	75	Yes
					3	Peerless Pump 6AE14	1,325[1]	76	1,190	55.6	Yes
							2,050[2]	175	1,785	125	Yes
					4	Peerless Pump 6AE14	2,050	175	1,777	125	Yes
Rose Hill Supply Station No. 2	2009	TESSL	545	8,000	1	Byron-Jackson	8,000	50	1,200	125	No
					2		8,000	50	1,200	125	No
Rose Hill 650 Zone	2004	545	650	5,250[3]	1	American-Marsh 6x8-12 HD	1,750	129	1,760	75	Yes
					2	American-Marsh 6x8-12 HD	1,750	129	1,760	75	Yes
					3	American-Marsh 6x8-12 HD	1,750	129	1,760	75	Yes
					4	American-Marsh 6x8-12 HD	1,750	129	1,760	75	Yes
					5	American-Marsh 3x4-15 HD	400	129	1,760	25	Yes
					6	American-Marsh 3x4-15 HD	400	129	1,760	25	Yes

Table 3-3. Redmond Pump Stations, Continued

Facility	Year Built or Renovated	Supply HGL	Pressure Zone Served	Nominal Pumping Capacity (gpm)	Pump No.	Pump	Rated Flow (gpm)	Rated Head (ft)	Speed (rpm)	Motor Power (hp)	Auxiliary Power
Rose Hill North Reservoir	Rebuilt 1991	450	545	2,500	1	Byron-Jackson	2,500	182	1,800	150	No
Bellevue/ Redmond NE 40th St.	1991	412.5	520	6,000	1[4]	Johnston VTP	2,000	142	1,760	100	Yes
					2[4]	Johnston VTP	4,000	142	1,760	200	Yes
					3[4]	Johnston VTP	4,000	142	1,760	200	Yes
					4	Future (not installed)					Yes
Novelty Hill	1999	Tolt	730	7,500[3]	1[4]	Byron-Jackson	2,500	128	1,780	150	Yes
					2[4]	Byron-Jackson	2,500	128	1,780	150	Yes
					3[4]	FloServe	3,250	180	1,800	200	Yes
					4[4]	FloServe	3,250	180	1,800	200	Yes
					5[4]	FloServe	3,250	180	1,800	200	Yes

NA = Data Not Available
[1] At full speed
[2] At reduced speed
[3] See Operation and Maintenance Manual for range of operating conditions and pump performance at varying speeds.
[4] Controlled via variable frequency drive (VFD).
[5] Replacement station is under construction.

Table 3-4. Pressure Reducing Valves

Pressure Reducing Valve Settings								
Location	PRV Number	Zone		Size (in)	Downstream Setting (psi)	Node Elevation (ft)1929	Node Elevation (ft)1988	Existing HGL (ft)
		From	To					
ROSE HILL SERVICE AREA PRVs								
NE 100th St. & 134th Ave NE	48	545	425	3	60	287.00	290.61	425.60
				6	55	287.00	290.61	414.05
NE Redmond Way & 140th Ave NE	49	545	425	3	61	284.87	288.48	425.78
				6	56	284.87	288.48	414.23
NE 80th St. & 140th Ave NE	50	545	425	3	64	277.00	280.61	424.84
				6	59	277.00	280.61	413.29
140th Pl NE & NE 73rd St.	51	545	425	2	46	318.73	322.34	424.99
				6	41	318.73	322.34	413.44
148th Ave NE & Old Redmond Rd. (Grasslawn Park)	52	545	425	2	58	290.28	293.89	424.26
				8	53	290.28	293.89	412.71
NE 64th St. & 151st Ave NE, Spiritbrook	53 *	545	425	3	60		287.20	138.60
				8	55		287.20	127.05
SR 520 & NE 51st St.	54	545	425	3	43		333.20	432.53
				8	41		333.20	427.91
NE 97th St. & 132nd Ave NE	55 *	545	425	2	57		289.90	131.67
				6	52		289.90	120.12
132nd Ave NE & NE 92nd St.	56	545	425	2	40	333.03	336.64	425.43
				4	35	333.03	336.64	413.88
152nd Ave NE behind MSFT bldg, Redmond West, off 148th	59	545	425	2	65	274.20	277.81	424.35
				8	60	274.20	277.81	412.80
132nd Ave NE & NE 92nd Ct, Walden Ridge	66	545	425	2	55	299.00	302.61	426.05
				6	50	299.00	302.61	414.50
136th Ave NE & NE 102 St.	67	545	425	2	56	297.00	300.61	426.36
				6	51	297.00	300.61	414.81

Pressure Reducing Valve Settings

Location	PRV Number	Zone From	Zone To	Size (in)	Downstream Setting (psi)	Node Elevation (ft)1929	Node Elevation (ft)1988	Existing HGL (ft)
NE 51st St. & 162 Ave NE	35	425	335	4	65	184.10	187.71	334.25
				10	60	184.10	187.71	322.70
159th Ave NE & NE 55th Way	36 *	425	335	2	64		179.60	147.84
				6	59		179.60	136.29
NE 59th Pl. & NE 158th Way South Meadows	37 *	425	335	2	57		205.53	131.67
				6	52		205.53	120.12
NE 65th St. & NE 157th Pl. North Meadows	38 *	425	335	2	67		182.00	154.77
				6	62		182.00	143.22
Old Redmond Rd. btwn hse#143 & 144, Walnut Hills	39	425	285	3	49	172.49	176.10	285.68
				8	44	172.49	176.10	274.13
NE 75th St. & 153rd Ave NE, Guall Val Condos, off Old Red Rd	40	425	285	3	54	160.35	163.96	285.09
				8	49	160.35	163.96	273.54
NE Redmond Way & Willows Rd	41	425	285	3	69	125.02	128.63	284.41
				8	64	125.02	128.63	272.86
149th Pl NE & NE 48th St., Scarborough Apts., off Willows Rd.	42	425	285	3	70	122.84	126.45	284.54
				8	65	122.84	126.45	272.99
Red-Kirk Way & 148th Ave NE, Samm. Ridge Condo's	43	425	285	3	78	105.55	109.16	285.73
				8	73	105.55	109.16	274.18
Willows Rd. behind bldg #9911, Opus	63	425	285	2	85	88.30	91.91	284.65
				8	80	88.30	91.91	273.10
NE 124th St. & 135th Ave NE, Four Wheel Drive Store	*45*	*395*	*285*	*3*	*67*	*130.00*	*133.61*	*284.77*
Now Owned by Kirkland				*8*	*62*	*130.00*	*133.61*	*273.22*
Willows Road & 140th Ave NE (by RxR tracts)	*46*	*395*	*285*	*3*	*75*	*112.62*	*116.23*	*285.87*
Now Owned by Kirkland				*8*	*70*	*112.62*	*116.23*	*274.32*

Pressure Reducing Valve Settings

Location	PRV Number	Zone		Size (in)	Downstream Setting (psi)	Node Elevation (ft)1929	Node Elevation (ft)1988	Existing HGL (ft)
		From	To					
Behind Primax Research Bldg in grass	44	545	285	3	66	133.29	136.90	285.75
				8	61	133.29	136.90	274.20
Explosive testing area off Willows Rd., Primex	64	450	285	3	67	130.76	134.37	285.53
				10	62	130.76	134.37	273.98
142nd Ave NE & NE 86th St., Cedar Homes	155	425	285	2		150.74	154.35	150.74
(OFF LINE)				6			3.61	
BELLEVUE OVERLAKE VIEWPOINT PRVs								
156 th Ave SE & NE 48th St., North Ravenswood	19	520	465	3	65	314.98	318.59	465.13
				8	60	314.98	318.59	453.58
156 th Ave SE & NE 46th St., South Ravenswood	20	520	465	3	65	313.87	317.48	464.02
				8	60	313.87	317.48	452.47
NE 40th St. & 162nd Ave NE	14	520	415	3	49		303.40	113.19
	*			8	44		303.40	101.64
163rd Ave NE & NE 36th Way	22	520	415	4	43	315.32	318.93	414.65
				10	38	315.32	318.93	403.10
Bellevue-Redmond Rd. & NE 32nd St.	34	520	415	3	42	317.69	321.30	414.71
				8	37	317.69	321.30	403.16
NE 24th St. & 178th Ave NE, 17769	10	520	335	1.5	51	217.31	220.92	335.12
				6	46	217.31	220.92	323.57
NE 30th Pl. & 177th Ave NE, Tiburon	16	520	335	1.5	49	215.56	219.17	328.75
				6	44	215.56	219.17	317.20
NE 28th Pl. & NE 173rd CT.	23	520	335	2	47		224.30	108.57
	*			6	42		224.30	97.02
Bellevue-Redmond Rd. & NE 40th St., 163rd	15	415	335	2	75		156.40	173.25

Pressure Reducing Valve Settings

Location	PRV Number	Zone		Size (in)	Downstream Setting (psi)	Node Elevation (ft)1929	Node Elevation (ft)1988	Existing HGL (ft)
		From	To					
	*			6	70		156.40	161.70
NE 46th St. & 164th Pl. NE	17	415	335	2	51	210.23	213.84	328.04
				8	46	210.23	213.84	316.49
WELL SERVICE AREA PRVs								
160th Ave NE & NE 105th CT.	9	470	390	1.5	57	259.42	263.03	391.09
				6	52	259.42	263.03	379.54
161st Ave NE & NE 109th St.	13	470	390	2	63		244.80	145.53
	*			6	58		244.80	133.98
158th Ave NE & NE 116th St., Pyke Property	65	470	390	2	68	232.46	236.07	389.54
				8	63	232.46	236.07	377.99
NE 122th St. & 164th Ct. NE - Cooper (Woodlands Ridge)	70	470	390	2	66	237.50	241.11	389.96
				8	61	237.50	241.11	378.41
NE 116th St. & 162nd Ave. NE - (Greystone)	75	470	390	2	64	241.00	244.61	388.84
				6	59	241.00	244.61	377.29
180th Ave NE & NE 98th St., COUNTRY ROUTE Perrigo Springs	1	470	350	3	64	198.53	202.14	346.37
				8	59	198.53	202.14	334.82
166th Ave NE & between NE 92nd and 95th St. (by church)	3	470	350	2	40	259.00	262.61	351.40
				8	35	259.00	262.61	339.85
168th Ave NE & NE 88th St.	4	470	350	4	59	214.47	218.08	350.76
				4	54	214.47	218.08	339.21
176th Pl. NE & NE 116th St.	7	470	350	2	58	216.74	220.35	350.72
				8	53	216.74	220.35	339.17
171st Ave Ne & NE 84th St.	8	470	350	3	64	203.00	206.61	350.84
				6	59	203.00	206.61	339.29
172nd Ave NE & NE 82nd St.	11	470	350	1.5	40	259.00	262.61	351.40
				6	35	259.00	262.61	339.85

Pressure Reducing Valve Settings

Location	PRV Number	Zone		Size (in)	Downstream Setting (psi)	Node Elevation (ft)1929	Node Elevation (ft)1988	Existing HGL (ft)
		From	To					
NE 104th St. & 182nd Ave NE	12	470	350	2	47		224.60	108.57
	*			6	42		224.60	97.02
NE 95th CT & 163rd Avenue NE, 4 MG Driveway	18	470	350	1.5	56	221.00	224.61	350.36
				6	51	221.00	224.61	338.81
181st Ave NE & NE 107th St.	21	470	350	2	47	241.43	245.04	350.00
				6	42	241.43	245.04	338.45
NE 99th St. & 183rd Ave NE, Hidden Ridge	24	470	350	2	56	220.71	224.32	350.07
				6	51	220.71	224.32	338.52
NE 164th Ave & NE 95th St., Vineyards	25	470	350	2	80	166.09	169.70	350.89
				8	75	166.09	169.70	339.34
178th Pl NE & NE 109th Ct., Abbey Road	26	470	350	2	56	219.70	223.31	349.06
				6	51	219.70	223.31	337.51
176th Ave NE & NE 120th Way	68	470	350	2	52	229.75	233.36	349.87
				6	47	229.75	233.36	338.32
177th Pl NE & NE 114th St (under construction)	69	470	350	2	46	243.00	246.61	349.26
				6	41	243.00	246.61	337.71
169th Pl NE - North of NE 84th Ct.	72	470	350	2	60	201.00	204.61	339.60
Shaughnessy Heights (North PRV)				8	55	201.00	204.61	328.05
176th Ave. NE - NE 122nd St.	76	470	350	2	48	239.00	242.61	349.88
Willowmere				6	43	239.00	242.61	338.33
160th Ave NE, end of road, River Trails	154	390	238	2		37.81	41.42	37.81
(NOT CONNECTED YET)				8			3.61	
SR202, 1,100ft South of 124th Ave. NE	157	390	238	2	50	122.00	125.61	237.50
WASHINGTON CATHEDRAL				8	45	122.00	125.61	225.95
166th Ave NE & NE 87th St. (behind locked gate)	2	350	238	2	51	100.81	104.42	218.62
				8	46	100.81	104.42	207.07

Pressure Reducing Valve Settings

Location	PRV Number	Zone		Size (in)	Downstream Setting (psi)	Node Elevation (ft)1929	Node Elevation (ft)1988	Existing HGL (ft)
		From	To					
172nd Ave NE & NE 80th St., 17121	5	350	238	2	56	109.00	112.61	238.36
				8	51	109.00	112.61	226.81
NE 100th CT. & 183rd Ave NE, Avon Trace	27	350	238	3	56	89.71	93.32	219.07
				8	51	89.71	93.32	207.52
Avondale Rd & NE 116th St in new Apt complx, South Pit	57	350	238	2	39	127.79	131.40	217.88
				8	34	127.79	131.40	206.33
Avondale Rd & NE 116th St in new Apt complx, North Pit	58	350	238	2	40	125.81	129.42	218.21
				8	35	125.81	129.42	206.66
NE 104th St btwn Avondale and 183rd Ave NE	62	350	238	2	38	130.40	134.01	218.18
				8	33	130.40	134.01	206.63
NE 90th Pl. & Avondale Rd in apt complx, The Heights	151	350	238	2	51	120.98	124.59	238.79
				8	46	120.98	124.59	227.24
169th Ave NE - North of NE 82nd St	73	350	238	2	53	108.00	111.61	230.43
Shaughnessy Heights (South PRV)				8	48	108.00	111.61	218.88
Genie Industries by water tank	47	300	SE238	3	35	136.68	140.29	217.53
				8	30	136.68	140.29	205.98
Redmond Fall City Rd in English Hill Apt bldg	61	300	SE238	2	52	98.63	102.24	218.75
				8	48	98.63	102.24	209.51
76th St. NE - between 185th & 188th Ave. NE	74	300	SE238	2	73	56.37	59.98	225.00
Taylor Short Plat				8	68	56.37	59.98	213.45
18200 Union Hill Road (Millenium)	150	300	SE238	2	83	45.82	49.43	237.55
(NOT CONNECTED YET)				8	78	45.82	49.43	226.00
162nd Ave NE & NE 98th St.	6	470	315	2	42	218.75	222.36	315.77
				8	37	218.75	222.36	304.22
Millenium NW Parking Lot next to Bear Creek	71	470	300	3	111	46.80	50.41	303.21
SE Redmond Transmission Main				8	106	46.80	50.41	291.66

Pressure Reducing Valve Settings

Location	PRV Number	Zone		Size (in)	Downstream Setting (psi)	Node Elevation (ft)1929	Node Elevation (ft)1988	Existing HGL (ft)
		From	To					
				8	101	46.80	50.41	280.11
				8	96	46.80	50.41	268.56
Ashford Park, South of 180th	152	470	285	3	80	98.03	101.64	282.83
*** HIGH PRESSURE ISSUES ***				8	75	98.03	101.64	271.28
180th Ave NE & NE 98th St., Perrigo Springs	153	470	238	10	15	202.53	206.14	237.18
(FLOW CONTROL)								
4 MGR North Pit (FLOW CONTROL)	31	470	238	10				
Ashford Park, North of 180th	156	285	238	2	53	109.00	112.61	231.43
				8	48	109.00	112.61	219.88
NOVELTY HILL (TRILOGY) PRVs								
239th Avenue NE, Serpentine Road North of 18th Tee	T4	730	670	2	62	527.42	531.03	670.64
Trilogy Package 4 South				8	57	527.42	531.03	659.09
East of Sun Break Way NE on NE 126th Street	T5	730	670	2	50	554.40	558.01	669.90
				8	45	554.40	558.01	658.35
North of NE Novelty Hill Road along 242nd Place NE	T6	730	670	2	77	493.23	496.84	671.10
				8	72	493.23	496.84	659.55
Sun Break Way NE, North of NE 30th Street	T1	670	625	2	58	491.98	495.59	625.96
				8	53	491.98	495.59	614.41
L to K, along Adair Creek Way NE	T2	670	625	2	91	414.26	417.87	624.47
				8	86	414.26	417.87	612.92
Trilogy Parkway North, North of NE 129th Court	T3	670	625	2	81	438.10	441.71	625.21
				8	76	438.10	441.71	613.66

3.5. Storage Facilities

The City currently has ten storage facilities, which provide storage for all four of its service areas. Three of the tanks are joint-use facilities with the cities of Bellevue and Kirkland.

3.5.1. Education Hill Tank Nos. 1 and 2

The Education Hill reservoirs serve the 470 pressure zone. Both tanks are of steel construction and have a combined volume of 5.0 MG. Tank No. 1 is a 2.0-MG tank, constructed in 1962 of steel-plating set on a concrete ring wall foundation. This tank has a height of 70 feet and is 70 feet in diameter. Tank No. 2 was constructed in 1988 to provide additional storage volume at the Education Hill site. This tank has a 3.0-MG volume and was constructed directly adjacent to Tank No. 1. It is of steel-plate construction set on a concrete ring wall foundation, has a height of 70 feet, and is 86 feet in diameter.

The Education Hill Booster Pump Station is located on the site to supply water to the adjacent 565 pressure zone. Valving and yard piping at the site allow isolation of either tank for cleaning and related maintenance functions. In 1990, several improvements were made at the site as part of the project to connect Redmond's distribution system to Tolt Pipeline No. 2. An altitude valve was added to prevent overfilling of the tanks. The altitude valve included a pressure-relief pilot that is set to automatically discharge into the tanks. This feature was added to prevent exposing the 470 pressure zone to full Tolt Pipeline hydraulic head in the event of a malfunction at the pressure-control vault on NE 104th Street. Pump outlets were also added at each tank outlet to facilitate transfer of water out of the tanks in preparation for cleaning or other maintenance activities that require draining the tanks.

The two Education Hill tanks have been cleaned and painted twice within the last 20 years and as a result, are in good condition. In 1988, the outside of Tank No. 1 was cleaned and painted. In 1997, divers inspected both tanks, and cleaned the inside. Very little sediment was found inside the tanks, presumably because the water is supplied from the wells. In 1998, both tanks had problems with the paint adhering to the primer. Therefore, both tanks were thoroughly cleaned and painted in 2008.

In 1992, Education Hill Tank No. 1 was completely retrofitted around the base. A new footing was poured, bringing the tank up to current seismic requirements at that time.

As part of the tank painting project in 2008, Tank No. 2 was completely retrofitted around the base with a new footing and metal stiffeners in the upper sections. Metal stiffeners were also installed in Tank No. 1. Furthermore, safety upgrades were also completed as part of this project. Ladder guards, handrails, platforms, larger access hatches, davit arms, and additional venting were all added to both tanks to improve safety for the maintenance personnel. A dechlorination manhole, rainwater downspouts, and cable trays were also constructed, along with reconstruction of the Tank No. 2 overflow, as part of the tank painting project in 2008. Both tanks now meet current safety, operational, and seismic requirements.

3.5.2. Reservoir Park Tank

The Reservoir Park Tank is a 4.0-MG tank constructed in 1976. It is a buried concrete facility with a height of 30 feet, and serves the 238 pressure zone. This tank was originally designed to be fed by the groundwater well supply in the 238 pressure zone. An on-site booster pump

station lifts water from the tank into the 470 pressure zone. Prior to Redmond's connection to Tolt Pipeline No. 2, this facility was the primary supply point for the City's 470 pressure zone. As part of the Tolt Pipeline No. 2 connection, flow and pressure control valves were added to regulate flow of water from the 470 pressure zone into the 238 pressure zone.

The tank hatch was replaced in 2003. Divers inspected the tank in 2005. Although no problems were identified, the tank is known to not meet current seismic design requirements. Therefore, a structural evaluation of the tank was done in conjunction with the Reservoir Park Booster Pump Station design project. Also as a part of the pump station design project, a new outlet pipe was designed. The latter improvement allows the tank to operate with separate inlet and outlet pipes. Seismic improvements to the reservoir were done and a new pump station was constructed in 2011 to address the deficiencies identified in the evaluation. The tank was again cleaned in 2022.

3.5.3. Perrigo Springs Tank

The Perrigo Springs Tank is a 0.5-MG tank that was constructed in 1962. It is of steel plate construction, with a diameter of approximately 53 feet and a height of 30 feet. This facility is supplied through a 16-inch pipeline, which is fed by the Well Service Area. This tank serves customers located along Avondale Road in the 238 pressure zone.

In 1999, a 20-inch pipeline, altitude valve, flow control valve, and pressure reducing valves (PRV) were constructed at the tank. The flow control valve allows the 470 zone water to supply the 238 zone through a 20-inch pipe from the Education Hill Tanks. A 12-inch pipeline and PRVs were also installed to supply water to the 350 zone.

The tank was painted both inside and out in 2007, as part of the Education Hill Tank Painting Project

3.5.4. SE Redmond Tank

The 3.5-MG SE Redmond Tank was constructed in 1996 . It is a steel tank with a diameter of 107 feet and a height of 67 feet. It serves the 238 zone along with the Perrigo Springs and Reservoir Park Tanks.

The SE Redmond Tank uses a series of valves to control flow in and out of the tank. A flow control valve is used to bring water into the tank from the 300 zone. An altitude valve is used to bring water into the tank from the 238 zone while another flow control valve is used to move water from the tank to the 238 zone. There is also a pressure reducing valve that would open in the event of a pressure drop (i.e. from a fire) in the 238 zone that would allow higher flows from the tank into the 238 zone.

The tank was repainted and received a seismic retrofit in 2021. Work included installation of a seismic valve to shut the tank off in the event of an earthquake.

3.5.5. Novelty Hill Tanks

The Novelty Hill Tank No. 1 is a 3.0-MG tank constructed in 1999. It is of steel plate construction, with a diameter of approximately 65 feet and a height of 138 feet. It serves the 730 pressure zone.

The No. 2 Tank is a 5.5-MG tank constructed in 2002. It is of steel plate construction, with a diameter of approximately 82 feet and a height of 138 feet. It also serves the 730 pressure zone.

Water from the Tolt Tie Line can supply these tanks via gravity much of the time, but when the Tolt's pressure is too low, water is pumped from the Novelty Hill Pump Station to the tanks. Water entering the tanks is controlled by two altitude valves (one for each tank). A transfer pumping system and re-chlorination system can re-circulate water to keep it fresh or transfer water from one tank to another. An On-Site Generation of Sodium Hypochlorite system is used to re-chlorinate the water if the chlorine residual is low.

3.5.6. Bellevue/Redmond NE 40th Street Tank

This tank is a joint-use facility that serves the Bellevue and Redmond 520 pressure zones. Constructed in 1991 of prestressed concrete, it has a height of 30 feet, diameter of 170 feet, and a total storage volume of 6.0 MG. The storage facility includes an on-site pump station that boosts water to the 520 pressure zone. The reservoir's pumped storage that does not float on the zone, so it requires the on-site NE 40th Reservoir Pump Station to operate. Also NE 40th Inlet Station is part of the joint-use facilities, and supplies the site with water directly from SPU's Tolt Eastside Supply Line. Recent maintenance work on the tank included filling of holes in the base of the tank from original construction, roof maintenance, and upgrades to the control valve and inlet meter.

As a joint-use facility the two cities share the costs of maintenance and any improvements that are required. Redmond's allocated storage volume is 2.64 MG.

3.5.7. Rose Hill North Reservoir

The Rose Hill North Reservoir is a joint-use tank shared by Redmond and Kirkland. It is a steel tank built in 1994 with a 154-foot diameter, a height of 103 feet, and a total volume of 14.3 MG. The reservoir serves Redmond's 285 and 395 zones and Kirkland's 450 pressure zone.

The 2001 Nisqually earthquake caused the floor plate of the tank to leak. This leak was repaired, and a seismic upgrade project was completed in 2010, along with a tank painting project.

As a joint-use facility the two cities share the costs of maintenance and any improvements that are required. Redmond's allocated storage volume is 4.90 MG.

3.5.8. Rose Hill South Reservoir

Similar to the Rose Hill North Reservoir, this reservoir is a joint-use facility shared by Redmond, Kirkland, and Bellevue. It is a steel tank built in 1971 with a diameter of 195 feet, a height of 50 feet, and a total volume of 11.2 MG. The tank has an overflow elevation of 545. As a joint-use facility, the cities share the costs of maintenance and any improvements that are required. Redmond's allocated storage volume is 3.29 MG.

Table 3-5 summarizes the physical characteristics of each of the City's storage facilities.

3.6. Distribution Mains

The City has approximately 340 miles of distribution mains. Table 3-6 shows an inventory of the City's distribution mains, showing the length of pipe by material and diameter.

3.7. Interties and Supply Connections

The City currently has seven supply connections to the regional supply system, which supplement the supply provided by the wells. Two connections to SPU's Tolt Pipeline No. 2 (TPL#2) serve the Well Service Area. Three connections to SPU's Tolt Eastside Supply Line (TESSL) serve the Rose Hill service area. These three connections are shared with Kirkland. An additional connection to the TESSL (at NE 40th St.) serves the Overlake/Viewpoint service area, and is shared with the City of Bellevue. The City's final supply connection is to SPU's Tolt Tie Line and serves Novelty Hill. Table 3-7 shows all of the City's supply connections.

The operating hydraulic grade varies in the regional transmission system based on overall regional demands and operation of SPU's Tolt filter plant at the upstream end of the regional system. At Redmond's supply connections, the hydraulic grade can vary considerably, from less than 500 feet to over 700 feet. When the hydraulic grade in the regional system is high, much of the City can be fed by gravity. At lower hydraulic grades in the regional system, booster pump stations are used. Cascade's agreement with Seattle includes specified minimum contractual heads (MCHs) at each supply station.

In addition to its supply connections with the regional supply system, the City has a number of both non-emergency and emergency interties with adjacent purveyors. These are shown in Table 3-8. Interties are defined in WAC 246-290-010 as "an interconnection between public water systems permitting the exchange or delivery of water between those systems." Prior to 1991, interties were established between utilities on an as-needed basis and no process was in place at the state level for review or approval. Since that time, DOH and the Washington State Department of Ecology have developed review and approval requirements.

Potential future interties are also shown in Table 3-8 and discussed further in Chapter 7. Locations for any new interties between the City and adjacent jurisdictions will be determined jointly by the parties involved.

Table 3-5. Redmond Storage Tanks

Facility	Type	Year Built / Year Improved	Total Volume (MG)	Percent Redmond	Redmond Volume (MG)	Diameter (ft)	Overflow Elevation (ft)	Base Elevation (ft)
Perrigo Springs	Steel	1962 / 1999 / 2007	0.5	100%	0.5	53	238	208
Reservoir Park	Buried Prestressed Concrete	1976 / 2011	4.0	100%	4.0	160	238	208
SE Redmond	Steel	1996/2021	4.5	100%	4.5	107	238	170.6
Education Hill No. 1	Steel	1962 / 1992 & 2008	2.0	100%	2.0	70	470	400
Education Hill No. 2	Steel	1988 / 2008	3.0	100%	3.0	86	470	400
Rose Hill South Reservoir	Steel	1971	11.2	29.4%	3.29	195	545	495
Rose Hill North Reservoir	Steel	1994	14.3	34.0%	4.90	154	450	347
Bellevue/Redmond NE 40th Street	Partially Buried Prestressed Concrete	1991	6.0	44%	2.64	170	412.5	376.5
Novelty Hill Tank No. 1	Steel	1999	3.0	100%	3.0	65	730	592.5
Novelty Hill Tank No. 2	Steel	2002	5.5	100%	5.5	82	730	592.5

Table 3-6. Distribution System Pipe Inventory (End of 2022)

Diameter (inches)	Total Length in System (feet)	Material						
		AC	CI	DI	PE	PVC	STL	Unknown
In-City Service Area								
Unknown	920			195				725
4	47,580	25,849	3,517	16,802		866		547
6	207,425	111,170	19,746	73,642	4	694		2,169
8	601,593	107,068	31,045	455,382	393	2,005		5,700
10	40,506	21,475		18,379				652
12	503,255	6,327	9,070	487,077		313		469
14	9357	7,553		1,738				66
16	58,278	5,614	313	52,227	2			122
20	24,330			24,330				
24	352			352				
28	1,518				1,518			
Subtotal	**1,495,115**	**285,056**	**63,691**	**1,130,122**	**1,917**	**3,878**		**10,451**
Jointly Owned Pipes with Bellevue								
6	856	41		816				
8	2,273	2,010		264				
10	6,124	6,081		35				8
12	4,608	1,338		3,270				
14	1,638		1,629	9				
16	709			709				
Subtotal	**16,209**	**9,469**	**1,629**	**5,103**				**8**
Jointly Owned Pipes with Kirkland								
6	274			261				14
8	296	156	31	109				
10	8			8				
12	2,883		15	2,868				
16	13,489			13,489				
18	145			145				
20	4,204			4,204				
24	4,378			4,378				
Subtotal	**25,678**	**156**	**46**	**25,462**				**14**

Diameter (inches)	Total Length in System (feet)	Material						
		AC	CI	DI	PE	PVC	STL	Unknown
Novelty Hill Service Area								
4	736			736				
6	9,809			9,809				
8	102,814			102,633	181			
10	32			32				
12	107,994			107,242	751			
16	6,336			6,336				
20	6,272			6,233			39	
24	13,872			13,712			160	
Subtotal	**247,865**			**246,733**	**932**		**199**	

AC = asbestos cement
CI = cast iron
DI = ductile iron
PVC = polyvinyl chloride
STL = steel

Table 3-7. Supply Connections to SPU Transmission Pipelines

Name	Supply Pipeline	Tap Size (in)	Purpose	Minimum Contract Head (ft)[1]	Pressure Zones Served	Flow Capacity (gpm)
Education Hill	TPL #2	10	Service to Education Hill and Well Service Area	515 (505)	470	5,000
Education Hill	TPL#2	16	Service to Education Hill and Well Service Area	515 (505)	470	5,000
Rose Hill No. 1	TESSL	10	Service to Bellevue/Kirkland/ Redmond Rose Hill Service Area	520 (510)	545 & 650	3,500[3] (1,029 to Redmond – 29.4%)
Rose Hill No. 2	TESSL	10	Service to Bellevue/Kirkland/ Redmond Rose Hill Service Area	535 (525)	545 & 650	8,000 (2,720 to Redmond - 34%)
Rose Hill No. 3	TESSL	10	Service to Bellevue/Kirkland/ Redmond Rose Hill Service Area	555 (545)	545	4,500 (1,530 to Redmond - 34%)
Overlake	TESSL	10	Service to Bellevue & Redmond's Overlake/Viewpoint Service Area	520 (510)	520	5,000[4]
Novelty Hill	Seattle Tolt Tie Line[2]	16 16	Service to Novelty Hill	610 (600)	730	7,900

[1] Minimum hydraulic grade line (HGL) per SPU datum, followed in parentheses by the minimum HGL per Redmond's datum.

[2] There are two meters at the Novelty Hill connection to the Tolt Tie Line.

[3] Kirkland's water system plan says "contract percentage is the contractual ownership interest of each City, per the Rose Hill Water Distribution Assumption Agreement."

[4] Shared with Bellevue.

Table 3-8. Interties to Adjacent Purveyors

Location	Connection	Meter Size (in.)	Purpose
Existing Interties			
Many interconnections	City of Bellevue	Varies	Non-emergency / Regional conveyance
Many interconnections	City of Kirkland	Varies	Non-emergency / Regional conveyance
NE 95th St. near 195th Ave. NE	Union Hill Water Association	6	Emergency
Novelty Hill Rd. and 224th Ave. NE *(Union Hill plans to install in future)*	Union Hill Water Association	TBD	Emergency
Redmond Ridge Dr. and NE 80th St.	Union Hill Water Association	8	Emergency (two-way)
NE 93rd St. and 221st Pl.	Union Hill Water Association	6	Emergency (two-way)
187th Ave. NE	Northeast Sammamish Sewer and Water District	6	Emergency
South end of Redmond Ridge	Sammamish Plateau Water and Sewer District	8	Non-emergency / Regional conveyance
NE 133rd St. and 227th Ave. NE	Woodinville Water District (owned by Woodinville)	8	Emergency (one-way, to Woodinville)
232nd Ave. NE and NE 135th St.	Woodinville Water District (owned by Redmond)	8	Emergency (two-way)
Potential Future Interties (Connection date to be determined)			
172nd Ave. NE and two or more other locations along service area boundary	Woodinville Water District	TBD	Emergency
Location to be determined	Sammamish Plateau/ Dawnbreaker	TBD	Emergency

TBD = To be determined

Chapter 4: Planning Data and Demand Forecast

City of Redmond 2024 Water System Plan

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4. Planning Data and Demand Forecast

This chapter discusses planning data and the City of Redmond's demand forecast. The information is presented in three main sections: the first section summarizes demographic data for Redmond; the second section summarizes Redmond's water use characteristics; and the third section combines the demographics and the water supply characteristics to develop Redmond's demand forecast.

As described in Chapter 3, Redmond retails water in two areas. The first area is the City Service Area, which approximates the City's municipal boundaries. The second area is the Novelty Hill Service Area, which is a planned community east of the City in unincorporated King County. These two areas together form the Retail Service Area. The information in this chapter distinguishes between the City, the Novelty Hill, and the Retail Service Areas.

Water system plans typically provide demand forecasts for a 20-year planning period. The plans are specifically required to provide forecasts for a base year through year ten and year 20 of the 20-year planning period. For this plan, 2023 was selected as the base year, with 2033 and 2043 representing the 10- and 20-year forecast horizons. Data used in this chapter do not include year 2022 because those data were not available during plan production.

The demand forecast developed in this chapter is used in the water rights evaluation in Chapter 7.2, in the source capacity evaluation in Chapter 10, and in documenting the City's water conservation program savings.

4.1. Demographics – Historical and Projected

The following four demographic units were analyzed for the City Service Area:

- Population
- Single Family Households
- Multifamily Households
- Employment

Households and employment are used directly in forecasting demand. The population numbers were not used directly for the demand forecast; however, they are provided to meet DOH water system planning requirements.

Table 4-1 presents historical and projected demographic numbers for the Retail Service Area. The values are based primarily on data developed between the City's planning department and the Puget Sound Regional Council (PSRC), with input from King County per the 2021 Countywide Planning Policies (CPPs). Historical demographic data were estimated for 2010 and several years between 2018 and 2022; blue cells in Table 4-1 indicate where historical demographics were estimated. Forecasted demographics for single family households, multifamily households, and employment were provided for 2050. Demographic data for the years between the estimates were interpolated using linear growth between milestones.

Demographic changes were not developed for the Novelty Hill Service area. King County confirmed there is not appreciable capacity for the area to grow further over the next 20 years. See Table 4-10 and Section 4.3.1 for more information on the demographic units for the Novelty Hill Service Area and their application in the demand forecast.

Table 4-1. Demographics

Calendar Year	Plan Year	Population [a]		Single Family (SF) Households [b]		Multifamily (MF) Households [b]		Employment [c]		Novelty Hill		
		Quantity	Annual Change	Quantity	Annual Change	Quantity	Annual Change	Quantity	Annual Change	SF	MF	Population
2010		54,144	n/a	11,948	n/a	12,229	n/a	76,313		2,700	873	8,321
2011		56,055	3.5%	11,877	-0.6%	12,863	5.2%	78,445	2.8%	2,863	873	8,729
2012		57,966	3.4%	11,806	-0.6%	13,497	4.9%	80,577	2.7%	3,025	873	9,134
2013		59,878	3.3%	11,735	-0.6%	14,131	4.7%	82,709	2.6%	3,172	873	9,501
2014		61,789	3.2%	11,664	-0.6%	14,765	4.5%	84,841	2.6%	3,246	873	9,686
2015		63,700	3.1%	11,592	-0.6%	15,399	4.3%	86,973	2.5%	3,297	873	9,814
2016	n/a	65,611	3.0%	11,521	-0.6%	16,033	4.1%	89,105	2.5%	3,297	873	9,814
2017		67,522	2.9%	11,450	-0.6%	16,667	4.0%	91,237	2.4%	3,296	873	9,811
2018		69,434	2.8%	11,379	-0.6%	17,301	3.8%	93,369	2.3%	3,296	873	9,811
2019		71,345	2.8%	12,543	10.2%	17,495	1.1%	95,501	2.3%	3,296	873	9,811
2020		73,256	2.7%	13,706	9.3%	17,689	1.1%	96,444	1.0%	3,296	873	9,811
2021		74,475	1.7%	13,794	0.6%	18,331	3.6%	98,573	2.2%	3,296	873	9,811
2022		75,694	1.6%	13,811	0.1%	19,009	3.7%	99,273	0.7%	3,296	873	9,812
2023	0	76,913	1.6%	13,762	-0.4%	19,892	4.6%	99,972	0.7%	3,296	873	9,812
2024	1	78,132	1.6%	13,713	-0.4%	20,776	4.4%	100,672	0.7%	3,296	873	9,812
2025	2	79,352	1.6%	13,664	-0.4%	21,659	4.3%	101,371	0.7%	3,296	873	9,812
2026	3	80,571	1.5%	13,615	-0.4%	22,543	4.1%	102,071	0.7%	3,296	873	9,812
2027	4	81,790	1.5%	13,565	-0.4%	23,426	3.9%	102,770	0.7%	3,296	873	9,812
2028	5	83,009	1.5%	13,516	-0.4%	24,309	3.8%	103,470	0.7%	3,296	873	9,812
2029	6	84,228	1.5%	13,467	-0.4%	25,193	3.6%	104,169	0.7%	3,296	873	9,812
2030	7	85,447	1.4%	13,418	-0.4%	26,076	3.5%	104,869	0.7%	3,296	873	9,812
2031	8	86,666	1.4%	13,369	-0.4%	26,960	3.4%	105,569	0.7%	3,296	873	9,812
2032	9	87,885	1.4%	13,320	-0.4%	27,843	3.3%	106,268	0.7%	3,296	873	9,812
2033	10	89,104	1.4%	13,271	-0.4%	28,726	3.2%	106,968	0.7%	3,296	873	9,812
2034	11	90,323	1.4%	13,222	-0.4%	29,610	3.1%	107,667	0.7%	3,296	873	9,812
2035	12	91,543	1.3%	13,173	-0.4%	30,493	3.0%	108,367	0.6%	3,296	873	9,812
2036	13	92,762	1.3%	13,124	-0.4%	31,377	2.9%	109,066	0.6%	3,296	873	9,812
2037	14	93,981	1.3%	13,074	-0.4%	32,260	2.8%	109,766	0.6%	3,296	873	9,812
2038	15	95,200	1.3%	13,025	-0.4%	33,143	2.7%	110,465	0.6%	3,296	873	9,812
2039	16	96,419	1.3%	12,976	-0.4%	34,027	2.7%	111,165	0.6%	3,296	873	9,812
2040	17	97,638	1.3%	12,927	-0.4%	34,910	2.6%	111,864	0.6%	3,296	873	9,812
2041	18	98,857	1.2%	12,878	-0.4%	35,793	2.5%	112,564	0.6%	3,296	873	9,812
2042	19	100,076	1.2%	12,829	-0.4%	36,677	2.5%	113,264	0.6%	3,296	873	9,812
2043	20	101,295	1.2%	12,780	-0.4%	37,560	2.4%	113,963	0.6%	3,296	873	9,812

Calendar Year	Plan Year	Population [a]		Single Family (SF) Households [b]		Multifamily (MF) Households [b]		Employment [c]		Novelty Hill		
		Quantity	Annual Change	Quantity	Annual Change	Quantity	Annual Change	Quantity	Annual Change	SF	MF	Population
2044	n/a	102,515	1.2%	12,731	-0.4%	38,444	2.4%	114,663	0.6%	3,296	873	9,812
2045		103,734	1.2%	12,682	-0.4%	39,327	2.3%	115,362	0.6%	3,296	873	9,812
2046		104,953	1.2%	12,632	-0.4%	40,210	2.2%	116,062	0.6%	3,296	873	9,812
2047		106,172	1.2%	12,583	-0.4%	41,094	2.2%	116,761	0.6%	3,296	873	9,812
2048		107,391	1.1%	12,534	-0.4%	41,977	2.1%	117,461	0.6%	3,296	873	9,812
2049		108,610	1.1%	12,485	-0.4%	42,861	2.1%	118,160	0.6%	3,296	873	9,812
2050		109,829	1.1%	12,436	-0.4%	43,744	2.1%	118,860	0.6%	3,296	873	9,812

[a] Population for years 2010 and 2020 were provided by the U.S. Census. Population for 2050 was calculated by assuming household occupancy of 2.5 for single family homes and 1.8 for multifamily homes. Population for intervening years was interpolated using linear growth.

[b] Number of households based on the 2050 growth preferred alternative, provided by the Redmond Planning Department.

[c] Employment estimates provided by the Puget Sound Regional Council Covered Employment Estimates by Jurisdiction.

4.2. Water Use Characteristics

The following subsections describe the City's water use characteristics since the prior planning period.

4.2.1. Production, Purchases, and Peaking Factor

Redmond purchases surface water from Cascade Water Alliance and has five of its own groundwater wells. Purchases from Cascade constitute the majority of the City's supply and this source provides all of the water delivered to Novelty Hill. As shown in Figure 4-1, for the Retail Service Area, purchases from Cascade provided 60% of the supply and Redmond's wells provided 40% of the supply for 2019-2021. This indicates the City has used more of its local groundwater supply since the prior plan when the values were 69% and 31%, respectively.

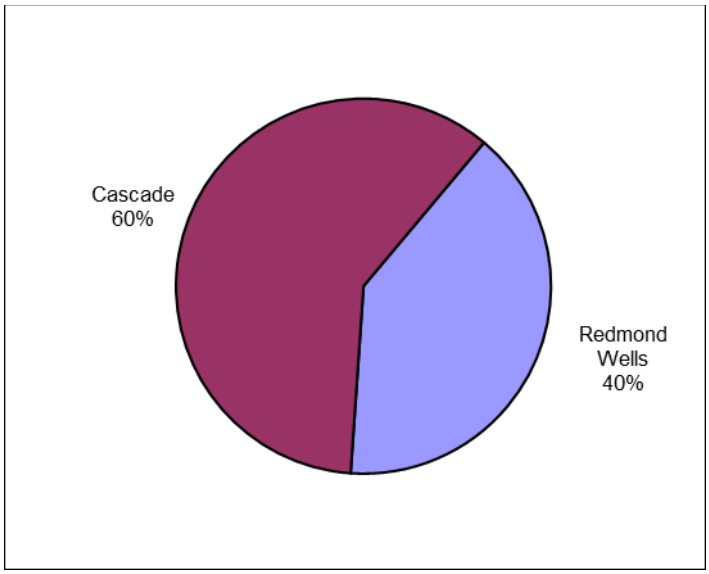


Figure 4-1. Source of supply - Retail Service Area (2019–2021)

The City Service Area uses a combination of Cascade and Redmond well water. As shown in Figure 4-2, for the City Service Area purchases from Cascade provided 55% of the supply, while the remaining balance came from Redmond's wells. The wells contributed varying volumes to the City's supply, with wells #1 and #5 providing similar volumes. Well #4 provided the least volume and was only used in the months of June – November 2020. Well #4 has ongoing water quality issues, mainly with manganese and fluctuating iron concentrations. It was also impacted by temporary construction dewatering, concerns about potential per-fluoroalkyl substances (PFAS) based on detection in surrounding monitoring wells, and low production volume relative to the water right. Therefore, Well #4 is generally not used unless necessary at this time. The City is working on solutions to address the ongoing issues with Well #4.

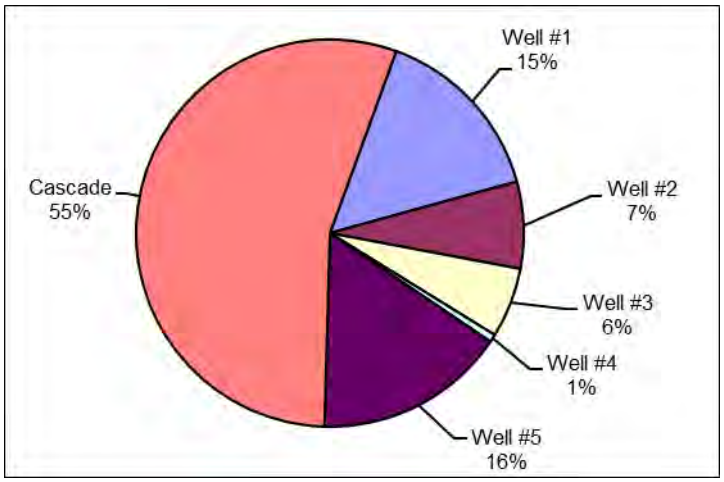


Figure 4-2. Source of supply - City Service Area (2019 – 2021)

Eight years of Redmond's water purchases and production are shown in Figure 4-3. Water production and purchases have ranged from a low of 2,477 million gallons (mg) in 2020 (the first year of the COVID-19 pandemic) to a high of 2,770 mg in 2015 (significant drought year). The

2019-2021 average purchases and production from each source are provided in Table 4-2. Total purchases and production averaged 2,548 mg for 2019-2021. This production profile suggests demands were stable throughout the planning period despite growth in population and connections to the system. This is common in the Northwest and is the result of water conservation programs and an increasingly water-conscious population.

Purchases and production by month for 2019-2021 are shown in Figure 4-4. As with most water utilities, Redmond's purchases and production increase in the summer months due to outdoor water use, primarily irrigation.

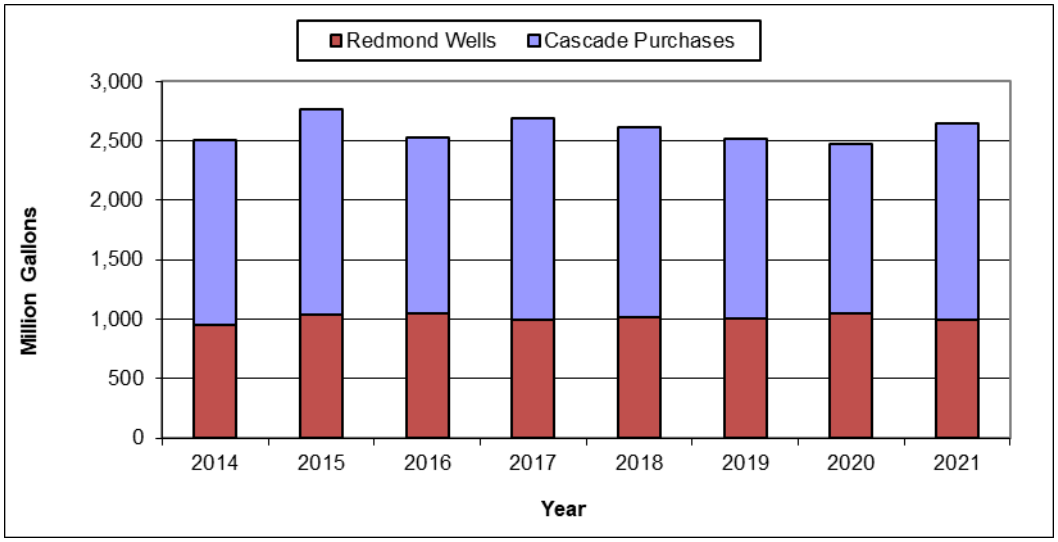


Figure 4-3. Annual water purchases and production for the Retail Service Area (2014–2021)

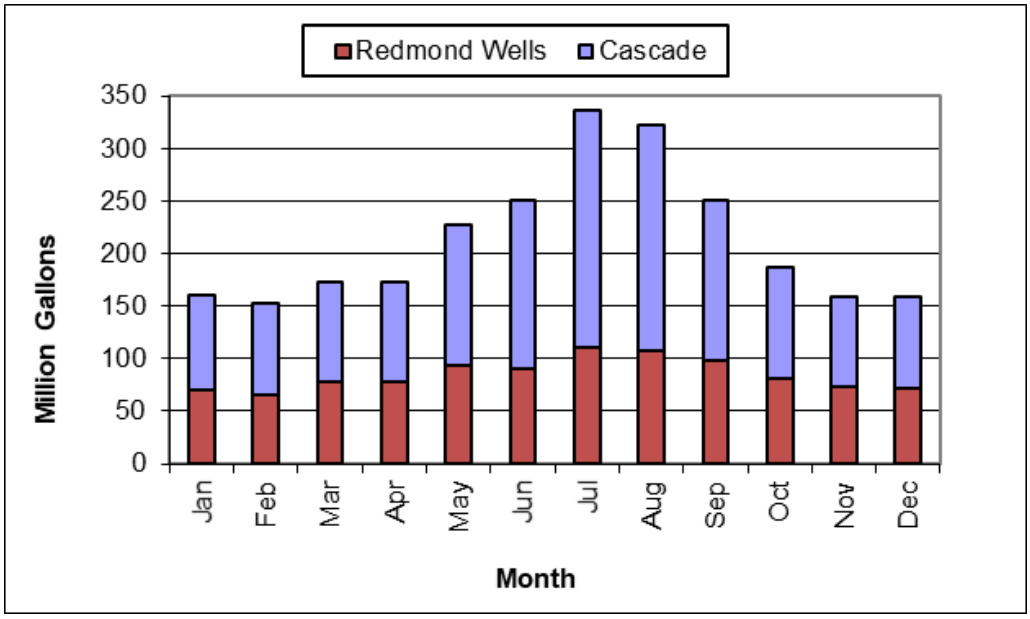


Figure 4-4. Monthly distribution of water purchases and production for the Retail Service Area (2019–2021 Average)

Table 4-2. 2019-2021 Average water purchases and production (million gallons)

Month	City Service Area								Novelty Hill Service Area		Retail Service Area			
	Well #1	Well #2	Well #3	Well #4	Well #5	Cascade	Subtotal	Percent	Cascade	Percent	Redmond Wells	Cascade	Total	Percent
Jan	24	13	8	0	25	75	146	6%	15	5%	71	90	161	6%
Feb	22	12	9	0	23	73	138	6%	15	5%	66	87	153	6%
Mar	25	13	12	0	27	77	154	7%	18	7%	77	95	173	7%
Apr	26	13	13	0	27	78	156	7%	16	6%	79	94	172	7%
May	31	15	14	0	33	110	203	9%	23	8%	94	133	227	9%
Jun	30	14	12	2	32	129	219	10%	32	11%	90	160	251	10%
Jul	38	17	14	1	41	184	295	13%	41	15%	111	225	336	13%
Aug	36	16	12	4	39	172	279	12%	42	15%	107	214	322	13%
Sep	33	14	11	4	36	123	222	10%	28	10%	98	152	250	10%
Oct	28	12	8	3	30	89	170	7%	17	6%	81	105	187	7%
Nov	25	12	8	1	26	68	141	6%	17	6%	73	85	158	6%
Dec	25	12	10	0	25	74	145	6%	14	5%	71	88	159	6%
Total	**344**	**164**	**133**	**15**	**363**	**1,251**	**2,270**	**100%**	**279**	**100%**	**1,019**	**1,529**	**2,548**	**100%**
Percent	**15%**	**7%**	**6%**	**1%**	**16%**	**55%**	**100%**	**n/a**	**100%**	**n/a**	**40%**	**60%**	**100%**	**n/a**

Average day demands (ADD) were calculated by dividing the total production and purchases in a year by the number of days in that year. Peak day demands, or maximum day demands (MDD), were developed from SCADA data by searching for maximum combined flow on all well booster pumps and intertie stations. Peaking factors (MDD divided by ADD) for 2014 to 2021 are shown in Table 4-3. The peaking factor has ranged from 2.3 in 2021 to 3.2 in 2017. The average peaking factor for 2019 – 2021 was 2.6, which was used in the demand forecast and system capacity analyses.

Table 4-3. Average day demands, maximum day demands, and peaking factors, 2014 - 2021

Year	Average Day (mgd) [a]	Peak Day [b]		Peaking Factor
		(mgd)	Date	
2014	6.9	16.9	7/12/2014	2.5
2015	7.6	17.7	7/10/2015	2.3
2016	6.9	16.3	8/1/2016	2.4
2017	7.4	23.4	8/30/2017	3.2
2018	7.2	18.1	7/14/2018	2.5
2019	6.9	20.9	6/15/2019	3.0
2020	6.8	16.0	7/31/2020	2.4
2021	7.2	16.7	7/2/2021	2.3
2019-2021 Avg	7.0	17.9	n/a	2.6

[a] Data Source: "Wells 1-5" PDF data provided by City staff.

[b] Data Source: "Max Day Production" spreadsheet provided by City staff.

4.2.2. Customer Categories, Connections, and Consumption

Redmond has the following five customer categories:

- **Single Family (Residential):** Detached residential buildings serving a single family, accessory dwelling units, and common-wall multifamily units with individual meters for each unit.
- **Multifamily:** Residential buildings, such as apartment buildings, duplexes, or condos, that serve multiple households.
- **Commercial (Non-Residential):** All other non-residential customers, except for the irrigation and fire categories which are described in more detail below.
- **Irrigation:** Irrigation water provided through a dedicated irrigation meter. Irrigation meters serve a range of customer types including single family, multifamily, and non-residential. Note that irrigation water may also be provided through the other customer categories when there is no dedicated irrigation meter, particularly for single family residential.
- **Fire:** Meters that serve single family residential fire sprinklers. While these meters are associated with single-family residences, they are their own customer category to segregate fire consumption from other domestic consumption used to determine water use factors.

The number of customer connections by category from 2008 to 2021 is provided in Table 4-4. At the end of 2021, the Retail Service Area had 19,581 connections, the vast majority of which (80%) were single family. The proportion of customer types differs between the City Service Area and the Novelty Hill Service Area. The City Service Area has a sizable portion of multifamily and non-residential connections. The Novelty Hill Service Area is predominately single family connections, though multifamily and non-residential growth has occurred since the prior plan.

Table 4-4. Number of connections by customer class, 2008 – 2021 [a,b,c]

Year		City Service Area						Novelty Hill Service Area						Retail Service Area					
		Single Family	Multifamily	Non-Residential	Irrigation	Fire	Subtotal	Single Family	Multifamily	Non-Residential	Irrigation	Fire	Subtotal	Single Family	Multifamily	Non-Residential	Irrigation	Fire	Subtotal
2008		10,845	1,294	1,280	510	352	14,281	2,436	80	55	50	4	2,625	13,281	1,374	1,335	560	356	16,906
2009		10,897	1,296	1,300	520	457	14,470	2,520	80	57	53	4	2,714	13,417	1,376	1,357	573	461	17,184
2010		11,016	1,297	1,293	525	523	14,654	2,700	80	57	56	4	2,897	13,716	1,377	1,350	581	527	17,551
2011		11,124	1,301	1,297	526	558	14,806	2,863	80	57	59	4	3,063	13,987	1,381	1,354	585	562	17,869
2012		11,194	1,320	1,296	531	568	14,909	3,025	80	57	58	4	3,224	14,219	1,400	1,353	589	572	18,133
2013		11,362	1,325	1,248	536	578	15,049	3,172	80	57	60	4	3,373	14,534	1,405	1,305	596	582	18,422
2014		11,525	1,327	1,251	545	578	15,226	3,246	80	57	63	4	3,450	14,771	1,407	1,308	608	582	18,676
2015		11,688	1,330	1,250	554	570	15,392	3,297	80	61	63	4	3,505	14,985	1,410	1,311	617	574	18,897
2016		11,811	1,331	1,255	559	570	15,526	3,297	80	61	63	4	3,505	15,108	1,411	1,316	622	574	19,031
2017		11,966	1,335	1,252	561	570	15,684	3,296	80	64	63	4	3,507	15,262	1,415	1,316	624	574	19,191
2018		12,095	1,337	1,248	574	570	15,824	3,296	80	80	64	4	3,524	15,391	1,417	1,328	638	574	19,348
2019		12,203	1,347	1,234	569	570	15,923	3,296	80	81	65	4	3,526	15,499	1,427	1,315	634	574	19,449
2020		12,285	1,318	1,262	575	570	16,010	3,296	80	82	66	4	3,528	15,581	1,398	1,344	641	574	19,538
2021		12,331	1,316	1,255	579	570	16,051	3,296	80	85	65	4	3,530	15,627	1,396	1,340	644	574	19,581
2019-2021 Avg [d]	**#**	**12,273**	**1,327**	**1,250**	**574**	**570**	**15,995**	**3,296**	**80**	**73**	**64**	**4**	**3,518**	**15,350**	**1,411**	**1,324**	**631**	**574**	**19,291**
	%	**77%**	**8%**	**8%**	**4%**	**4%**	**100%**	**94%**	**2%**	**2%**	**2%**	**0.1%**	**100%**	**80%**	**7%**	**7%**	**3%**	**3%**	**100%**

[a] Data Source: Number of Connections By Class excel spreadsheets

[b] Categories in the raw data are commercial, irrigation, multifamily, residential, townhomes, and multiuse. Within those categories, service codes are applied which describe meters associated with more precise uses such as irrigation and fire. Those meters were isolated to determine the final number of meters that belong in the irrigation and fire categories. Multiuse meters were considered non-residential.

[c] Townhomes go into single family residential category

[d] Average number of connections is used to calculate the proportions of connections in each service area.

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Water consumption data were provided by the City's billing department. Billing data was made available as monthly totals for the entire system by customer class and included a line item for water wheeled to Sammamish Plateau Water (Sammamish). Consumption data included an additional "Exempt" category describing connections that are not charged for sewer based on use of this meter. These connections are all non-residential. The City provided data describing the proportion of water billed in the City Service Area vs. the Novelty Hill service area; the proportions average approximately 89% and 11%, respectively, throughout the period of record. These are the values the City reports to Cascade.

The average water billings, by customer category and by month, over the last 3 years is provided in Table 4-5. This table includes a column for water wheeled to Sammamish, not counted within the consumption values. The monthly distribution of actual water differs from this representation since billing numbers are based on meter read dates, which are not perfectly aligned with the month.

Figure 4-5 displays the percentage of total consumption by customer class for the Retail Service Area. Single family residential is the largest customer category, comprising 38% of consumption, followed by Multifamily which comprises 29% of consumption. Non-residential and irrigation demands comprise 18% and 13%, respectively, of total demands. The Exempt category comprises 3% of total demand, and the fire category comprises less than 1% of demand and is not displayed in the figure.

Proportion of consumption in the Retail Service Area by sub-service area is shown in Figure 4-6. Approximately 89% of the consumption occurs in the City Service Area and 11% in the Novelty Hill Service Area. The consumption by customer category in the City and Novelty Hill service areas is shown in Figure 4-7 and Figure 4-8, respectively. The Fire customer category does not appear on these figures because its relative proportion is much smaller than all other customer classes (less than 1%).

In the City Service Area, single family represents approximately one third of total consumption at 34%, with multifamily and non-residential demands following behind at 31% and 19%, respectively. Irrigation accounts for 13% of demands, with a majority of the remaining demands in the exempt category and a very small proportion for fire. In the Novelty Hill service area, a significantly greater proportion of consumption is in the single family category at 70%. The multifamily category comprises 12% of consumption, with the remaining categories each comprising less than 10%.

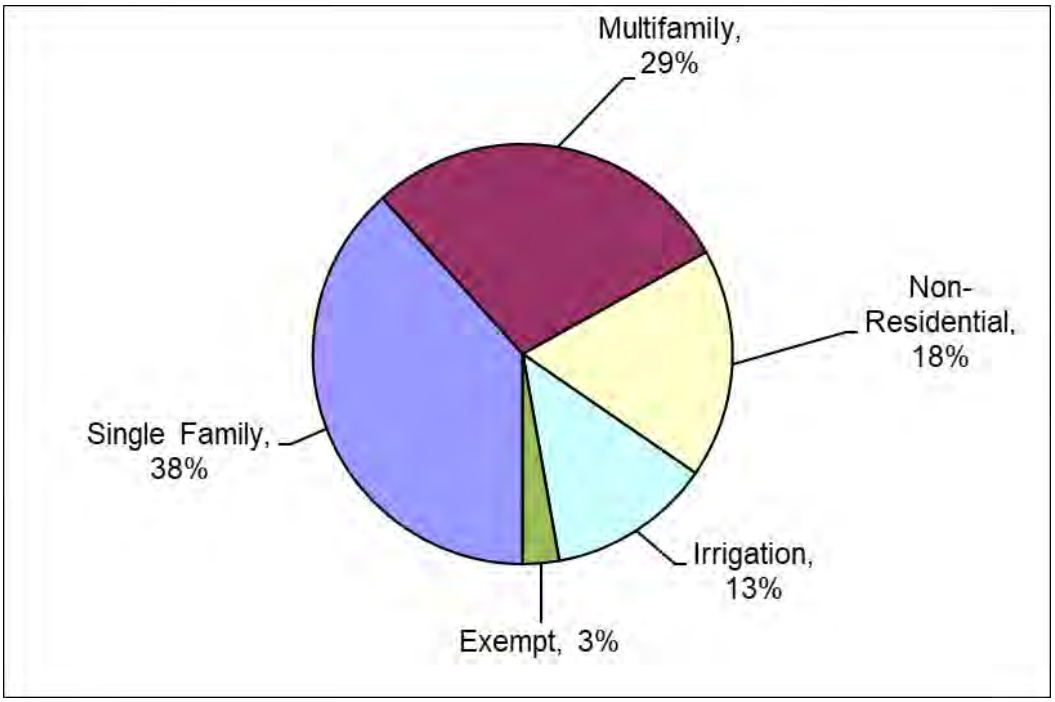


Figure 4-5. Consumption in the Retail Service Area by customer category (2019–2021)

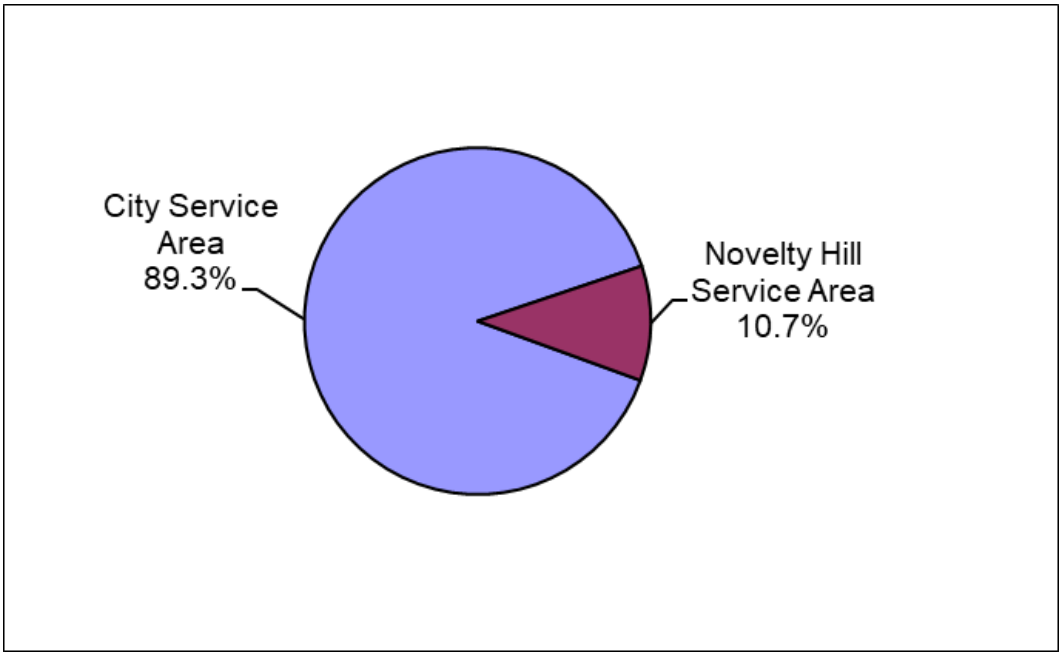


Figure 4-6. Consumption by service area (2019–2021)

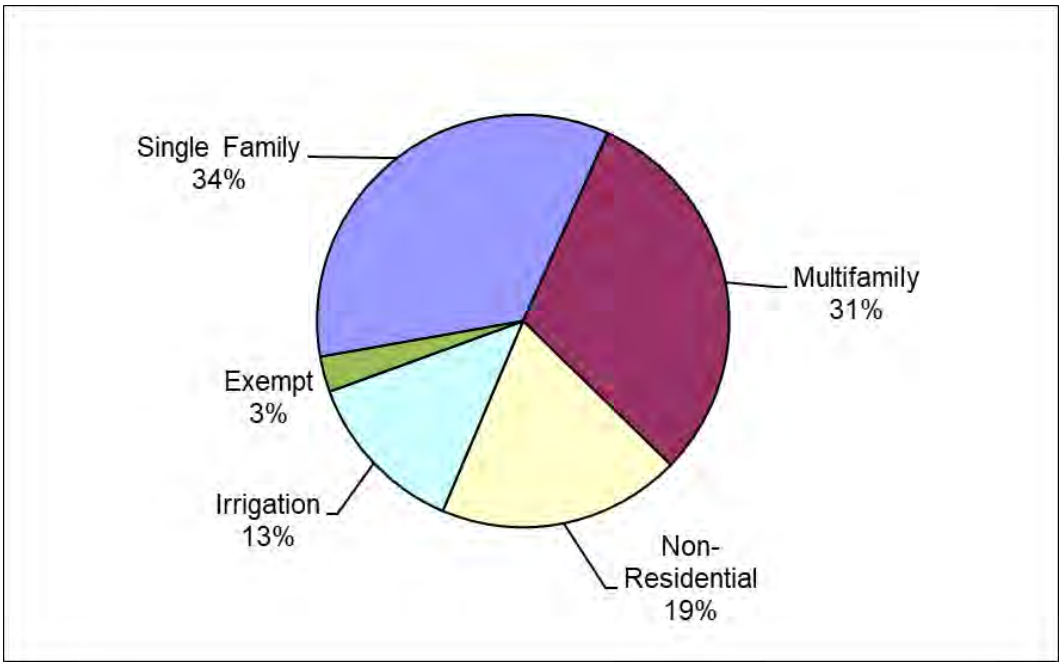


Figure 4-7. Consumption in the City Service Area by customer category (2019–2021)

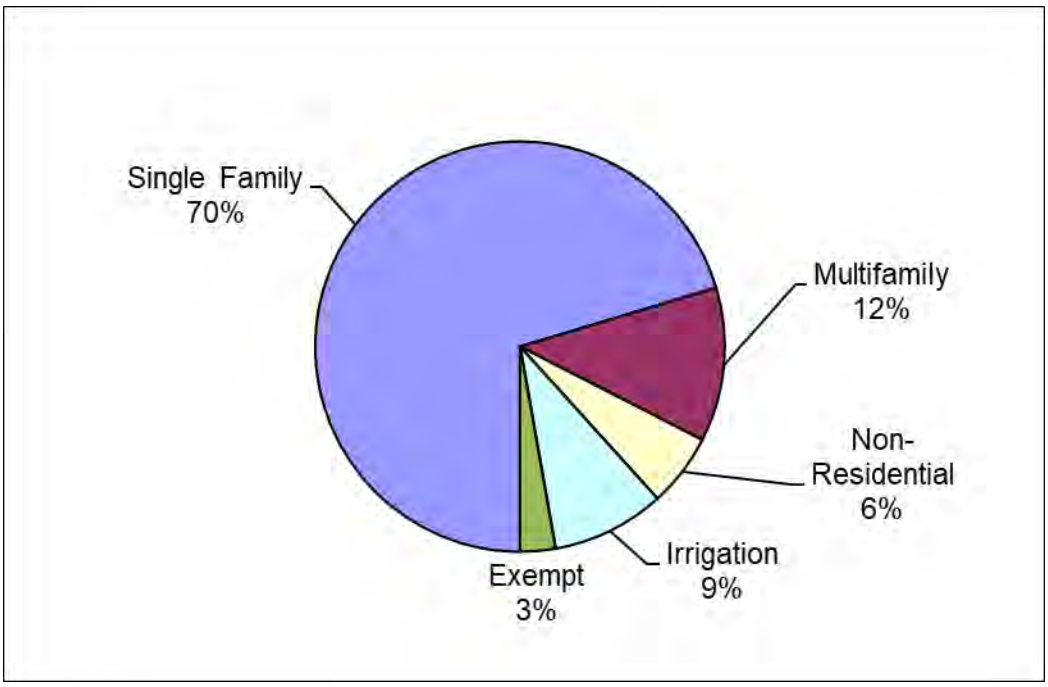


Figure 4-8. Consumption in the Novelty Hill Service Area by customer category (2019–2021)

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Table 4-5. Average water consumption in million gallons, 2019 – 2021 [a,b,c]

Month	Retail																								Water Wheeled to Sammamish
	City Service Area								Novelty Hill Service Area								Retail Service Area								
	Single Family	Multi family	Non-Res.	Irrig.	Fire[d]	Exempt	Sub total	Percent	Single Family [e]	Multi family	Non-Res.	Irrig.	Fire	Exempt	Sub total	Percent	Single Family	Multi family	Non-Res.	Irrig.	Fire	Exempt	TOTAL	Percent	
Jan	45.4	51.3	27.9	0.7	0.0	0.2	125.4	6%	12.4	2.5	1.1	0.1	0.0	0.0	16.1	6%	57.8	53.8	29.0	0.7	0.0	0.2	141.5	6%	0.4
Feb	48.1	47.1	29.8	0.5	0.0	0.2	125.7	6%	11.8	2.7	1.3	0.0	0.0	0.0	15.9	6%	59.9	49.8	31.1	0.5	0.0	0.2	141.6	6%	0.3
Mar	49.6	53.0	31.5	1.3	0.0	0.5	135.8	7%	11.8	2.4	1.2	0.1	0.0	0.1	15.5	6%	61.4	55.3	32.7	1.4	0.0	0.5	151.3	6%	0.3
Apr	59.9	52.0	28.0	6.7	0.0	1.5	148.1	7%	10.8	2.4	1.1	0.5	0.0	0.2	15.0	6%	70.7	54.4	29.1	7.3	0.0	1.7	163.0	7%	5.5
May	49.9	54.4	32.8	27.2	0.0	5.3	169.6	8%	10.8	2.6	1.2	2.3	0.0	0.6	17.5	7%	60.7	57.0	34.0	29.4	0.0	6.0	187.2	8%	0.8
Jun	85.9	53.7	36.4	47.3	0.0	9.4	232.8	11%	12.2	2.5	1.1	3.9	0.0	1.1	20.8	8%	98.1	56.2	37.5	51.3	0.0	10.6	253.6	11%	0.7
Jul	85.1	56.3	42.2	67.9	0.0	13.0	264.5	13%	12.3	2.6	1.1	5.6	0.0	1.6	23.0	9%	97.4	58.9	43.3	73.5	0.0	14.5	287.6	12%	1.1
Aug	92.0	56.5	44.1	68.7	0.0	14.7	276.1	13%	19.0	2.6	1.2	5.6	0.0	1.8	30.3	12%	111.0	59.1	45.4	74.3	0.0	16.5	306.4	13%	1.1
Sep	62.3	53.9	37.7	42.2	0.0	10.2	206.3	10%	19.0	2.6	1.5	3.4	0.0	1.2	27.7	11%	81.3	56.6	39.2	45.6	0.0	11.4	234.0	10%	0.6
Oct	51.2	54.1	32.3	8.0	0.0	2.4	147.8	7%	21.7	2.7	1.4	0.6	0.0	0.3	26.8	11%	72.9	56.7	33.7	8.6	0.0	2.6	174.6	7%	0.4
Nov	36.7	51.7	28.4	1.2	0.0	0.4	118.4	6%	21.6	2.5	1.2	0.1	0.0	0.0	25.4	10%	58.3	54.2	29.6	1.3	0.0	0.4	143.8	6%	0.5
Dec	52.8	52.1	26.5	0.4	0.0	0.2	132.0	6%	12.4	2.5	1.1	0.0	0.0	0.0	16.1	6%	65.2	54.7	27.6	0.4	0.0	0.2	148.1	6%	0.6
Total	**718.8**	**636.3**	**397.7**	**272.0**	**0.0**	**57.9**	**2,082.6**	**100%**	**175.9**	**30.4**	**14.4**	**22.4**	**0.0**	**6.9**	**250.0**	**100%**	**894.6**	**666.7**	**412.0**	**294.4**	**0.0**	**64.8**	**2,332.6**	**100%**	**12.3**
Percent	**35%**	**31%**	**19%**	**13%**	**0%**	**3%**	**100%**	**n/a**	**70%**	**12%**	**6%**	**9%**	**0%**	**3%**	**100%**	**n/a**	**38%**	**29%**	**18%**	**13%**	**0%**	**3%**	**100%**	**n/a**	**n/a**

[a] Data Source: "Water Sold by Month" and "UBCons" spreadsheets provided by City staff.

[b] Eight years of billing data was analyzed; however the average uses the most recent three years in order to focus on current trends.

[c] The monthly distribution of actual water use may differ somewhat from this representation since billing numbers are based on meter read dates and some meters are read bi-monthly.

[d] Fire consumption is on the scale of hundreds of cubic feet. The minimum consumption observed was 200 cubic feet in numerous months between 2019 – 2021, and the maximum was 1,800 cubic feet in December 2021. When converted to million gallons per month, the values round to 0.0.

[e] The bi-monthly billings of the Novelty Hill Service Area single family customers showed minimal sales one month and large sales the next month. Therefore, the billings were smoothed out over each two month period.

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Monthly distribution of water billings is shown in Figures 4-9 to 4-11 for the Retail Service Area, City Service Area, and the Novelty Hill Service Area, respectively. As noted previously, the monthly distribution of actual water use may differ somewhat from this representation since billing numbers are based on meter read dates, which lag behind actual use. As shown in Figure 4-10 and Figure 4-11, the City and the Novelty Hill Service Areas both show increased use in the summer due to outdoor water use driven by the single family, irrigation, and exempt customer categories. The customer classes associated with irrigation demands are described in greater detail in Section 4.2.4. These figures indicate the monthly demand values for the retail service area are driven by the City Service Area due to the similarities between Figure 4-9 and Figure 4-10. Figure 4-12 displays the average water sold to Sammamish from 2019 – 2021. Historical data suggests there is no seasonal pattern that dominates the monthly volume of water wheeled to Sammamish. The large April volume is due to a significantly larger than normal volume sold to Sammamish in April 2021.

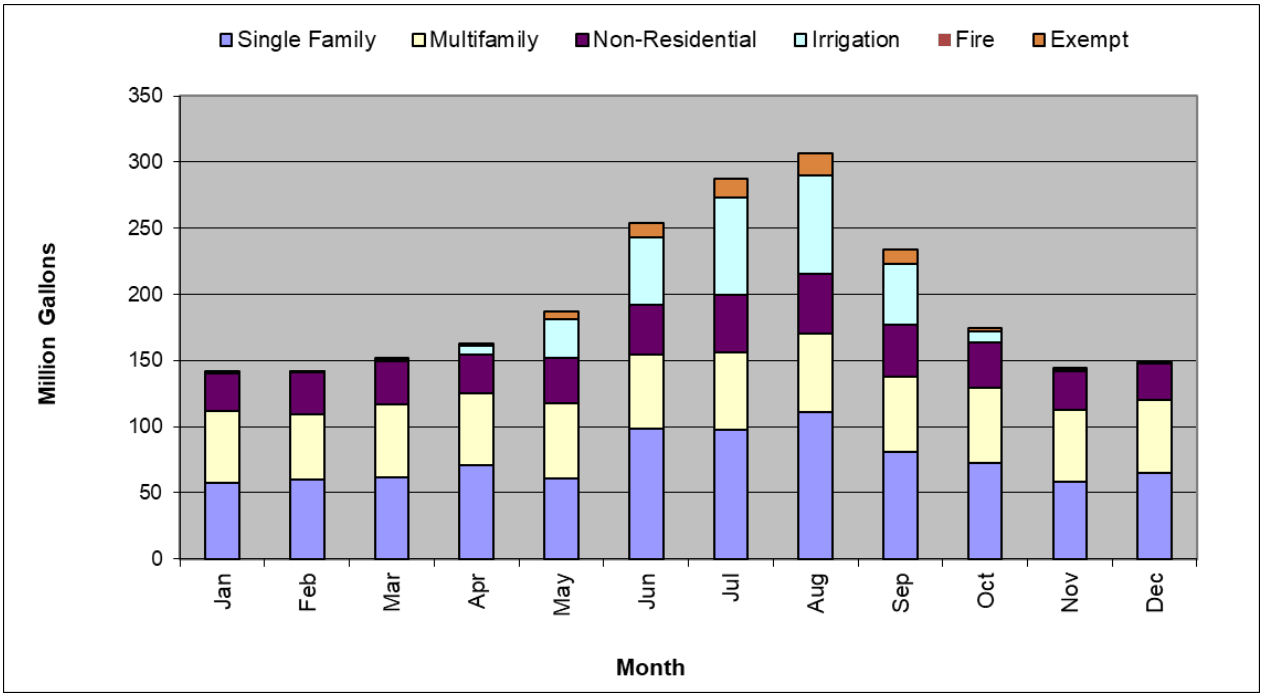


Figure 4-9. Monthly distribution of water consumption in Retail Service Area (2019–2021 Average)

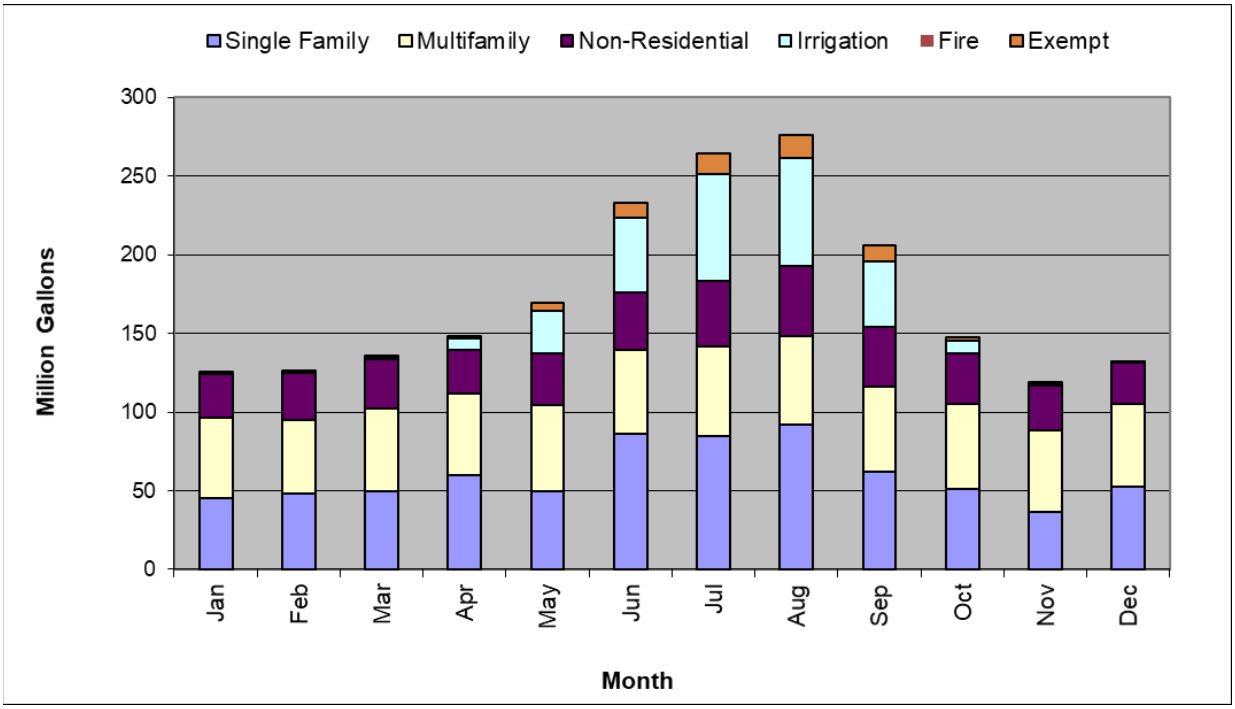


Figure 4-10. Monthly distribution of water consumption in City Service Area (2019–2021 Average)

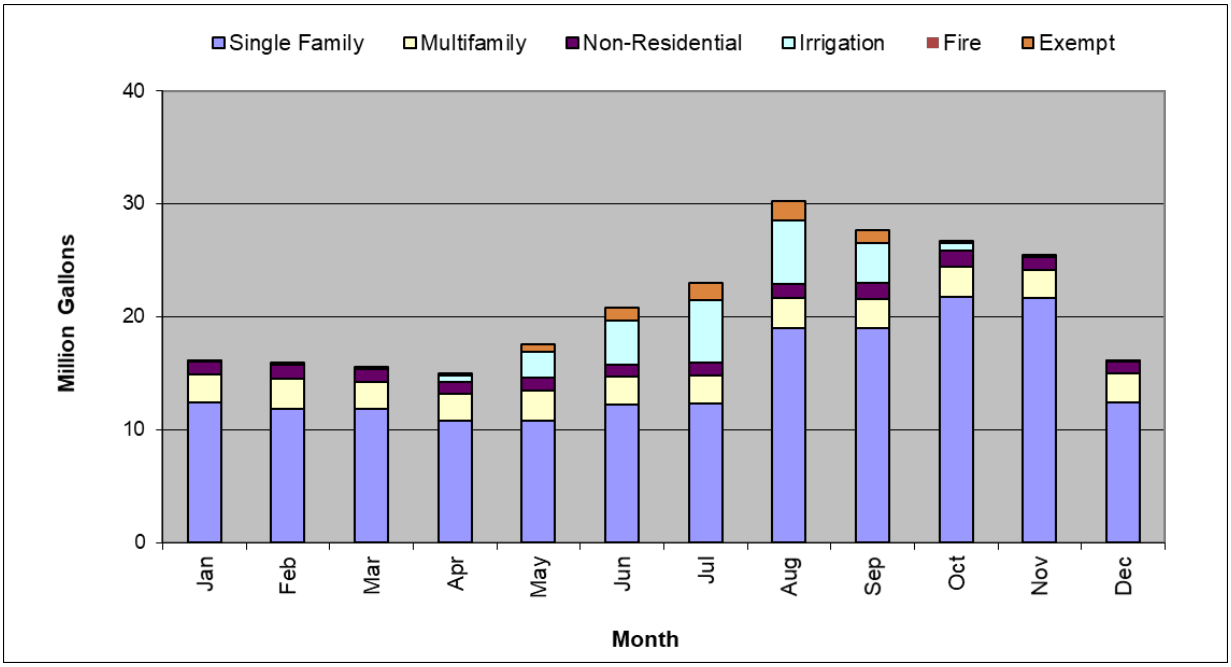


Figure 4-11. Monthly distribution of water consumption in Novelty Hill Service Area (2019–2021 Average)

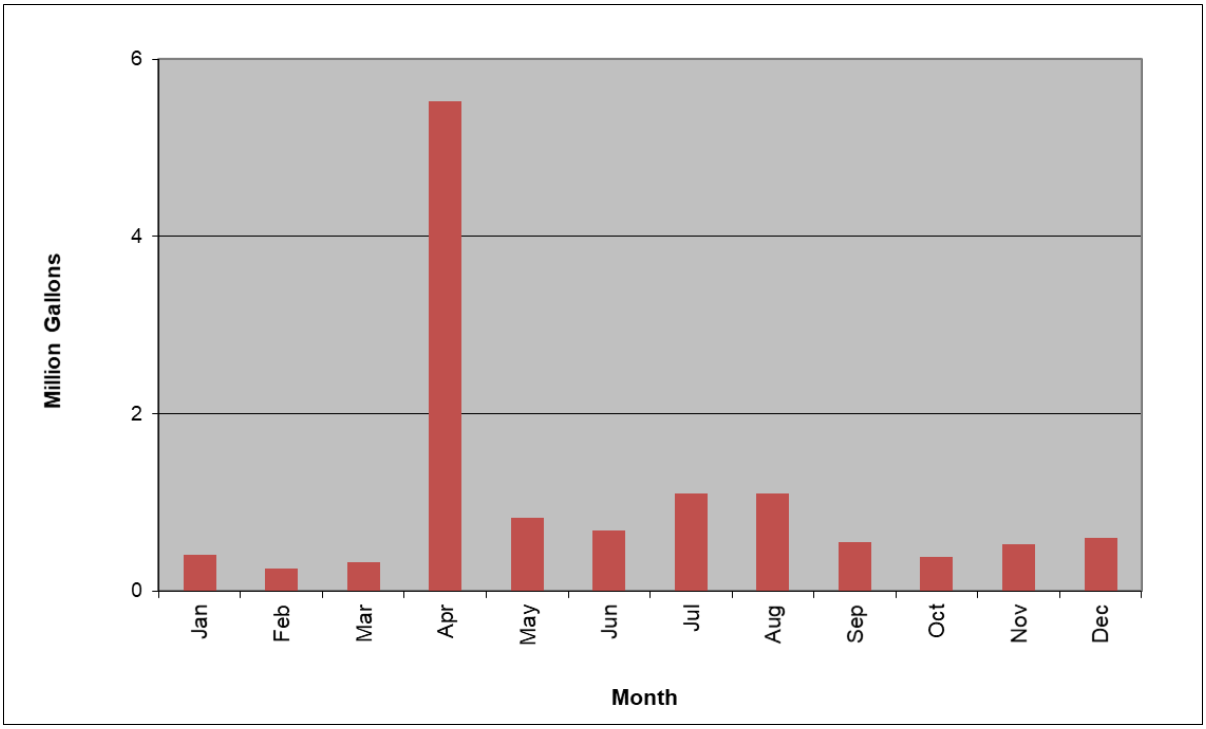


Figure 4-12. Monthly distribution of water consumption for Sammamish (2019–2021 Average)

Customers with large water demands are of interest because their demand could have significant impact on the overall demand for Redmond. The 10 largest customers, in terms of water consumption, were examined for 2016 to 2021. Table 4-6 shows the 10 largest customers for 2021; the large customer profile changes year to year, so a single year is shown to simplify and represent a general profile of large users. In 2021, the 10 largest customers had a combined annual consumption of 367 mg, which was 14% of the 2021 production and purchases.

Table 4-6. Largest 10 customers in 2021

#	Name	Billing Category	Annual Consumption (mg)
1	MICROSOFT	Commercial	135
2	CITY OF REDMOND	Commercial/Irrigation	31
3	SIXTY-01 APARTMENT COMPLEX	Multifamily	30
4	ESSEX REDMOND HILL NE LP	Multifamily	29
5	SASADA SPORTS INTERNATIONAL	Irrigation	26
6	UNISEA INC	Commercial	25
7	ESSEX REDMOND HILL CWLP	Multifamily	24
8	DIG-KW REDMOND LLC	Multifamily	23

#	Name	Billing Category	Annual Consumption (mg)
9	CAMBRIAN APARTMENTS 04WA009	Multifamily	22
10	KING COUNTY PARKS/MARYMOOR	Irrigation	20
		Total:	**367**

4.2.3. Water Balance, Non-Revenue, and Leakage

A water balance is an accounting for all water that is produced and purchased. Redmond's 2021 water balance is shown in Table 4-7. The table is a slightly modified version of the format recommended for use by the American Water Works Association.

The water balance allocates the Water Produced and Purchased to different categories at three different levels.

Level 1 allocates the water to either Revenue Water or Non-Revenue Water. As implied by the names, Revenue Water generates income while Non-Revenue Water does not. This is helpful in understanding what percent of water production and purchases generates income for Redmond. Additionally, non-revenue water needs to be factored into the demand forecast. Redmond's 2021 water production and purchases are divided into 92.3% Revenue Water and 7.7% Non-Revenue Water.

Table 4-7. Water balance (2021)

	Level 1	Level 2	Level 3	Volume (mg)		% of Produced and Purchased Water
Water Produced and/or Purchased	Revenue Water	Billed Authorized Consumption	1. Billed Water Exported	24	[a]	0.9%
			2. Billed Metered Consumption	2,420	[b]	91.4%
			3. Billed Unmetered Consumption	0	[c]	0%
	Non-Revenue Water	Unbilled Authorized Consumption	4. Unbilled Metered Consumption	0	[d]	0%
			5. Unbilled Unmetered Consumption	0	[d]	0%
		Apparent Losses	6. Unauthorized Consumption	0	[d]	0%
			7. Customer Metering Inaccuracies	0	[d]	0%
		Real Losses	8. Known Leakage	0	[d]	0%
			9. Assumed Leakage	203	[e]	7.7%
			TOTAL	**2,646**	[f]	**100%**

[a] Data Source: "2021 Water Sold by Month" spreadsheet provided by City staff. This is water provided to Sammamish.
[b] Data Source: "2021 Water Sold by Month" spreadsheet provided by City staff.
[c] This category does not apply to Redmond.
[d] Redmond staff do not track this number, therefore zero was used in the water balance.
[e] Water Production minus all other categories.
[f] Data Source: Well production and Cascade purchases spreadsheets provided by City staff.

Level 2 splits Non-Revenue Water into the following three sub-categories, which are useful in identifying potential additional revenue sources and identifying the magnitude of leaks or other losses that could be addressed:

- **Unbilled Authorized Consumption:** Includes uses such as water system flushing, firefighting, and unbilled contractor use. Typically, it is standard practice not to charge for uses falling into this sub-category. However, it is always a prudent idea to review these uses to ensure that a legitimate revenue opportunity is not missed.
- **Apparent Losses:** Includes unauthorized uses and customer meter inaccuracies, both of which are lost revenue opportunities.
- **Real Losses:** Includes various types of system leaks. A certain level of leakage is unavoidable; however, leakage beyond that level should be repaired to avoid unduly burdening both the natural resource and the physical infrastructure. Any amount that cannot be assigned to another category is considered a real loss under the American Water Works Association's protocol, as well as per the formula for calculating distribution system leakage under Washington State's Water Use Efficiency Rule.

Redmond did not provide data regarding authorized non-revenue water. Therefore, all non-revenue water is considered distribution system leakage.

Level 3 further splits water into additional sub-categories to support further estimation and water management.

A longer history of other water balance elements is provided in Table 4-8. The table contains data from 2014 to 2021, inclusive of water wheeled to Sammamish. The 2019–2021 average distribution system leakage has been 8.0% of water production and purchases. Under Washington State's Water Use Efficiency Rule, distribution system leakage should not exceed 10%, based on a 3-year rolling average. Redmond has achieved this goal since 2015.

The 2019–2021 average non-revenue water as a percent of consumption is 8.7%. This number is used to develop the non-revenue component of the demand forecast.

Table 4-8. Distribution system leakage (million gallons)

Year	Water Produced and Purchased [a]	Authorized Consumption [b]	Distribution System Leakage [c]		
			Qty	Percent of Production & Purchases	Percent of Consumption [d]
2014	2,508	2,209	298	11.9%	13.5%
2015	2,770	2,606	164	5.9%	6.3%
2016	2,534	2,403	132	5.2%	5.5%
2017	2,696	2,506	190	7.0%	7.6%
2018	2,620	2,451	169	6.4%	6.9%
2019	2,522	2,350	173	6.8%	7.4%
2020	2,477	2,265	212	8.5%	9.3%
2021	2,646	2,420	226	8.6%	9.4%
2019-2021 Average [e]	**2,548**	**2,345**	**204**	**8.0%**	**8.7%**

[a] Data Source: "Redmond Water Usage" spreadsheets provided by City staff.

[b] Data Source: "WSP 10 Year Water Consumption" spreadsheet provided by City staff.

[c] Distribution system leakage is defined in the new Water Use Efficiency Rule as water production and purchases minus authorized consumption.

[d] Used for developing the demand forecast. Note this is intentionally different than non-revenue as a percent of production and purchases.

[e] Five years of data was analyzed, however the average uses the most recent three years in order to focus on current trends.

4.2.4. Water Use Factors and Equivalent Residential Units

Water use factors were calculated for three customer categories: single family, multifamily, and non-residential. The water for the irrigation customer category was allocated to the single family, multifamily, and non-residential categories to better estimate the impact outdoor use has on the water use factors. As described in footnote b of Table 4-4, most meters have both a category (i.e., customer class) and a service code. The service code may indicate that while a meter is in the single-family customer class, its service code is for irrigation, meaning it provides irrigation water for single family households. This situation appears for all customer categories.

Therefore, the relative proportions of consumption through irrigation service code meters by customer class were used to allocate the consumption of those irrigation meters without a clear connection to a customer class to better estimate the impact irrigation use has on water use factors. Table 4-9 displays the irrigation reallocation calculation for the City Service Area. In the City Service Area, 70% of the irrigation category was allocated to the multifamily class and 30% was allocated to the non-residential class. The City assumed the same percent split applied to the Novelty Hill Service Area.

Table 4-9. Irrigation reallocation for the City Service Area

2019		
Original Numbers[1]		
%	Cf	Sector
0.000%	100	SF
18%	5,735,100	MF
43%	13,582,200	NR
39%	12,397,500	Irrigation
100%	31,714,900	Total
MF and NR[2]		
%	Cf	Sector
30%	5,735,100	MF
70%	13,582,200	NR
100%	19,317,300	Total
Allocate Irrigation to Other Sectors[3]		
%	Cf	Sector
0.000%	100	SF
30%	9,415,785	MF
70%	22,299,015	NR
0%	0	Irrigation
100%	31,714,900	Total

2020		
Original Numbers[1]		
%	Cf	Sector
0.001%	300	SF
19%	5,678,700	MF
46%	13,713,500	NR
35%	10,622,000	Irrigation
100%	30,014,500	Total
MF and NR[2]		
%	Cf	Sector
29%	5,678,700	MF
71%	13,713,500	NR
100%	19,392,200	Total
Allocate Irrigation to Other Sectors[3]		
%	Cf	Sector
0.001%	300	SF
29%	8,789,185	MF
71%	21,225,015	NR
0%	0	Irrigation
100%	30,014,500	Total

2021		
Original Numbers[1]		
%	Cf	Sector
0.0215%	8,800	SF
20%	8,200,700	MF
45%	18,560,200	NR
34%	14,088,000	Irrigation
100%	40,857,700	Total
MF and NR[2]		
%	Cf	Sector
31%	8,200,700	MF
69%	18,560,200	NR
100%	26,760,900	Total
Allocate Irrigation to Other Sectors[3]		
%	Cf	Sector
0.0215%	8,800	SF
31%	12,517,874	MF
69%	28,331,026	NR
0%	0	Irrigation
100%	40,857,700	Total

2019-2021 Avg		
Allocate Irrigation to Other Sectors[3]		
%	Cf	Sector
0.008%		SF
30%		MF
70%		NR
0%		Irrigation
100%		Total

[1] Allocated the consumption from irrigation and exempt meters to SF, MF, NR & Irrigation based on consumption data in the Springbrook data set.. Some meters had sufficient information to determine that the water is for the SF, MF, or NR sector. If the meter did not have sufficient information, the water was allocated to Irrigation.

[2] Relative weighting of MF and NR.

[3] Allocated the water in the "Irrigation" category to MF and NR, based on the ratio of the original MF and NR numbers.

Table 4-10 shows the inputs and the results of the water use factor calculations. For the single-family category, the water use factor is 160, 146, and 157 gallons per day (gpd) per single family household respectively for the City, the Novelty Hill, and the Retail Service Areas. For the multifamily category, the water use factor is 131, 116, and 131 gpd per multifamily household respectively for the City, the Novelty Hill, and the Retail Service Areas. For the non-residential category, the water use factor is 17 gpd per employee in the City Service Area. An employee-based non-residential water use factor was not developed for the Novelty Hill Service Area since it was not required for the demand forecasting method applied to that area. These water use factors are inclusive of the irrigation demand allocations described previously.

Table 4-10. Water use factors and ERUs (2019-2021 average)

Customer Category	City Service Area					
	Consumption (gpd)	Households or Employees		Consumption Per Household or Employee (gpd)		Number of ERUs [h]
Single Family (SF) [a]	1,969,251	12,273	[d]	160	[g]	12,273
Multifamily (MF) [b]	1,965,777	14,961	[e]	131		12,286
Non Residential (NR) [c]	1,612,100	96,839	[f]	17		10,076
	Novelty Hill Service Area					
	Consumption (gpd)	Households or Employees		Consumption Per Household or Employee (gpd)		Number of ERUs
Single Family (SF) [a]	481,845	3,296	[d]	146	[g]	3,296
Multifamily (MF) [b]	101,662	873	[e]	116		696
Non Residential (NR) [c]	82,315	n/a	[i]	n/a	[i]	564
	Retail Service Area					
	Consumption (gpd)	Households or Employees		Consumption Per Household or Employee (gpd)		Number of ERUs
Single Family (SF)	2,451,096	15,569	[d]	157	[g]	15,569
Multifamily (MF)	2,067,439	15,834	[e]	131		13,168
Non Residential (NR)	1,694,414	n/a	[i]	n/a	[i]	10,792

[a] For consumption, this includes the "residential" category, plus a portion of the "irrigation" category. For the City and Novelty Hill service areas, the portion of irrigation water is small enough to round to 0%.

[b] For consumption, this includes the "multifamily" category, plus a portion of the "irrigation" category. This includes 30% of the irrigation water.

[c] For consumption, this includes the "commercial" category, plus a portion of the "irrigation" category. This includes 70% of the irrigation water.

[d] Data Source: Number of connections by class spreadsheets provided by City staff.

[e] Data Source: “MF_Equiv_Dwell Units” spreadsheets provided by City staff.

[f] Data Source: City of Redmond's Planning and Community Development Department. Note this is the 2019-2021 average.

[g] This number is the City of Redmond's ERU. ERUs, or equivalent residential units, are a method of representing water use by non-residential customers as an equivalent number of residential customers. The City's ERU is the average amount of water used by a single family household. The ERU is calculated by dividing single family water consumption by the number of single family households.

[h] The number of ERUs in any customer category is calculated by dividing that customer category's water consumption by the ERU value (i.e., the consumption per single family household).

[i] The number of employees in Novelty Hill is unknown.

Table 4-10 also shows the number of Equivalent Residential Units, or ERUs, in each customer category. ERUs are a method of representing water use by non-residential customers as an equivalent number of residential customers. An ERU is the amount of water used by a single family household. For the Retail Service Area, Redmond's ERU number is 157 gpd. This is reduced from the ERU value in the prior WSP which was 176 gpd. This is due to a nearly 3,000 increase in single family connections but with only a mild increase in single family consumption. For the Retail Service Area, the number of ERUs for each customer category is obtained by dividing the consumption for a customer category by 157. For the Retail Service Area, the 2019-2021 average number of ERUs was 39,529. This is greater than the total combined ERUs in the prior plan of 36,694. The single family and multifamily customer classes are the primary reasons for this increase.

4.3. Demand Forecast

4.3.1. Demand Forecast Methodology

Different demand forecast methodologies were used for the City Service Area, the Novelty Hill Service Area, and for the water wheeled to Sammamish.

City Service Area

For the City Service Area, the demand forecast methodology is shown graphically in Figure 4-13. The basic process is to combine demographic data with water use factors to develop the retail demands. Demands are also developed for non-revenue water. The retail and the non-revenue demands are summed to create the total average day demand. To generate the total maximum day demand, a peaking factor is applied to the average day demand. More details on each step are provided below.

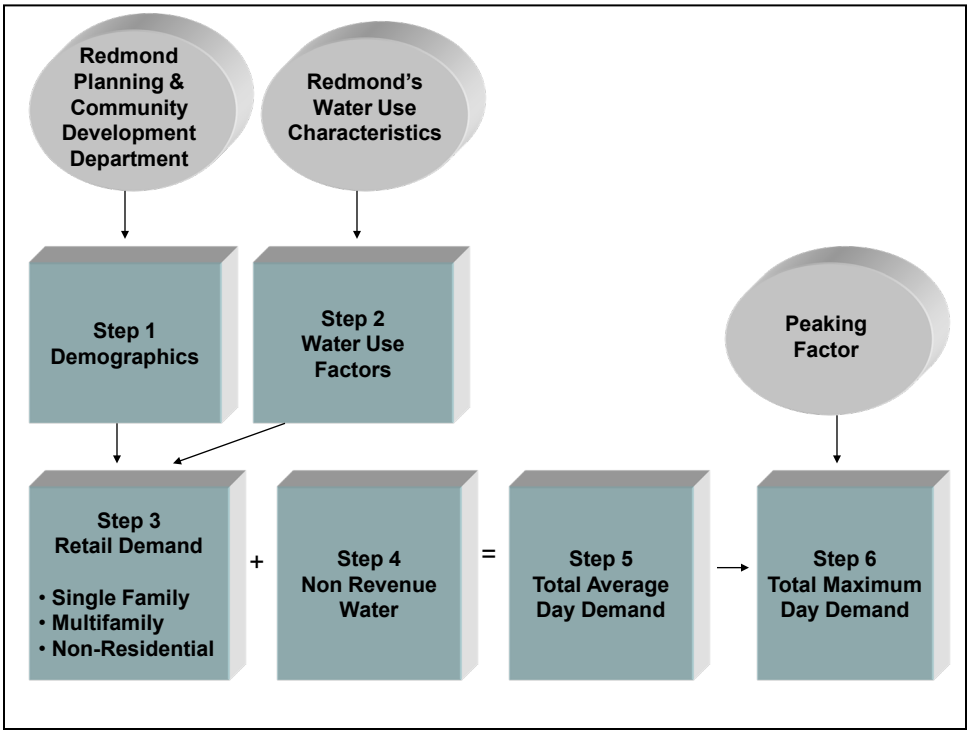


Figure 4-13. Demand forecast methodology for City Service Area

- **Step 1 Demographics:** Demographics were developed per the methodology described in Section 4.1.
- **Step 2 Water Use Factors:** Water use factors were developed per the methodology described in Section 4.2.4.
- **Step 3 Retail Demand:** The demographic projections (from Step 1) were multiplied by the water use factors (from Step 2) to generate the demand for the single family, multifamily, and non-residential customer categories.
- **Step 4 Non-Revenue Demand:** The sum of all retail demands (single family, multifamily, and non-residential) was multiplied by the 2019–2021 average "non-revenue water as % of consumption" from the water balance table, which is 8.7%.
- **Step 5 Total Average Day Demand (ADD):** The average day demand was calculated by adding the demands from all preceding steps.
- **Step 6 Total Maximum Day Demand (MDD):** To generate the total maximum day demand, a peaking factor was applied to the average day demand. As shown in Table 4-3, that peaking factor is 2.6.
- **Step 7 Conservation Adjustment:** The methodology outlined in Steps 1 through 6 creates a baseline demand forecast. This baseline forecast was then adjusted for conservation. (Note that the conservation adjustment step is not shown on Figure 4-13.)

As a member of the Cascade Water Alliance (Cascade), which manages a conservation program for its member utilities, the City will continue conservation efforts beyond 2022 per

those outlined in Cascade's conservation plan. Cascade will continue its current course of action through 2025. The conservation program will be updated when Cascade updates its Transmission and Supply Comprehensive Plan in 2025. The City will implement the new conservation program and consider how it will impact future demands at that time. More information about the conservation program is in Chapter 5.

Novelty Hill Service Area

The Novelty Hill Service Area is considered built-out and thus the City does not anticipate any future growth. Therefore, the average demand from 2019 – 2021 for each customer category was calculated and summed to represent the base year demands. The same non-revenue factor was applied to Novelty Hill as the City Service Area. These demands were summed to determine the total demand in Novelty Hill, which was then held constant through the entire planning period.

Sammamish Plateau Water

For the water wheeled to Sammamish Plateau Water, the forecast for the average day demand used the quantity specified in the associated agreement between Redmond and the District, which is 160 acre-feet per year or 0.14 mgd. For the maximum day demand, a peaking factor was not applied to the District demand since that demand has historically occurred during the winter rather than the summer which is when the maximum day demand for Redmond's system as a whole typically occurs.

4.3.2. Demand Forecast Results

A summary of the projected demands for key years is provided in Table 4-11. The table includes demand forecasts both without and with additional conservation, as required by Washington State's Water Use Efficiency Rule. The demand without additional conservation shows the total average day demand increasing from 8.1 mgd in 2023 (base year of the water system planning period) to 9.4 mgd in 2033 (Year 10) and to 10.7 mgd in 2043 (year 20). The associated maximum day demand is expected to increase from 20.4 mgd in 2023 to 23.9 mgd in 2033 and to 27.2 mgd by 2043.

More detailed versions of these two demand forecasts are provided in Table 4-12 and Table 4-13.

Table 4-11. Demand forecast summary [a]

Year	Demand Without Additional Conservation				
	Average Day Demand (mgd)				Maximum Day Demand (mgd)
	City Service Area	Novelty Hill Service Area	Sammamish	Total	
2023 (Base)	7.22	0.74	0.14	8.10	20.55
2033 (10-Year)	8.52	0.74	0.14	9.41	23.89
2043 (20-Year)	9.82	0.74	0.14	10.71	27.23
Year	**Demand With Additional Conservation**				
	Average Day Demand (mgd)				Maximum Day Demand (mgd)
	City Service Area	Novelty Hill Service Area	Sammamish	Total	
2023 (Base)	7.17	0.74	0.14	8.05	20.50
2033 (10-Year)	8.46	0.74	0.14	9.33	23.82
2043 (20-Year)	9.76	0.74	0.14	10.64	27.16

[a] Total values differ slightly from the sum of the City Service Area, Novelty Hill Service Area, and Sammamish due to rounding.

The estimated conservation savings are based on Cascade's current program, which are anticipated to be updated in 2025. The City may experience improvements in water use efficiency from more stringent water codes and standards for fixtures and appliances, such as the 2021 state plumbing code, and rate increases in the future. These influences have not been modeled and are not reflected in the demand forecast.

The demand forecasts are shown in Figure 4-14. The various components of the average day demand without conservation are displayed in Figure 4-15, which provides information about the relative impact of each component.

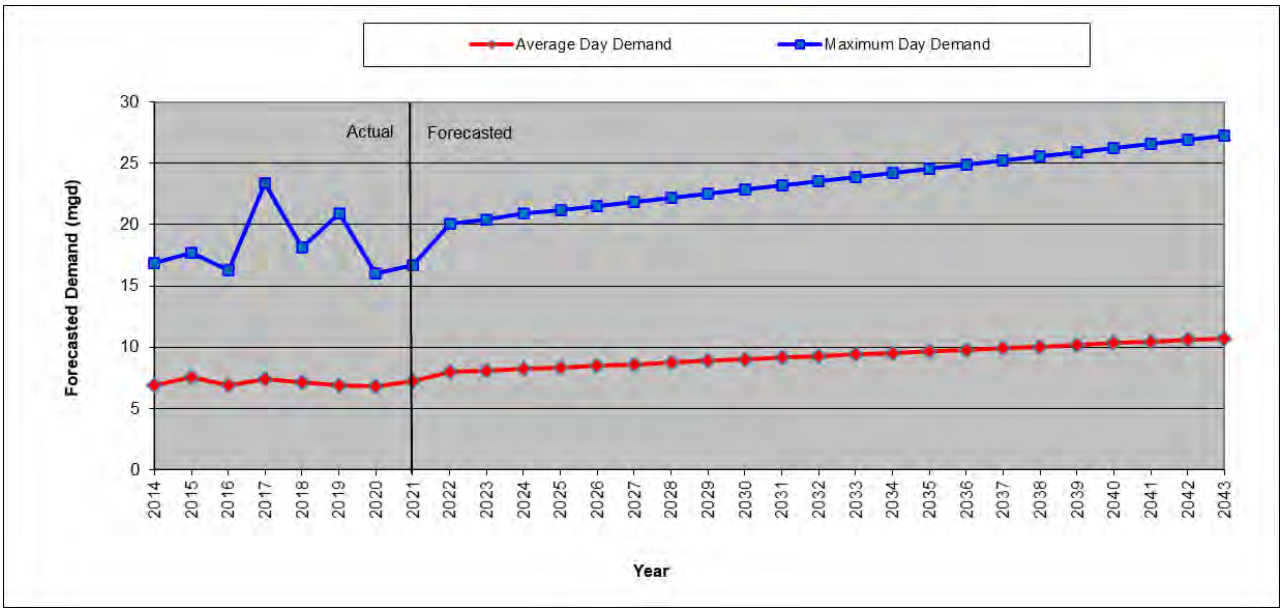


Figure 4-14. Demand forecast summary

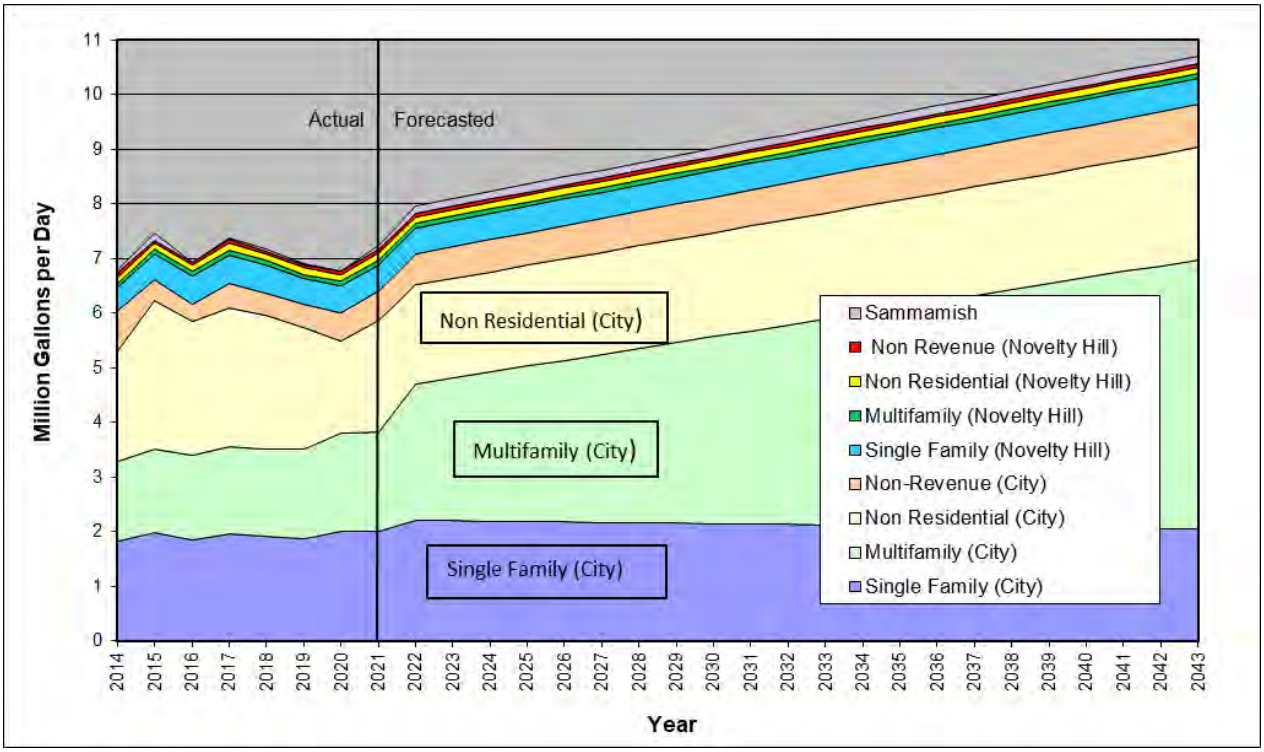


Figure 4-15. Demand forecast ADD details (without conservation)

Table 4-12. Detailed demand forecast (without additional conservation)

Calendar Year	Plan Year	Demographics (for City Service Area)[a]			Water Use Factors (for City Service Area) (gpd)[b]			Demand														
								Average Day Demand (ADD mgd)														
								City Service Area						Novelty Hill Service Area								
		Single Family Households (SF HH)	Multifamily Households (MF HH)	Employees	Per SF HH	Per MF HH	Per Employee	Single Family (SF)[c]	Multifamily (MF)[d]	Non Residential (NR)[e]	Subtotal[f]	Non-Revenue[g]	City Subtotal[h]	Single Family (SF)[i]	Multifamily (MF)[i]	Non Residential (NR)[i]	Subtotal[f]	Non-Revenue[g]	NH Subtotal[h]	Sammamish Plateau WSD[j]	Total[k]	Maximum Day Demand (MDD mgd)[l]
2022[m]	n/a	13,811	19,009	99,273	160	131	17	2.2	2.5	1.8	6.5	0.6	7.09	0.5	0.1	0.1	0.7	0.1	0.74	0.14	7.97	20.22
2023	0	13,762	19,892	99,972	160	131	17	2.2	2.6	1.8	6.6	0.6	7.22	0.5	0.1	0.1	0.7	0.1	0.74	0.14	8.10	20.55
2024	1	13,713	20,776	100,672	160	131	17	2.2	2.7	1.8	6.8	0.6	7.35	0.5	0.1	0.1	0.7	0.1	0.74	0.14	8.23	20.89
2025	2	13,664	21,659	101,371	160	131	17	2.2	2.8	1.8	6.9	0.6	7.48	0.5	0.1	0.1	0.7	0.1	0.74	0.14	8.36	21.22
2026	3	13,615	22,543	102,071	160	131	17	2.2	3.0	1.9	7.0	0.6	7.61	0.5	0.1	0.1	0.7	0.1	0.74	0.14	8.49	21.56
2027	4	13,565	23,426	102,770	160	131	17	2.2	3.1	1.9	7.1	0.6	7.74	0.5	0.1	0.1	0.7	0.1	0.74	0.14	8.62	21.89
2028	5	13,516	24,309	103,470	160	131	17	2.2	3.2	1.9	7.2	0.6	7.87	0.5	0.1	0.1	0.7	0.1	0.74	0.14	8.75	22.22
2029	6	13,467	25,193	104,169	160	131	17	2.2	3.3	1.9	7.4	0.6	8.00	0.5	0.1	0.1	0.7	0.1	0.74	0.14	8.88	22.56
2030	7	13,418	26,076	104,869	160	131	17	2.1	3.4	1.9	7.5	0.7	8.13	0.5	0.1	0.1	0.7	0.1	0.74	0.14	9.01	22.89
2031	8	13,369	26,960	105,569	160	131	17	2.1	3.5	1.9	7.6	0.7	8.26	0.5	0.1	0.1	0.7	0.1	0.74	0.14	9.15	23.23
2032	9	13,320	27,843	106,268	160	131	17	2.1	3.7	1.9	7.7	0.7	8.39	0.5	0.1	0.1	0.7	0.1	0.74	0.14	9.28	23.56
2033	10	13,271	28,726	106,968	160	131	17	2.1	3.8	1.9	7.8	0.7	8.52	0.5	0.1	0.1	0.7	0.1	0.74	0.14	9.41	23.89
2034	11	13,222	29,610	107,667	160	131	17	2.1	3.9	2.0	8.0	0.7	8.65	0.5	0.1	0.1	0.7	0.1	0.74	0.14	9.54	24.23
2035	12	13,173	30,493	108,367	160	131	17	2.1	4.0	2.0	8.1	0.7	8.78	0.5	0.1	0.1	0.7	0.1	0.74	0.14	9.67	24.56
2036	13	13,124	31,377	109,066	160	131	17	2.1	4.1	2.0	8.2	0.7	8.91	0.5	0.1	0.1	0.7	0.1	0.74	0.14	9.80	24.90
2037	14	13,074	32,260	109,766	160	131	17	2.1	4.2	2.0	8.3	0.7	9.04	0.5	0.1	0.1	0.7	0.1	0.74	0.14	9.93	25.23
2038	15	13,025	33,143	110,465	160	131	17	2.1	4.4	2.0	8.4	0.7	9.17	0.5	0.1	0.1	0.7	0.1	0.74	0.14	10.06	25.56
2039	16	12,976	34,027	111,165	160	131	17	2.1	4.5	2.0	8.6	0.7	9.30	0.5	0.1	0.1	0.7	0.1	0.74	0.14	10.19	25.90
2040	17	12,927	34,910	111,864	160	131	17	2.1	4.6	2.0	8.7	0.8	9.43	0.5	0.1	0.1	0.7	0.1	0.74	0.14	10.32	26.23
2041	18	12,878	35,793	112,564	160	131	17	2.1	4.7	2.0	8.8	0.8	9.56	0.5	0.1	0.1	0.7	0.1	0.74	0.14	10.45	26.57
2042	19	12,829	36,677	113,264	160	131	17	2.1	4.8	2.0	8.9	0.8	9.69	0.5	0.1	0.1	0.7	0.1	0.74	0.14	10.58	26.90
2043	20	12,780	37,560	113,963	160	131	17	2.0	4.9	2.1	9.0	0.8	9.82	0.5	0.1	0.1	0.7	0.1	0.74	0.14	10.71	27.23

[a] From Table 4-1 Demographics.

[b] From Table 4-10 Water Use Factors and ERUs.

[c] The number of single family households multiplied by the water use per single family household factor.

[d] The number of multifamily households multiplied by the water use per multifamily household factor.

[e] The number of employees multiplied by the water use per employee factor.

[f] The sum of the SF, MF, and NR demands.

[g] The sum of the SF, MF, and NR demands multiplied by the percent of non-revenue water as a percent of consumption, which is 8.7%. (Note this is intentionally different than non-revenue as a percent of production.)

[h] The sum of the SF, MF, and NR demands plus the non-revenue water.

[i] Demands are held constant at the 2019 - 2021 consumption average because Novelty Hill is built-out and demands are anticipated to remain nearly constant through the planning horizon.

[j] This is the quantity specified in the agreement between Redmond and Sammamish Plateau Water and Sewer District.

[k] The sum of the retail subtotals for the City and Novelty Hill, plus the Sammamish Plateau WSD water.

[l] The ADD subtotals from the City and Novelty Hill Service Areas multiplied by the City's 2019-2021 average peaking factor (which is 2.6) plus the ADD for Sammamish Plateau WSD. The peaking factor is not applied to Sammamish Plateau WSD since that demand has historically occurred during the winter rather than the summer which is when the MDD typically occurs.

[m] Year 2022 demands were determined using the same methodology as forecast years because data were unavailable during plan development.

Table 4-13. Detailed demand forecast (with additional conservation)

Calendar Year	Plan Year	Demographics (for City Service Area)[a]			Water Use Factors (for City Service Area) (gpd)[b]			Conservation Adjusted Demand Forecast (mgd)[c]				
		Single Family Households (SF HH)	Multifamily Households (MF HH)	Employees	Per SF HH	Per MF HH	Per Employee	City Service Area Subtotal (ADD)	Novelty Hill Service Area Subtotal (ADD)	Sammamish Plateau WSD (ADD)	Total (ADD)	Maximum Day Demand (MDD)
2022[d]	n/a	13,811	19,009	99,273	160	131	17	7.05	0.74	0.14	7.93	20.18
2023	0	13,762	19,892	99,972	160	131	17	7.17	0.74	0.14	8.05	20.50
2024	1	13,713	20,776	100,672	160	131	17	7.29	0.74	0.14	8.17	20.83
2025	2	13,664	21,659	101,371	160	131	17	7.41	0.74	0.14	8.29	21.15
2026	3	13,615	22,543	102,071	160	131	17	7.54	0.74	0.14	8.42	21.48
2027	4	13,565	23,426	102,770	160	131	17	7.67	0.74	0.14	8.55	21.82
2028	5	13,516	24,309	103,470	160	131	17	7.80	0.74	0.14	8.68	22.15
2029	6	13,467	25,193	104,169	160	131	17	7.93	0.74	0.14	8.81	22.49
2030	7	13,418	26,076	104,869	160	131	17	8.06	0.74	0.14	8.94	22.82
2031	8	13,369	26,960	105,569	160	131	17	8.19	0.74	0.14	9.07	23.15
2032	9	13,320	27,843	106,268	160	131	17	8.33	0.74	0.14	9.20	23.49
2033	10	13,271	28,726	106,968	160	131	17	8.46	0.74	0.14	9.33	23.82
2034	11	13,222	29,610	107,667	160	131	17	8.59	0.74	0.14	9.46	24.16
2035	12	13,173	30,493	108,367	160	131	17	8.72	0.74	0.14	9.59	24.49
2036	13	13,124	31,377	109,066	160	131	17	8.85	0.74	0.14	9.73	24.82
2037	14	13,074	32,260	109,766	160	131	17	8.98	0.74	0.14	9.86	25.16
2038	15	13,025	33,143	110,465	160	131	17	9.11	0.74	0.14	9.99	25.49
2039	16	12,976	34,027	111,165	160	131	17	9.24	0.74	0.14	10.12	25.83
2040	17	12,927	34,910	111,864	160	131	17	9.37	0.74	0.14	10.25	26.16
2041	18	12,878	35,793	112,564	160	131	17	9.50	0.74	0.14	10.38	26.49
2042	19	12,829	36,677	113,264	160	131	17	9.63	0.74	0.14	10.51	26.83
2043	20	12,780	37,560	113,963	160	131	17	9.76	0.74	0.14	10.64	27.16

[a] From Table 3-1 Demographics.
[b] From Table 3-9 Water Use Factors and ERUs.
[c] Conservation adjusted forecasted based on conservation assumptions described in Chapter 5. Conservation adjusted forecasts were only developed for service area subtotals; therefore, no customer class-specific conservation adjusted forecasts are displayed.
[d] Year 2022 demands were determined using the same methodology as forecast years because data were unavailable during plan development.

Chapter 5: Water Use Efficiency Program

City of Redmond 2024 Water System Plan

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(Not applicable)

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5. Water Use Efficiency Program

This chapter has three purposes: 1) review the City's compliance with State water use efficiency (WUE) planning requirements, 2) describe the City's recent conservation program, and 3) describe the conservation program the City is implementing and anticipated timeline for a new program.

The conservation planning requirements that must be addressed in water system plans are contained in the following sources:

- State of Washington Water Use Efficiency Rule (January 2007)
- Department of Health Water Use Efficiency Guidebook (January 2017)
- Department of Health Water System Planning Handbook (August 2020)

The State of Washington revised water conservation planning requirements because of the 2003 Municipal Water Law. An outgrowth of that law is the Water Use Efficiency Rule (Rule), which was finalized in January 2007. The Rule has several requirements and corresponding compliance dates. Some of the requirements are associated with water system plans, while other requirements are independent of the water system planning cycle.

There are seven main categories of requirements: 1) meters, 2) data collection, 3) distribution system leakage, 4) goals, 5) efficiency program, 6) demand forecast, and 7) performance reports. The City has met all the requirements of the WUE rule in past planning cycles and continues to do so.

5.1. 2019-2022 WUE Program

The City participates in a regional conservation program administered by Cascade Water Alliance (Cascade). Conservation programs typically run on a six-year cycle where new goals and associated program must be reestablished. Cascade most recently updated and adopted its conservation program for 2019 through 2022. Cascade's plans to update its water use efficiency program and goals is discussed in Section 5.2.

5.1.1. Goals

Cascade's Board of Directors adopted the following WUE goal in November 2018, after conducting a goal-setting process that involved opportunity for public input:

> *"Cascade will dedicate the necessary resources to achieve cumulative drinking water savings of 0.4 million gallons per day on an annual basis by December 31, 2022."*

As a constituent member of Cascade, the City adopted this goal as their own in the 2020 Environmental Sustainability Action Plan (ESAP), which was formally adopted by the Redmond City Council in September 2020. The ESAP, excerpts of which are provided in Appendix F, also calls for a water service area centric water consumption goal. The first step in developing this goal is to complete a comprehensive Water Use Reduction Strategy, which will specify the detailed water use reduction actions to expand on the broad strategies outlined in the ESAP.

The Water Use Reduction Strategy will include evaluation of the appropriate water consumption reduction target for implementation.

5.1.2. Measures

Cascade provides its constituents with information about its WUE program through its annual report. The 2022 annual report is included as Appendix E.

Measures described in Cascade's annual report include:

Cascade provides its constituents with information about its WUE program through its annual report. The 2022 annual report is included as Appendix E.

Measures described in Cascade's annual report include:

- **Classroom presentations**, including a remote curriculum which can be used by teachers and parents where students can participate in a video chat session with an educator. The Blue Teams option offers a customized project over several classroom visits for a more in-depth study of a particular subject.
- **Problem-based learning for water system** program provides middle and high school teachers with a wide range of entry points including science, social studies, math, and language arts to incorporate the study of water into their classrooms.
- **Community learning** geared towards adult learners which included a watershed health series, home water use series, a field trip series, and the Cascade Gardner remote gardening classes promoting water efficiency.
- **Soil and water stewardship program** which provides free training to residents to learn about natural yard care, watershed health, drip irrigation, rain water harvesting, and other topics. These students can then bring their acquired knowledge back to their community. Cascade also supports the regional Garden Hotline.
- **Irrigation Assessments** which provide irrigation system assessments for high-peak season use customers.
- **Water watchers'** trainings and workshops for residents who are interested in monitoring local streams for watershed health
- **Participation in Fix-A-Leak Week** including distribution of toilet leak detection dye packets to multi-family and hotel properties.
- **Rebates for ENERGY STAR certified fixtures**
- **Free water efficient fixtures** available for order from the Cascade website.
- **Events,** such as fairs and festivals, including Redmond Derby Days, to promote water efficiency

Other actions related to water use efficiency that the City conducts include:

- **Source Meters:** The City has source meters on all of its wells and interties. The City does not have a formal calibration schedule. However, the City's work over the last decade to rebuild its wells has resulted in new meters on all wells. The rehabilitation work has been completed at all five of the City's wells. Redmond's connections to the Seattle Public

Utilities (SPU) transmission system, through which Redmond receives Cascade Water Alliance water, are also fully metered.

- **Service Meters:** Service meters at customer connections are another key component of providing accurate water information for conservation planning. The City has meters on all service connections. The City periodically tests its service meters and refurbishes or replaces malfunctioning meters. The City tests larger meters more frequently than smaller meters and strives to calibrate large commercial meters (3" and larger) approximately every year.
- **Leak detection and repair:** The City is proactive about leak control, even though it is not required to have a water loss control action plan since its leakage is low. The City relies on system break history, pipeline condition assessments, and projected future demands to identify and prioritize rehabilitation and replacement projects. As discussed in Section 4.2.3, the City's 2019 - 2021 average distribution system leakage was 8% of production and purchases. This result is within the 10% or less requirement of the WUE Rule and demonstrates that the City is successfully managing leaks.
- **Bills showing consumption history:** Customer bills providing historical consumption data allow customers to understand how their use varies throughout the year and from year to year. This information helps customers make informed choices about how they manage their water use, including implementing conservation. The City's customer bills include historical consumption data showing consumption for the previous 12 billing cycles, which typically covers two years.

4. Conservation Pricing

Rates can be used to encourage conservation action by customers. Rates typically consist of a fixed charge and a variable charge. There are four basic rate structures for the variable charge: uniform, declining block, increasing block, and seasonal. Both increasing blocks and seasonal rates are considered conservation pricing. Increasing blocks charge more per unit of consumption with additional consumption. Seasonal rates charge more per unit of consumption during the peak season.

Redmond's rate structure incorporates increasing blocks and seasonal rates, as well as irrigation rates that are higher than non-irrigation rates. The variable portions of Redmond's rates are shown in Table 5-1. The residential category uses an increasing block structure with four blocks. For both the City Service Area and the Novelty Hill Service Area, the fourth block is priced nearly four times higher than the first block. The commercial regular (i.e., non-irrigation) category uses seasonal rates. For the City Service Area, the summer rates are 71% higher than the winter rates. For the Novelty Hill Service Area, the summer rates are 44% higher than the winter rates. For commercial customers with dedicated irrigation meters, irrigation water is charged at a higher rate than non-irrigation water. For the City Service Area, the irrigation water rates are 48% higher than the summer rates for non-irrigation water. For the Novelty Hill Service Area, the irrigation water rates are 2.6 times higher than the summer rates for non-irrigation water.

Table 5-1. Variable Portion of Water Rates[1]

Residential – Charge per ccf							
City Service Area				Novelty Hill Service Area			
0 – 8.00 ccf	8.01 - 20 ccf	20.01 - 40 ccf	40.01+ ccf	0 - 8.00 ccf	8.01 - 18 ccf	18.01 - 32 ccf	32.01+ ccf
$1.95	$3.90	$5.85	$7.80	$4.01	$8.02	$12.03	$16.04
Commercial Regular – Charge per ccf							
City Service Area				**Novelty Hill Service Area**			
Winter Rate		Summer Rate		Winter Rate		Summer Rate	
$2.73		$4.67		$3.78		$5.46	
Commercial Irrigation – Charge Per ccf							
City Service Area				**Novelty Hill Service Area**			
$6.89				$14.41			

1. The dollar amounts are from Redmond's 2023 rates. 1 ccf = 748 gallons

5.1.3. Estimated Savings

The estimated conservation savings Cascade has achieved in the 2019 – 2022 WUE program are shown in Table 5-2. It is estimated that the conservation program saved approximately 227,892 gallons per day by the end of 2021, which is approximately 57% of the program savings goal. Redmond does not calculate conservation savings specific to its service area.

Table 5-2. Estimated Savings Achieved by Existing Program

Year	Savings (gpd – Annual Average)	
	Annual	Cumulative
2019	142,484	142,484
2020	48,316	190,800
2021	37,092	227,892

1. Retrieved from Cascade water efficiency annual reports

Moving forward, Cascade intends to continue or increase emphasis on teacher and student education on water issues and the relationship between water and climate change, and irrigation efficiency and sustainable landscape training.

5.2. Future WUE Program

Correspondence with Cascade's WUE director indicated the 2019 – 2022 goal associated program will be extended through at least 2024. Cascade will begin the process of updating its Transmission and Supply Plan in 2025, at which time the WUE program will be revisited and revised. Therefore, Cascade will continue to implement water use efficiency programs consistent with the 2019 – 2022 program with the intention to reach 500,000 gallons per day of savings across all seven Cascade members. This represents an additional 100,000 gallons per day of savings above the 2019 – 2022 goal.

5.2.1. Effect on Demand

The demand forecast presented in Section 3.3 includes two forecasts: one without additional conservation and one reflecting the additional savings from the conservation program. The Cascade 2021 Annual Water Efficiency Program Report stated that annual savings of 227,892 gallons per day had been achieved. To calculate savings through 2025, achievement of the 500,000 gpd goal in 2025 was assumed with linear growth towards that achievement (approximately 68,000 gpd additional savings per year from 2022-2025).

Cascade's savings goal is applied across all seven members and is not disaggregated into savings for each individual customer. To determine an approximate share of savings the City will achieve, the savings were divided by seven, the number of Cascade members. Table 5-3 displays the forecasted conservation savings by year for the Cascade service area and the City's portion. The annual average savings by year for the City were subtracted from the average day and maximum day demand forecasts. The total savings in 2025 were subtracted from all subsequent forecast years through the end of the forecast horizon.

Table 5-3. Estimated Savings Achieved by Existing Program

Year	Savings (gpd – Annual Average)	
	Total Savings	Redmond Portion
2022	295,919	42,274
2023	363,946	51,992
2024	431,973	61,710
2025	500,000	71,429

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Chapter 6: Distribution Facilities Design and Construction Standards

City of Redmond 2024 Water System Plan

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(Not applicable)

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6. Distribution Facilities Design and Construction Standards

This chapter provides an overview of the City's design and construction requirements for new facilities. These requirements have increased and become more stringent over time, with changes made as needed to reflect new construction materials and techniques, and to be consistent with state and national standards.

6.1. Project Review Procedures

For new water system facilities, the City has specific project review procedures. For projects that are cited in the water system plan, the main steps involved in water system project review are:

- Applicant completes the applicable permit applications and supporting documentation.
- Applicant describes the project and any existing planning information.
- Applicant may elect to have a pre-application meeting with City staff to learn more about the application requirements. Appropriate City staff includes staff from water, sewer, stormwater, streets, fire, parks, and planning.
- Applicant applies for and obtains a Utility Availability Certificate from Public Works.
- Applicant prepares preliminary engineering plans.
- Applicant submits the preliminary engineering plans to Development Services for its review.
- Planning (planner and engineers), Fire and Public Works review the application and plans and returns comments to the applicant. Applicant must respond to any comments from city reviewers to the reviewer's satisfaction.
- When the reviewers are satisfied that the application and plans meet all requirements, the project goes to the Technical Review Committee for approval.
- If approved, the Technical Review Committee issues a project approval letter. If not approved, the project goes back to the reviewers to ensure any issues are addressed prior to Technical Review Committee approval.
- Applicant develops final design and construction plans.
- Planning, Fire, and Public Works staff review the final design and construction plans. Applicant must respond to any comments from the Planning, Fire, and Public Works staff, to the Technical Review Committee's satisfaction.
- When the Planning, Fire, and Public Works staff are satisfied that the application and plans meet all requirements, they will approve the final design and construction plans.
- A preconstruction meeting is held.
- Construction commences.

For projects that propose to deviate from the current WSP, the City must first have the water system plan amended to include the proposed project. Then the steps outlined above must be followed for review of proposed projects. Additionally, if the project is outside the City Limits, then an application for service outside the City Service Area must be submitted for approval by the City Council.

Some water system projects must be forwarded to DOH for additional review and approval; specifically, those projects containing the following elements:

- Source of supply (including wells)
- Water quality treatment
- Reservoir/storage tank improvements
- Booster pump stations
- Tank coatings

Design and construction standards were most recently amended in October 2020 and are available on the City's website at: Standard Specifications (redmond.gov), as well as provided in Appendix P. They are incorporated in this WSP by reference. Therefore, the City is not required to submit plans for distribution mains for DOH review.

6.2. Policies and Requirements for System Additions

Policies and requirements for system additions, particularly for developer extensions, are provided in the *2019 City of Redmond Design Requirements: Water and Wastewater System Extensions* (Design Requirements (redmond.gov)), which is also provided in Appendix P. The design requirements in effect at the time of the 2011 plan were submitted to DOH in conjunction with the prior water system plan. Key policies guiding developer extensions are discussed in Section 2.5.4 of this water system plan.

Conceptual locations and sizes for new water mains are shown on the figures in Chapter 12 (Improvement Program). Not all required pipes are shown on these maps. Each development proposal will be reviewed by the City to determine actual required pipe and other facility sizes and locations.

6.3. Design Standards

The *Design Requirements* include some of the performance standards or levels of service discussed in the next section, and sizing criteria required in the design of all water system improvements. The City's sizing criteria meets or exceeds the minimum necessary to meet performance standards established in WAC 246-290. Additional design criteria are specified in the City's *2020 Standard Specifications and Details*, which is available on the City's website at Standard Specifications (redmond.gov) or in Appendix P.

6.4. Level of Service Criteria

The state has established minimum service criteria that all public water systems must meet. The City has developed water system level-of-service criteria, which are performance standards

that help to ensure a safe, reliable source of supply for all customers. The City's level-of-service criteria meet or exceed all state requirements.

6.4.1. Distribution System Pressure Requirements

Minimum Service Pressure

WAC 246-290-230 establishes minimum system pressure requirements that must be maintained in all public water systems. These standards, particularly with respect to fire flow, have increased periodically since the first facilities in the City's system were constructed. The current pressure requirements defined by the state are:

- A minimum residual pressure of at least 30 psi must be maintained throughout the system during peak hour demand (PHD).
- A minimum residual pressure of at least 20 psi must be maintained throughout the distribution system during a fire flow event and assuming maximum day demand (MDD) conditions.

The City's design requirements for water and wastewater system extensions state that:

> *The system will be designed to have sufficient capacity to minimize pressure variations, provide minimum residual pressure of 40 psi at each meter during periods of maximum use, and provide sufficient volumes of water at adequate pressure to satisfy the expected maximum instantaneous demand plus fire flow.*

The City's requirements exceed state requirements, by requiring: 1) a minimum pressure of 40 psi, as opposed to 30 psi, during maximum use periods; and, 2) that minimum pressures be maintained during fire flow events and assuming maximum instantaneous demand conditions, as opposed to MDD.

Maximum Service Pressure

Although WAC 246-290-230 does not establish maximum allowable system pressure requirements, new facilities are typically designed to limit maximum system pressures to 100 psi. This criteria helps minimize the need for individual pressure-reducing valves (PRVs) at customer taps, which the local plumbing code requires on new service lines with pressures greater than 80 psi. The City's policy is not to retrofit areas with current service pressures exceeding 80 psi. However, individual customers can install their own PRVs if desired. In addition, if pressures in an area increase above 80 psi as a result of modifications made to the water system by the City, the City will assist affected property owners in the installation of individual PRVs.

Pressure Zones

The distribution system is divided into pressure zones to provide operational flexibility and to help meet minimum and maximum pressure requirements. Pressure zone boundaries generally follow ground contour elevations; however, physical boundaries such as streets and property lines are also used to simplify maintenance and operations. Pressure zones are separated by PRVs that automatically open, close, or throttle to maintain pre-set downstream service pressures.

From an operations and system reliability standpoint, it is desirable to keep the number of pressure zones to a minimum and to combine zones wherever possible. For reliable service to pressure zones, at least two PRVs will serve each zone, where possible. However, pressure zones are established such that fire-fighting requirements can be met within a given zone assuming one PRV is out of service.

6.4.2. Fire Flow Requirements

Fire fighting requires a high rate of flow for a short period of time. Fire flow requirements typically are the most severe level of service criteria that must be met by a water system. These requirements are often the deciding factor when sizing distribution mains, defining pressure-zone boundaries, and sizing storage facilities.

The water system must have adequate supply, storage, and distribution capacity to supply fire-fighting requirements, while maintaining an adequate level of service to residential and commercial customers. WAC 246-290-230 defines adequate service as a minimum of 20 psi residual pressure anywhere in the system during the time the water system is supplying both the design fire flow and the projected maximum day demand. As noted earlier, the City requires that a 20-psi residual pressure be maintained under conditions that assume fire flow events during periods of maximum instantaneous demands. This standard exceeds state requirements.

The City of Redmond Fire Department is responsible for determining fire flow requirements for proposed multifamily, non-residential, or large single-family developments, using a formula based on criteria set forth by the Insurance Services Office (ISO). These criteria consider such variables as building floor area, type of construction, and exposure to other combustibles. Provision of automatic fire sprinklers is often a consideration in determining individual building fire flow requirements. In establishing design fire flows, the Redmond Fire Department also considers a reasonable response capability of the department itself, which is a function of such variables as available manpower and fire suppression equipment.

In general, a minimum design fire flow of 1,500 gpm is used for new single-family residential areas. For multi-family, non-residential, or large single-family developments, the design fire flows may be up to 3,500 gpm. If the fire flow requirement based on structure type and location is higher than 3,500 gpm, the structure design is typically modified to reduce the required fire flow to 3,500 gpm or less. The duration of design fire flows ranges from 2 to 4 hours for 1,500-gpm and 3,500-gpm fire flows, respectively. These service criteria are for new development and redevelopment projects. For existing structures, the distribution system should be able to provide the fire flow that was required when the structure was built.

6.4.3. System Storage Requirements

For new storage facilities, system storage volume requirements are comprised of the following five separate components.

- Operating storage
- Equalizing storage
- Fire flow storage
- Standby storage

- Dead storage

Figure 6-1 provides a graphical illustration of these storage components.

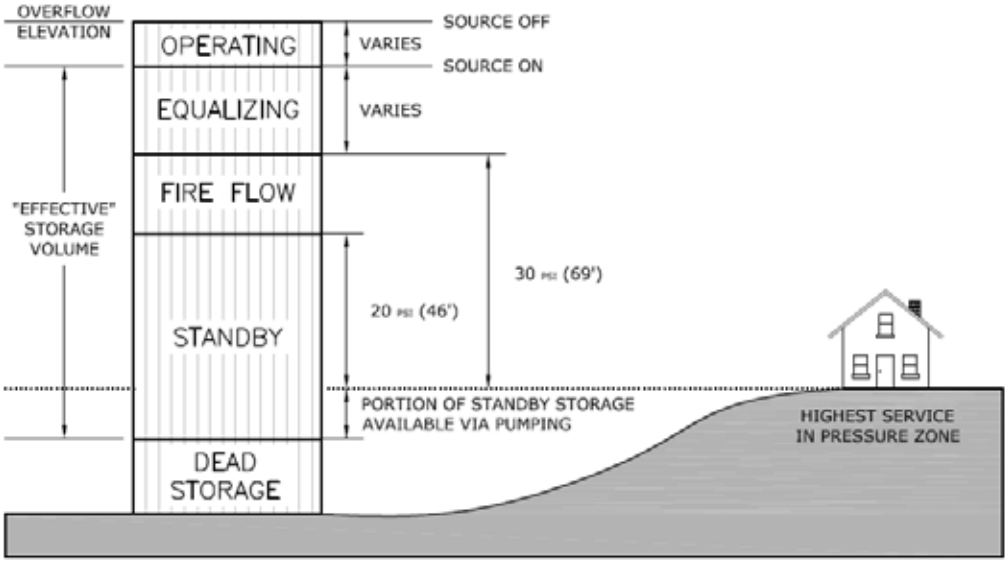


Figure 6-1. Storage Components

Operating and Dead Storage

Operating storage is defined in WAC 246-290-010 as "the volume of distribution storage associated with source or booster pump normal cycling times under normal operating conditions and is additive to the equalizing and standby storage components, and to fire flow storage if this storage component exists for any given tank." This is the volume of water that lies between low and high water-storage elevations set by City operations staff to control system pumps and flow-control valves.

Dead storage is defined in WAC 246-290-010 as "the volume of stored water not available to all consumers at the minimum design pressure." This is the volume at the bottom of the tank that cannot be used because it is physically too low to be withdrawn from the tank (i.e., located below the outlet pipe), provides poor water quality, or causes hydraulic problems at pump inlets such as pump cavitation or vortexing.

Operating and dead volumes are subtracted from the total storage volume of a tank to determine the available, or effective, storage in a tank.

Equalizing Storage

Equalizing storage is defined in WAC 246-290-010 as "the volume of storage needed to supplement supply to consumers when the peak hourly demand exceeds the total source pumping capacity." Equalizing volume requirements are greatest on the day of maximum demand. They are most often analyzed over a 24-hour demand cycle, although a longer cycle can be used. Operation of a properly balanced system results in replenishment of storage facilities during those times of day when the demand curve is below the capacity of the supply system, and withdrawal of water from storage when the demand exceeds the supply capacity.

The equalizing volume of a storage tank must be located at an elevation that provides a minimum pressure of 30 psi to all customers served by the tank.

Fire Flow Storage

Fire flow storage is defined in WAC 246-290-010 as "the volume of stored water available during fire suppression activities to satisfy minimum pressure requirements." This volume of a storage tank must be located at an elevation that provides a minimum pressure of 20 psi throughout the pressure zone served by the tank.

As previously noted, design fire flows within the City of Redmond were established by the Redmond Fire Department using criteria set by the ISO. These criteria relate building floor area, type of building construction, exposure to other structures, type of materials stored within the building, and other considerations to set a minimum required fire flow.

Within the City of Redmond, the maximum required fire flow is 3,500 gpm. The minimum fire flow duration is 4 hours. Required minimum fire flow volume is determined by applying a 3,500gpm fire flow over a 4hour time duration, resulting in a need for approximately 0.84 million gallons (MG).

Standby Storage

Standby storage is defined in WAC 246-290-010 as "the volume of stored water available for use during a loss of source capacity, power, or similar short-term emergency." This storage volume is required to supply a portion of system demands during a foreseeable system emergency or outage. Major system emergencies, such as those created by an earthquake, are intended to be covered by emergency system operations planning, since construction of sufficient standby storage volume to accommodate sustained system demands under emergency conditions is not economically feasible.

DOH has established guidelines for determining minimum required standby volume. As documented in Chapter 7 (Reservoir Design and Storage Volume) of DOH's *Water System Design Manual (June 2020)*, this component is calculated as the greater of: two times the average day demand (ADD), less multi-source credit; *or* 200 gallons times the number of ERUs served by the storage facility. The City has established standards that exceed this minimum criterion. A minimum standby volume of 400 gallons per ERU is required for all neighborhoods throughout the City except Novelty Hill. The standby component in the Novelty Hill area is set at 800 gallons per ERU because unlike other portions of the City, there are no redundant supply or storage facilities capable of serving that area.

The multi-source credit is applicable only for pressure zones that have multiple sources of supply, and allows the required standby storage volume in such instances to be reduced. The credit assumes the largest source of supply is out of service; thus, it is calculated as the total source available to a particular pressure zone, or zone combination, less the capacity of the largest source. No credit is allowed for zones having only one source of supply. The effect of the multi-source credit on the City's storage requirements in certain pressure zones may change in the future as the City transitions from receiving a portion of its water supply from the City of Seattle to receiving that supply from other Cascade Water Alliance sources. Design of future storage facilities will take this transition into consideration.

WAC 246-290-235(4) provides that "Standby and fire suppression storage volumes may be nested with the larger of the two volumes being the minimum available, provided the local fire protection authority does not require them to be additive." The Redmond Fire Department approved nesting for the storage capacity analyses in the 2011 WSP and has stated the assumptions from that plan may be used again in this WSP update.

6.5. Construction Standards

The City's standard construction materials and methods are addressed by the City of Redmond's *2020 Standard Specifications and Details* (Standard Specifications (redmond.gov)) City of Redmond *Water and Wastewater Design Requirement* (Design Requirements (redmond.gov)), both of which are provided in Appendix P. The City's standards are updated every two years by the Department of Public Works. Projects in County right-of-way in unincorporated King County must also meet the requirements of the *King County Road Standards.*

6.6. Construction Certification and Follow-Up Procedures

In order to assure that water projects are constructed according to the City's standards, the utility reviews all design drawings and specifications prior to construction. In addition, the City has construction staff present on each construction site to inspect construction of water facilities. Construction in King County right-of-way typically involves staff from the King County Utility Inspection Unit to ensure that work meets all applicable County construction standards.

The construction inspection staff includes several inspectors assigned to multiple projects throughout the City. During peak construction periods the City also utilizes inspectors hired through on-call agreements. Inspectors ensure that the system is built in accordance with the approved construction drawing along with the appropriate City, state, or federal standards.

All construction projects are required to have record drawings submitted to the Public Works Engineering Division for approval. In addition, per WAC 246-290-120(5), DOH requires that all water system projects complete a Construction Completion Report for Public Water System Projects.

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Chapter 7: Water Supply Resource Evaluation

City of Redmond 2024 Water System Plan

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(Not applicable)

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7. Water Supply Resource Evaluation

This chapter includes an evaluation of the City's independent sources of supply and purchased water to determine the ability of its sources to meet existing and forecast demands within its water service area. The chapter also provides an evaluation of reclaimed water as a potential future supply source. Finally, this chapter contains discussion about the reliability of the sources of supply, contingency planning, and future supply improvements.

This is a planning document only, it is not intended as a definitive statement or analysis of the full scope of all water rights held by the City, or in which the City may have an interest. As noted later in this chapter, the Washington State Department of Ecology (Ecology) and the City have previously engaged in written communications regarding the extent and validity of the City's water right portfolio. Nothing herein shall be interpreted or used as a statement against the interests of, or binding upon, the City in any future proceeding or analysis concerning the scope of the water rights held by the City or in which the City may have an interest.

7.1. Existing Supply Sources

The City has two main sources of water supply: groundwater produced by its own wells, and regional surface water purchased through membership in Cascade Water Alliance. Approximately 40 percent of the City's existing demands are served by the City's wells, and the remaining 60 percent is supplied by Cascade (see Figure 3-1).

The City's five wells exclusively supply the Well Service Area, which is supplemented by purchased water from Cascade during periods of peak demand. The Overlake/Viewpoint and Rose Hill Service Areas receive water purchased from Cascade, which originates at Seattle's Tolt Reservoir and is delivered through the Tolt Eastside Supply Line (TESSL).

The Novelty Hill Service Area is served completely by wholesale water purchased from Cascade. The City's purveyor tap is off the Tolt Tie Line, which connects SPU's Tolt Pipeline No. 1 and Tolt Pipeline No. 2. Water from the Tie Line is conveyed to the Novelty Hill booster pump station, where it is then pumped into the Novelty Hill storage tanks.

Under the Cascade Interlocal Contract, Redmond retains ownership and control of its own groundwater sources, and Cascade commits to meeting Redmond's water supply needs exceeding the capacity of the City's local sources.

7.1.1. Redmond's Groundwater Supply

The City owns and operates five wells within the Well Service Area. All five wells were reconstructed in the past as part of the City's source improvement project.

As a member of Cascade having its own independent supply, Redmond has committed to producing water from its groundwater sources. An "Independent Supply Production Requirement" is defined based on a Member Water Audit prepared for Cascade and updated in July 2022. Redmond's Production Requirement, which was established during the May 2008 Cascade Member Water Audit is shown in Table 7-1. The production requirements have increased as Redmond redeemed available Regional Capital Facilities Charge (RCFC) credits from Cascade over a period of time.

Table 7-1. Cascade Independent Supply Production Requirements

Production Metric	Initial Production Requirement (2008)	Final Production Requirement
Average Day	2.20 mgd	2.60 mgd
Peak Season	2.58 mgd	3.51 mgd
Peak Day	3.90 mgd	3.90 mgd

7.1.2. Cascade Supply

As a Member of Cascade the City has access to contracted water supply. At this time, Cascade's contracted water enters the Redmond system from the regional supply system owned and operated by Seattle Public Utilities (SPU). Redmond has seven connections to the regional supply system. Two connections to SPU's Tolt Pipeline No. 2 (TPL#2) serve the Well Service Area. Three connections to SPU's Tolt Eastside Supply Line (TESSL) serve the Rose Hill service area. These three connections are shared with the cities of Bellevue and Kirkland. An additional connection to the TESSL (at NE 40th St.) serves the Overlake/Viewpoint service area, and is shared with the City of Bellevue. The City's final supply connection is to SPU's Tolt Tie Line and serves Novelty Hill.

Cascade's contract with SPU was described in Section 2.3.4 of this Water System Plan. Cascade also has contracted supply from Tacoma Public Utilities. Cascade's supply strategy is more fully described in Cascade's 2012 Transmission and Supply Plan, which had a limited update in 2019. Based on Redmond's proximity to the Tolt system on the north and the sufficiency of the SPU supply, it appears likely that water originating at SPU's Tolt source will continue to be used in Redmond for many decades to come. Redmond has no current plans to utilize the contracted supply from Tacoma Public Utilities. However, as Cascade's mix of supply resources changes over time, Redmond's sources may also change.

Cascade will be updating its Transmission and Supply Plan in 2025. The City will actively participate in the process and consider how Cascade's source profile will impact the City's supply reliability.

7.2. Water Rights

The City's water rights consist of six groundwater rights associated with five wells and two surface water rights associated with Seidel Creek. In 2004, Ecology reviewed the City's water rights at the City's request, resulting in an exchange of letters with Ecology. Copies of the water rights and the above referenced letters are on file at the City's Public Works Department.

7.2.1. Groundwater Rights

Well No. 1

Well No. 1 has two water right certificates associated with it. Certificate 1313-A has a priority date of July 23, 1951 and Certificate G1-00130C has a priority date of February 3, 1972 (see Table 7-2). Certificate 1313-A has a permitted instantaneous pumping rate of 200 gpm and an annual quantity of 224 acre-feet. Certificate G1-00130C has a permitted instantaneous

pumping rate of 700 gpm and an annual quantity of 1,120 acre-feet. The total combined right is 900 gpm with an annual quantity of 1,344 acre-feet (afy).

Well No. 2

Well No. 2 is associated with Certificate 3420-A, with a priority date of July 25, 1958, a permitted instantaneous pumping rate of 500 gpm, and an annual withdrawal quantity of 605 acre-feet. One of the conditions on the Report of Examination for this water right was that the combined, primary water rights associated with Certificate 1313-A (see Well No. 1) and 3420-A was set equal to 605 acre-feet. Therefore, the maximum annual quantity that can be withdrawn under Certificate 3420-A is 605 acre-feet less the annual quantity withdrawn under Certificate 1313-A (Well No. 1). If the entire amount of Certificate 1313-A is not withdrawn from Well No. 1, then that amount not withdrawn from Well No. 1 may be withdrawn from Well No. 2 (up to a maximum amount of 605 acre-feet if well No. 1 withdraws 1,120 acre-feet or less).

Well No. 3

Well No. 3 is associated with Certificate 6675-A, with a priority date of November 27, 1968, a permitted instantaneous pumping rate of 480 gpm, and an annual quantity of 400 acre-feet. The quantities associated with Certificate 6675-A are additive based on the planned donation of the City's surface water rights on Seidel Creek into temporary trust (Certificates 249 and 250). The Report of Examination for 6675-A states that the "total annual water use under Certificates 249, 250, 1313-A, 3420-A and 6675-A shall not exceed 2,420 ac-ft/yr." Because Certificates 249 and 250 are being donated to temporary trust, the authorized quantities under Certificates 1313-A, 3420-A and 6675-A are less than 2,420 ac-ft/yr. Therefore, the 400 ac-ft/yr authorized by Certificate 6675-A is additive.

Well No. 4

Well No. 4 is associated with Certificate G1-22608C, with a priority date of November 5, 1975. This certificate is a primary water right and has a permitted instantaneous pumping rate of 800 gpm and an annual quantity of 1,280 acre-feet.

Well No. 5

Water Right Certificate G1-24204C has a priority date of November 17, 1982. This certificate is a primary water right and has a permitted instantaneous pumping rate of 1,000 gpm, and an annual quantity of 1,600 acre-feet, granted for Well No. 5.

7.2.2. Surface Water Rights

The City has two surface water rights for diversions from Seidel Creek. The first surface water right, Certificate 249, is for a permitted diversion of five cubic feet per second (cfs) (2,244 gpm) and has a priority date of April 5, 1927. The second right, Certificate 250, is for 33 acre-feet per year (afy) of impoundment storage and also has a priority date of April 22, 1927. The City is actively applying to place the Seidel Creek rights into temporary trust.

7.2.3. Comparison with Current and Future Needs

Based on the City's groundwater right certificates, the City's total instantaneous rights equal 3,680 gpm and its total primary annual rights equal 5,005 afy. The City supplements its water rights with water purchased from Cascade Water Alliance.

The City may need to seek approval for changes in locations of points of withdrawal for their existing groundwater rights to continue to have the capability to pump groundwater up to their maximum authorized instantaneous and annual quantities.

Table 7-2 provides a summary of the City's water rights and water provided via interties with Cascade, and a comparison to the City's existing consumption and forecasted water demand. The City does not anticipate needing to apply for additional water rights during the 20 year planning period of this Water System Plan.

Table 7-2. Water Rights Self-Assessment

Certificate/Permit Number	Priority Date	WFI Source #	Existing Water Rights			Base Year Production (2023) [2]				10-Year Forecasted Production [2]				20-Year Forecasted Production [2]			
			Primary Qi (gpm)	Primary Qa (afy)	Non-Additive Qa (afy)	Total Qi (gpm)	Excess or Deficiency (gpm)	Total Qa (afy)	Excess or Deficiency (afy)	Total Qi (gpm)	Excess or Deficiency (gpm)	Total Qa (afy)	Excess or Deficiency (afy)	Total Qi (gpm)	Excess or Deficiency (gpm)	Total Qa (afy)	Excess or Deficiency (afy)
Surface Water																	
249 (Seidel Cr.)	4/5/1927		2,244	n/a	n/a	*n/a* [1]											
250 (Seidel Cr.)	4/22/1927		n/a	n/a	n/a												
Groundwater																	
1313-A (Well 1)	7/23/1951	S15	200	224		200	0	0	0	200	0	0	0	200	0	0	0
3420-A (Well 2)	7/25/1958	S16	500	381	224	500	0	503	102	500	0	503	102	500	0	503	102
6675-A (Well 3)	11/27/1968	S03	480	400 [3]		480	0	400	0	480	0	400	0	480	0	400	0
G1-00130C (Well 1)	2/3/1972	S15	700	1,120		700	0	1,056	64	700	0	1,056	64	700	0	1,056	64
G1-22608C (Well 4)	11/5/1975	S04	800	1,280		400	400	46	1,234	400	400	46	1,234	400	400	46	1,234
G1-24204 (Well 5)	11/17/1982	S07	1,000	1,600		1,000	0	1,114	486	1,000	0	1,114	486	1,000	0	1,114	486
TOTALS (Groundwater Only):			3,680	5,005	224	3,280	400	3,120	1,885	3,280	400	3,120	1,885	3,280	400	3,120	1,885
Interties [4]																	
Cascade Water Alliance			*n/a* [5]			*n/a* [5]											
42250T/Kirkland	n/a	S05															
05575B/Bellevue		S06															
77050Y/Seattle		S08															
TOTALS (Cascade) [6]:			28,648	46,249	n/a	10,993	17,655	5,963	40,286	13,313	15,335	7,423	38,826	15,633	13,015	8,883	37,366
TOTALS (Combined):			32,328	51,254		14,273	18,055	9,083	42,172	16,593	15,735	10,543	40,711	18,913	13,415	12,003	39,251

[1] Seidel Creek water rights are being donated to temporary trust and the amounts (Qi and Qa) attributable to these water rights are not included in the total water rights currently available to the City's water system.

[2] Production values for each well/water right are based on 2019-2021 average production values (see Table 4-2). For the purpose of this analysis, future well production is assumed to remain consistent with current levels of production, with increases in demand met by additional water purchased from Cascade Water Alliance. Consistent with recent operational records, Well 1 water production is assumed to utilize Qa from G1-00130C, and no Qa from 1313-A; thereby, allowing Well 2 to utilize both the primary and non-additive portions of Qa associated with 3420-A. The City is in the early stages of identifying a potential replacement location for Well 4 (as described in Project S-1 in Chapter 12, Capital Improvement Program). Once a replacement well is installed and placed into service, the City anticipates increasing the use of Well 4. Until that occurs and actual production rates of the new well are known, future production is assumed to be equal to the 2019-2021 average annual production of Well 4.

[3] Ecology issued Certificate 6675-A "as a supplemental supply the total annual water use under all rights [of the City as of 1969] shall not exceed 2,420 acre-feet". In other words, Certificate 6675-A was supplemental to Certificates 249, 250, 1313-A, and 3420-A. Certificates 249 and 250 are currently being placed in temporary trust and are not calculated as part of the City's consumptive use of water. Therefore, the total Qa of water for Certificates 1313-A, 3420-A, and 6675-A shall not exceed 2,420 afy combined. Combined, these three water rights amount to a Qa of 1,005 afy. As a result, Certificate 6675-A is additive and the City will continue to acknowledge 6675-A as additive while Certificates 249 and 250 are in temporary trust.

[4] Only non-emergency interties with Cascade Water Alliance are considered in this analysis.

[5] Water acquired through interties from Cascade Water Alliance is based on instantaneous needs. Projected Cascade Water Alliance supply is considered in combined fashion, not broken out by intertie, as the City will obtain water from the various interties as needed to meet demands throughout the distribution system.

[6] Total instantaneous rate based on hydraulic capacities of interties described in Table 3-7. Total annual volume based on the instantaneous rate applied over the course of a year.

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7.3. System Reliability

This section describes features of the water system that contribute to the reliability of water supply.

7.3.1. Physical Assets

Well Service Area

The Well Service Area has four potential sources of supply that can provide its water. First, the City's wells provide the main source for that area. Second, the City has two supply connections with Seattle's Tolt Pipeline No. 2: one at NE 104th Street and 160th Avenue NE, and the other on NE 172nd Street. Wholesale water supplied through these connections supplements the City's own source of supply during peak demands in the Well Service Area. Approximately 14 million gallons per day (mgd) can be supplied through these connections. The third source of supply is comprised of three flow-controlled connections with the Rose Hill Service Area that can provide approximately 3 mgd. These connections between service areas are normally closed and do not provide water on a regular basis. Finally, an emergency intertie with Northeast Sammamish Sewer and Water District can provide additional supply if needed.

Well #4 has historically experienced issues with production capacity. Physical issues such as screen clogging and water quality issues with manganese and iron limit its functionality and prevent the City from exercising the well's full water right. Since the early 2000s, the City has considered options to remedy this issue including changing the point of withdrawal for the water right, redrilling the well and filing a showing of compliance with Ecology. The City continues to evaluate the best resolution for Well 4.

The City's two connections with Tolt Pipeline No. 2 provide sufficient supply capacity to fully meet needs in the Well Service Area in the event the wells are not available. The connections to the Rose Hill Service Area offer additional supply reliability, though they alone are not capable of fully supplying average day demand.

Rose Hill and Overlake/Viewpoint Service Areas

The Rose Hill and Overlake/Viewpoint Service Areas have interconnections through which demands to the two service areas can be met in a variety of ways. The Rose Hill Service Area is normally served through three connections to the TESSL. It also has connections to the Overlake/Viewpoint area for use in the event the three TESSL connections are not available. While normally served by one connection to the TESSL, the Overlake/Viewpoint Service Area can receive water from Rose Hill in the event its TESSL connection is not available. The Overlake/Viewpoint area can also receive water through the City of Bellevue system's other TESSL connections.

Novelty Hill Service Area

Novelty Hill's supply is provided through a connection to the Tolt Tie Line, which connects Tolt Pipeline Nos. 1 and 2. Storage capacity within that service area provides short-term provisions for meeting demands if anything should occur to the intertie that normally serves that area. Emergency interties with adjacent purveyors (Woodinville and Union Hill) provide a backup source of supply for short-term purposes.

Interties

The City's existing interties are discussed in Chapter 3.7. In addition to its supply connections, the City has interties for emergency supply purposes, in the event its primary supplies are unavailable. Existing interties are listed in Table 3-8. Redmond is currently planning to develop an additional intertie with Woodinville at 172nd Avenue NE. This intertie would provide additional capacity, particularly to meet peak day demands within the Well Service Area, and provide additional redundancy in the system.

Water Shortage Response Planning

The City's Water Shortage Response Plan (2016) outlines procedures to be followed in the event supply from Cascade or from the City's wells are reduced or disrupted due to a drought or emergency. The Cascade membership agreement provides that members must respond to water shortages in a collective, shared fashion under a Cascade shortage management plan and that resources must be shared in a manner that reduces the risk of severe shortages to each member. As such, the City follows Cascade's water shortage management plan, which is included as Appendix A to the City's Water Shortage Response Plan. The City's plan also includes SPU's Water Shortage Contingency Plan as Appendix B. The City's 2016 Water Shortage Response Plan, including the associated appendices from Cascade and SPU, is included as Appendix G to this WSP.

7.3.2. Climate Change

Climate change is a world-wide phenomenon which will impact water supplies in all regions, including the Puget Sound. Key climate change impacts related to water systems are the reduction of supplies or alteration of water supply timing, as well as increased demands related to outdoor use during summer.

Several agencies in the region conduct climate change studies such as the Climate Impacts Group at the University of Washington. Water supply agencies, including the Water Supply Forum and Cascade Water Alliance, both of which the City is associated with, have used this research to begin planning for the impacts of climate change on water supply. In addition, the City has developed its own Climate Vulnerability Risk Assessment and Strategy, which includes climate change impacts on water supply.

The extensive research and planning for climate change adaptation in the Puget Sound region has set the region up for success regarding water supply reliability in the near future. The City's Climate Vulnerability Risk Assessment and Strategy indicates that the City's water system is resilient to the near-term impacts of climate change. The City will continue to engage with climate change research and regional planning to ensure water supplies remain resilient as climate change impacts continue to manifest and are better understood.

7.4. Evaluation of Reclaimed Water Opportunities

DOH requires that water system plans include an evaluation of opportunities to use reclaimed water. Reclaimed water is wastewater that has been highly treated to permit it to be used again for purposes specified under State law. Use of reclaimed water can help water systems stretch their available supplies and reduce withdrawals of water from aquifers or surface streams. However, retrofitting a reclaimed water supply to an existing community poses significant costs and other challenges.

For more than two decades, the City has worked with Cascade Water Alliance and King County to explore the feasibility of reclaimed water use within the City. Specific potential opportunities for use of this resource have been identified in previous planning documents including Cascade's 2005 and 2012 Transmission and Supply Plans, as well as the City's prior water system plans.

The location of King County's Brightwater Treatment Plant to the north of the City in Snohomish County, and that facility's associated Sammamish Valley "South Backbone" reclaimed water transmission line that extends into the northern portion of the City's retail service area, has prompted more detailed consideration of reclaimed water use over the past 10 years. King County provides reclaimed water directly to customers located within or near the City. These include irrigation uses at the Willows Run Golf Course and the 60 Acres Soccer Complex, and a reclaimed water fill station at the County's York Pump Station. Additional uses that could be potentially served by the South Backbone reclaimed water transmission line were studied in 2018 by Cascade and King County, with participation by the Cities of Redmond, Kirkland, and Bellevue. Ultimately, it was concluded that the high cost of pumping and piping this water to various use locations was prohibitive to implementation in the near future.

In addition, other considerations regarding reclaimed water use have been evaluated, including the potential for impacts of certain uses to Redmond's groundwater quality. As discussed in detail in Section 2.3.8, the City has limited the use of reclaimed water within its critical aquifer recharge area (CARA) to those uses that discharge to the sanitary sewer. Memoranda of Understanding (MOUs) between the City and King County reflect these limitations, even in portions of the CARA that extend beyond the City's retail service area, so as to be protective of aquifer water quality. Additionally, King County and Cascade Water Alliance have entered into an MOU that applies to all service areas of Cascade members regarding reclaimed water planning and coordination.

For the reasons noted above pertaining to CARA-based limitations and high costs of additional infrastructure needed for delivery, and because the City is already investing substantial funds to secure long-term potable water supplies as a member of the Cascade Water Alliance, use of reclaimed water for additional applications within the City's service area appears to offer little direct benefit to the City's water customers at this time. Therefore, the City of Redmond does not plan to invest water utility funds in construction of a reclaimed water delivery system in the near future. However, the City remains open to proposals from King County or other parties related to reclaimed water, if alternative funding sources can be identified to finance the necessary construction projects and if the proposals meet reclaimed water use requirements as established by City code and the aforementioned MOUs.

A completed King County Water Reclamation Evaluation Checklist is provided in Appendix H.

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Chapter 8: Water Quality

City of Redmond 2024 Water System Plan

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(Not applicable)

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8. Water Quality Regulations and Compliance

The City of Redmond manages its water system to achieve compliance with state and federal rules and regulations. These include the federal Safe Drinking Water Act (SDWA) and state regulations outlined in Washington Administrative Code (WAC) 246-290. This chapter reviews the City's compliance with these requirements.

Redmond treats water from its independent supply sources to comply with requirements for water sources. City personnel generate sodium hypochlorite on-site for disinfection of the well water. Sodium fluoride also is added at the well sites for its dental benefit. CO2 stripping is provided at the City's wells to increase pH for corrosion control, except at Well No. 4 where sodium hydroxide is used.

Water received from the regional supply system is treated at the source by Seattle Public Utilities. Where regional supply water passes through Bellevue or Kirkland, some localized treatment also may occur prior to entry into Redmond's distribution system. Redmond works closely with these partner utilities to maintain a high level of water quality delivered to the City's customers.

The City's Maintenance and Operations Center (MOC) monitors water quality conditions within the City's distribution system. Water samples are collected at various locations throughout the City's service area to verify compliance with state and federal regulations. Table 11-4 in Chapter 11 presents the chemical, physical, and bacteriological parameters that are part of the MOC's regular monitoring program. Also included in Table 11-4 is the frequency that each parameter is tested. The City's status is discussed in terms of effective source water, distribution system, and other applicable and anticipated regulations.

8.1. Safe Drinking Water Act

The federal regulatory framework directing water quality is the Safe Drinking Water Act (SDWA) of 1974 and its 1986 and 1996 amendments. The SDWA and amendments, as administered by the United States Environmental Protection Agency (EPA), have impacts on the operation and monitoring of the Redmond water system. The regulatory impacts to Redmond include requirements for disinfection, limits on bacteriological quality and disinfection by-products, and monitoring for various types of potential contaminants in source waters and within the City's distribution system.

8.2. Washington Administrative Code

Chapter 246-290 WAC incorporates the SDWA and its amendments. The Washington State Department of Health (DOH) has primacy for ensuring these requirements are implemented and enforced. The Redmond system (ID #71650B) is classified as Group A public water system and is therefore required to meet drinking water quality regulations and conform to sampling and reporting requirements for Group A systems.

Drinking water quality regulations currently applicable to the City are listed in Table 8-1. These regulations are classified as pertaining to the source water, distribution system, or other effective rules. Anticipated regulations are discussed separately at the end of this chapter.

Table 8-1. Safe Drinking Water Act Rules Applicable to Redmond System

Rule	Parameters Regulated	WAC or FR*
Source Water Quality Regulations		
National Primary and Secondary Drinking Water Standards (1976)	Physical and Chemical	40 FR 141
Phase 1 (VOCs), Phase 2 and Phase 5 Rules (IOCs and SOCs) (1994)	Volatile organic compounds (VOCs), inorganic chemicals (IOCs), and synthetic organic chemicals (SOCs)	246-290-300(4) and (7)
Surface Water Treatment Rule (1990) and Long-Term 2 Enhanced Rule (2006)	Turbidity, disinfection, viruses, Giardia lamblia, chlorine residual, and cryptosporidium.	246-290-451
Arsenic Rule (2006)	Arsenic	246-290-300(4)
Radionuclides Rule (1976, 2003)	Combined radium, gross alpha, beta and photon emitters, and uranium	246-290-300(8)
Groundwater Rule (2010)	Viruses, fecal indicators	246-290-300(1) 71 FR 224 (Nov 21, 2006)
Wellhead Protection Program	Planning tool to identify potential sources of contamination and protect drinking water supplies	246-290-135(3)
Unregulated Contaminants Monitoring Rule 4 (2018)	Various contaminants considered for future regulations	N/A
PFAS Rule (TBD)	TBD	TBD
Distribution System Water Quality Regulations		
Final Lead and Copper Rule and Revisions (2021)	Lead, copper, water quality parameters, treatment for corrosion control, and replacement of lead service lines.	246-290-300(5)
Total Coliform Rule (2018)	Total and fecal coliform, E. coli	246-290-300(2) and (3)
Stage 1 Disinfectants/Disinfection By-Products Rule (2002)	Trihalomethanes, haloacetic acids, chlorine residual, total organic carbon, others	246-290-300(6)
Stage 2 Disinfectants/Disinfection By-Products Rule (2006)	Trihalomethanes, haloacetic acids	71 FR 388 (Jan 4, 2006)
Other Regulations		
Consumer Confidence Reports and Public Notification Rules (1998/2000)	Requires annual report addressing drinking water quality and notifications of water quality violations.	246-290-71001 through 246-290-72012
Operator Certification	Requires minimum standards for operator certification by State	246-292

* WAC – Washington Administrative Code; FR – Federal Register

8.3. Source Water Regulations

This section summarizes water quality regulations that pertain to sources and are applicable to the City. In prior WSPs, Maximum Contaminant Limits (MCLs) and observed sample ranges were listed for all regulated contaminants. For this WSP update, the sections have been streamlined and no longer show tables of all contaminants, their MCLs, and the observed sample range. This information is available on the DOH Sentry webpage. This section now describes each water quality regulation applicable to the City, how the City is meeting those standards, and if any exceedances were observed during the prior planning period.

A discussion of each rule and Redmond's status follows.

8.3.1. National Primary and Secondary Drinking Water Standards

National Primary Drinking Water Standards are currently set for 87 contaminants. MCLs and maximum contaminant level goals (MCLGs) have been established for 77 contaminants, while the remaining ten have treatment technique requirements. A constituent's MCL is generally based on its public health goal (PHG), which is the level of a contaminant in drinking water below which there is no known or expected health risk. Regulated constituents include microbial contaminants, inorganic chemicals (IOCs), volatile organic chemicals (VOCs), synthetic organic chemicals (SOCs), radionuclides, and disinfection by-products (DBPs). Regulations affecting DBPs are discussed in the distribution system water quality section.

The EPA regulates most of the chemical contaminants through the rules known as Phase I, II, IIb, and V. The EPA issued the four rules regulating 69 contaminants over a five-year period as it gathered, updated, and analyzed information on each contaminant's presence in drinking water supplies and its health effects. The Phase I Rule was promulgated July 8, 1987 and included eight VOCs. The Phase II and IIb Rules (published January 30 and July 1, 1991) updated or created new limits for 38 contaminants. The Phase V Rule (published July 17, 1992), set standards for 23 additional contaminants. These rules form the basis of the Washington Department of Health regulations described in WAC 246-290-300. Since the Phase V Rule, MCLs for additional contaminants have been established through new regulations, such as the Arsenic Rule, and were adopted by DOH.

WAC 246-290-300 requires that these compounds be monitored at each source on 12-to-36-month sampling cycles depending on the contaminant and source type. As part of the Phase II Rule, systems with a significant amount of asbestos-cement (AC) pipe must conduct periodic asbestos monitoring in the distribution system. The City's status regarding the Asbestos Rule is discussed later in the section pertaining to distribution water quality.

The EPA has also established secondary standards for 15 contaminants to address the aesthetic quality of drinking water; these secondary standards have also been adopted within the WAC. Because the federal standards primarily address taste and odor, rather than health issues, they are often used only as a guideline. For existing public water systems, the WAC stipulates that the required follow-up action be determined by the DOH based on the degree of consumer acceptance of the water quality and their willingness to bear the cost of meeting the secondary standard.

Redmond has maintained compliance with the primary drinking water regulations in the City's service areas. SPU is responsible for conducting monitoring per regulations for drinking water supply sources under their control, which would include responsibility for ensuring compliance with the Phase I, II, and V regulations for the imported supplies.

The following subsections describe the contaminants regulated under national standards in more detail.

Volatile Organic Compounds

Volatile organic chemicals (VOCs) are manufactured, carbon-based chemicals that vaporize quickly at normal temperatures and pressures. VOCs include many hydrocarbons associated with fuels, paint thinners, and solvents. VOCs are divided into the two following groups:

- Regulated VOCs that have been determined to pose a significant risk to human health.
- Unregulated VOCs for which the level of risk to human health has not been established.

There are currently 21 regulated volatile organic chemicals (VOCs).

Redmond's monitoring requirements differ by source and are described in the Water Quality Monitoring Schedule (WQMS) (Appendix I). No VOC exceedances have been observed during the prior planning period.

Synthetic Organic Compounds

DOH regulates 33 Synthetic Organic Compounds. This group includes organic pesticides and other synthetic chemicals. The City received waivers for monitoring of dioxin, diquat, endothall, ethylene dibromide, and glyphosate. Monitoring requirements by source are described in the WQMS. No SOC exceedances have been observed during the prior planning period.

Inorganic Compounds

Regulated inorganic chemicals include elemental metals such as mercury, arsenic, and iron. Some non-metallic constituents such as chloride, fluoride, and sulfate are also included in this category. Physical properties of IOCs that affect water quality in this category include turbidity, specific conductivity, total dissolved solids, and color. WAC 246-290 specifies primary and secondary MCLs for IOCs. Asbestos samples are collected from the distribution system since the source of asbestos is asbestos cement pipe. As such, this requirement is discussed in a future section.

DOH granted a waiver for IOC monitoring, and Redmond is required to monitor for IOCs once every 9 years. The most recent sample was taken on May 3, 2017. No exceedance was observed.

8.3.2. Arsenic Rule

EPA published the final Arsenic Rule in January 2001 with an effective date of January 2006. The Arsenic Rule established the arsenic MCL at 0.010 mg/L and it identifies several best available treatment technologies for compliance. The rule makes arsenic monitoring requirements consistent with monitoring for other inorganic chemicals regulated under the Phase II/V standardized monitoring framework. Compliance with the MCL is based on the running annual average of monitoring results at each entry point to the distribution system. However, if arsenic is detected above the MCL in any individual sample, the system must increase the frequency of monitoring at that sampling point to quarterly.

The City had no arsenic exceedances during the prior planning period.

8.3.3. Radionuclides Rule

The Radionuclides Rule was updated in December 2000, with an effective date of 2003. The rule includes MCLs for radium-226 and radium-228, referred to as combined radium (5 pCi/L), adjusted gross alpha emitters (15 pCi/L), beta and photon emitters (4 mrem/year), and uranium (30 µg/L). Under this rule, monitoring for radionuclides must be conducted after the point of treatment for each well and before the first customer receives the water. Systems are required to conduct initial monitoring between 2003 and 2007, unless earlier radionuclide data can be used as grandfathered data. The required monitoring frequency will depend on system contaminant levels observed during initial monitoring.

Redmond tested all wells with the exception of Well #4 for gross alpha in 1997. Well #4 was out of service until 2002, so gross alpha was tested for Well #4 in 2003 per DOH request. Redmond now samples for radionuclides at all sources on a six year schedule. The most recent sample date was June 19, 2019. No exceedances were observed.

8.3.4. Groundwater Rule

The Groundwater Rule (GWR), promulgated November 8, 2006, applies to all public water systems that use groundwater for all or part of their drinking water supply, unless the groundwater sources are under the influence of surface water or groundwater and surface water are blended prior to treatment. The basic requirements of the Groundwater Rule include triggered source water monitoring or compliance monitoring, sanitary surveys, corrective actions, and public notification. DOH adopted the federal Groundwater Rule on September 30, 2010 and it went into effect on November 1, 2010.

The City has chosen the source water "triggered monitoring" option for compliance with the Groundwater Rule. This means that triggered source water monitoring for total coliform and *E. coli* is required within 24 hours of notification that a routine distribution system or consecutive system coliform sample is positive under routine RTCR monitoring. The City is then required to test each source (prior to treatment) that was in operation at the time the positive routine RTCR sample was collected.

8.3.5. Wellhead Protection Program

Per WAC 246-290-135(3), public water systems are required to implement a Wellhead Protection Program (WHPP) to protect their groundwater supplies. Source water protection programs are planning tools to be used by water utilities to identify potential sources of water contamination, and to protect existing and future drinking water supplies.

A WHPP has been prepared for the Redmond system and is discussed in Chapter 9 of this Water System Plan.

8.3.6. Unregulated Contaminant Monitoring Rule

The 1986 amendments to the Safe Drinking Water Act require public water systems to monitor for unregulated contaminants every five years and submit these data to the states. The intent of this program is to gather scientific information on unregulated contaminants and find unregulated contaminants of concern in the nation's drinking water to determine if regulations are required to protect human health. Both the 1993 and 1996 amendments to the Act added new lists of contaminants, which led EPA to develop a revised program for monitoring. The new

program became known as the Unregulated Contaminant Monitoring Regulations (UCMR 1999). The new UCMR program began in 2001 and produces a new list of unregulated contaminants for monitoring every five years.

Unregulated Contaminant Monitoring Regulation 1 (UCMR 1) required all public water systems (PWSs) serving more than 10,000 people to monitor for unregulated contaminants from 2001-2005. Unregulated Contaminant Monitoring Regulation 2 (UCMR 2) required further sampling for additional parameters during 2008-2010. This monitoring cycle included 25 unregulated contaminants (10 “List 1” and 15 “List 2”) and five associated analytical methods. Redmond completed UCMR 1 with samples collected from groundwater sources in June and November 2002. UCMR 2 samples were collected in October 2009 and April 2010.

UCMR 3

The UCMR supporting the second cycle (UCMR 3) of monitoring was published on May 2, 2012. The UCMR 3 requires monitoring for two lists of 30 contaminants during 2013 and 2015.

All PWSs serving more than 10,000 people, and 800 representative PWSs serving less than 10,001 people were required to monitor for the 10 “List 1” contaminants during a 12-month period between January 2013 and December 2015. Systems serving more than 100,000 people (including both retail and wholesale customers) and selected smaller systems were required to conduct screening monitoring for 15 “List 2” contaminants on the Screening Survey List. This list includes contaminants that will be monitored at distribution system entry points and within the distribution system.

The City collected samples for UCMR 3 throughout 2014 and 2015 for the 10 “List 1” contaminants based on the population in the service area. There were detections of Strontium, Vanadium, Hexavalent Chromium, and Chlorate in this round of sampling.

UCMR 4

Under the UCMR program, EPA asks large systems to monitor once every five years for a list of no more than 30 unregulated contaminants. There is one tier of contaminants in UCMR4; List 1 - Assessment Monitoring. All systems serving more than 10,000 persons were required to monitor for 10 List 1 cyanotoxins during a 4-consecutive month period from March 1, 2018 and November 31, 2020. All system serving more than 10,000 persons were also required to monitor for 20 List 1 additional contaminants during a 12-month period between January 1, 2018 and December 31, 2020. The 20 List 1 additional contaminant consist of metals, pesticides, HAA, alcohols, semivolatile chemicals, and indicators.

The City collected samples for UCMR 4 in 2018. No detections of chemicals in the lists were observed.

UCMR 5

On December 17, 2021, the EPA executed the final "Revisions to the Unregulated Contaminant Monitoring Rule (UCMR 5) for Public Water Systems" and the rule was subsequently published in the Federal Register on December 27, 2021 (86 FR 73131). The 5-year UCMR 5 cycle spans 2022 – 2026, with preparations in 2022, sample collection from 2023 – 2025, and completion of data reporting in 2026.

UCMR 5 specifies monitoring for 29 per- and polyfluoroalkyl substances and lithium. As a groundwater system, the City must collect samples two times during a consecutive 12-month monitoring period with sample events occurring five-to-seven months apart.

The City is planning to begin sampling in 2023.

8.3.7. PFAS Rule

Per- and polyfluroalkyl substances (PFAS) are a large family of chemical in use since the 1950s to make a wide variety of stain-resistant, water resistant, and non-stick consumer products. PFAS also have many industrial uses because of their special properties. In Washington State, PFAS have been used in certain types of firefighting foams utilized by the U.S. military, local fire departments, and airports.

The State Board of Health revised the Group A drinking water rules in 2022 to require water systems to monitor for select PFAS compounds. The new rule establishes state action levels (SAL) for five PFAS compounds. Systems with a PFAS sample result that exceeds a SAL should collect a confirmation sample. If the average of the results of the initial and confirmation samples exceed the SAL, or if the system doesn't collect a confirmation sample, the system must notify its customers of the SAL exceedance event. The SALs can be reviewed on the DOH website.

Water systems will be required to monitor for PFAS beginning January 2023 through December 2025. Each water system's Water Quality Monitoring Schedule will list the PFAS monitoring requirement starting in 2023. The frequency of monitoring will be based on the results of the first sampling events per the guidance in DOH publication 331-668: PFAS Monitoring and Follow Up Actions.

The State's PFAS rule require monitoring during the same timeframe as the recently promulgated UCMR 5. Therefore, the City will conduct monitoring for this rule coincident with UCMR 5 monitoring which will begin in 2023. The City is actively developing its communications plan for customers regarding PFAS, regulatory requirements, and upcoming sampling.

8.4. Distribution System Regulations

This section summarizes effective water quality regulations pertaining to the distribution system. A discussion of each rule follows.

8.4.1. Lead and Copper Rule

Lead and copper are metals that may be found in household plumbing materials and water service lines. Lead can cause a variety of negative health impacts, including delaying physical and mental development in infants and children. Copper can cause aesthetic issues in addition to short-term and long-term negative health impacts. The Lead and Copper Rule (LCR) establishes action levels, monitoring, and compliance requirements for lead and copper levels at customers' taps. To meet the established action levels, 90 percent of all samples must have lead levels equal to or less than 0.015 mg/L and copper levels equal to or less than 1.3 mg/L. If these action levels cannot be met, systems must implement public education and a corrosion control treatment strategy for meeting these levels.

The EPA initiated a review of the LCR implementation across the nation in 2004, which resulted in revisions to the LCR. This effort was focused on determining whether national lead levels are

increasing in the US. As a result of this effort, the EPA identified several targeted changes to the existing regulation that would meet short-term goals for improving implementation of the Lead and Copper Rule. These revisions were finalized in October 2007 and became effective in December 2007.

The short-term revisions were intended to enhance implementation of the Lead and Copper Rule in the areas of monitoring, treatment, customer awareness, and lead service line replacement. Additionally, these revisions focus on improving compliance with public education requirements of the Lead and Copper Rule to ensure that consumers receive meaningful and timely information that assists in limiting exposure to lead in drinking water. CO2 stripping is provided at the City's wells to increase pH for corrosion control, except at Well No. 4 where sodium hydroxide is used. Redmond does not participate in Seattle Public Utility's Regional Monitoring Program for Lead and Copper. Redmond is in compliance with the Lead and Copper Rule and is on a DOH-approved reduced monitoring schedule for lead and copper. The City is required to collect a minimum of 50 samples once every three years. Sampling occurred in 2018 in accordance with DOH requirements. No exceedances were observed in sampling events throughout the prior planning period through June 2021.

The EPA promulgated further revisions to the LCR in 2021. The goals of the rule revisions are:

- Provide greater and more effective protection of public health
- Better identify high levels of lead
- Improve reliability of lead tap sampling results
- Strengthen corrosion control treatment (CCT) requirements
- Expand consumer awareness
- Improve risk communication
- Accelerate lead service line replacement (LSLR)

The rule revision mostly focuses on lead. The rule incorporates a trigger level for lead of 0.010 mg/L liter (90th percentile). A sample at this concentration triggers additional planning, monitoring, and treatment requirements.

A key focus of the revisions are lead service lines (LSLs). The rule requires water systems to inventory their LSLs and establish an LSL removal plan (or demonstrate the absence of LSLs) within three years of rule publication (October 16, 2024). The inventory must be updated annually and made publicly available. The results of lead monitoring determine the rate at which the utility must replace LSLs:

- If P90 > 15 ug/L, the system must replace 3% of LSLs per year based on a 2-year rolling average for at least 4 consecutive 6-month monitoring periods
- If P90 > 10 ug/L to 15 ug/L, LSL replacement goals will be developed in consultation with the regulatory agency for two consecutive 1-year monitoring periods

The rule contains guidance on how these plans should be developed. These regulations also affect priorities for sample collection. More information about the LCR can be found on the EPA website: EPA - Lead and Copper Rule

The City is in contact with DOH concerning guidance on meeting the new requirements, particularly concerning testing in schools and completing the required service line survey. The City will begin planning how to execute the service line survey using the EPA's guidance for

compliance with the revised rule. The City is actively developing its communications plan for customers regarding the LCR. DOH continues to discuss and develop guidance on meeting the requirements of the rule and the City will implement guidance practices as they become available.

8.4.2. Total Coliform Rule

The Revised Total Coliform Rule (RTRC) replaced the Total Coliform Rule (TCR) on April 1, 2016. The RTRC requires water systems to monitor their distribution system for the presence of coliform bacteria, which is a surrogate used to indicate treatment effectiveness, distribution system integrity, and possible contamination of fecal origin. The City performs monitoring as outlined in its existing *Coliform Monitoring Plan*. Monitoring is required at representative sites on a monthly basis, with the sample quantity dependent on the size of the population served. All samples testing positive for total coliform must be followed by repeat sampling and additional testing to determine if *E. coli* is present.

Under the RTCR, treatment technique triggers are defined which require the utility to conduct an assessment to find and fix sanitary defects. Violations under the RTCR typically indicate a failure to act. The types of violations include: treatment technique violations, *E. coli* MCL violations, monitoring violations, and reporting violations. Details regarding treatment technique triggers and violations are found in DOH Publication No. 331-206, which is included in Appendix J, after the City's current Coliform Monitoring Plan. The City will regularly review and update the Coliform Monitoring Plan to reflect population changes and monitoring requirements.

The City of Redmond is in compliance with the RTCR and WAC 246-290-300(2). The City collects at least 100 routine coliform samples per month at locations throughout the system, as well as entry-point chlorine sampling each day that routine or repeat samples are collected.

8.4.3. Surface Water Treatment Rule

The SWTR requires a minimum disinfectant residual of 0.2 mg/L at the point of entry and throughout the distribution system. Disinfectant residual must be monitored throughout the distribution system every calendar day. The City employs analyzers throughout the distribution system to continuously monitor disinfectant residual. Data is compiled and recorded in the SCADA system.

Though the City does not divert and treat surface water, the City collects chlorine residual measurements daily, and at the same time and location as routine and repeat coliform samples.

8.4.4. Stage 1 Disinfectants/Disinfection By-Products Rule

Disinfection by-products (DBPs) result from the reaction of natural organic matter (NOM) and various inorganic precursors with chemical disinfectants. Toxicological research has shown that many DBPs have carcinogenic and other adverse properties when ingested over long periods of time. In 1979, the EPA enacted the Total Trihalomethane Rule, which set an interim MCL for total trihalomethanes (TTHM) of 0.1 mg/L as a running annual system-wide average based on quarterly monitoring within the distribution system. This rule applied to water systems using a chemical disinfectant and serving over 10,000 customers.

In 1998, the EPA promulgated the Stage 1 Disinfectants/Disinfection By-Products (D/DBP) Rule to further reduce the DBP levels in drinking water. The Stage 1 D/DBP Rule became effective

in January 2002 for large systems (those serving 10,000 or more people) and January 2004 for small systems (those serving less than 10,000 people). The Stage 1 D/DBP Rule established new MCLs for chlorite, bromate, and the sum of five haloacetic acids (HAA5) (0.060 mg/L), and established maximum residual disinfection levels (MRDLs) for chlorine (4.0 mg/L), chloramines, and chlorine dioxide. It also lowered the MCL for TTHM (0.080 mg/L) and set total organic carbon removal requirements for systems using conventional filtration.

DOH directed Redmond to test for TTHM and HAA5 at five locations per quarter within the groundwater system and the Novelty Hill (or Redmond Ridge) system. The system has four groundwater plants (Wells 1&2, Well 3, Well 4, and Well 5). Wells 1 and 2 are 130 feet apart, draw from the same aquifer, are blended prior to distribution, and therefore considered to be one plant.

Results for samples collected in 2009 at points of entry and various locations in the Redmond distribution system yielded TTHM levels ranging from 0.007 to 0.041 mg/L and HAA(5) levels ranging from <0.005 to 0.036 mg/L. These results are less than the MCLs.

8.4.5. Stage 2 Disinfectants/Disinfection By-Products Rule

The Stage 2 DBP Rule was published in the Federal Register on January 4, 2006. The rule was developed to provide more equitable protection against DBPs on a system-wide basis by changing the compliance monitoring provisions. The Stage 2 DBP Rule applies to water systems that serve drinking water treated with a primary or secondary chemical disinfectant. The Stage 2 DBP Rule does the following:

- Changes the method of calculating DBP regulatory compliance to a locational running annual average (LRAA) of quarterly samples, in which the system calculates a running annual average for each DBP monitoring location instead of calculating a running annual average for the entire system.
- Changes the location and number of DBP monitoring sites. The rule requires systems to conduct an Initial Distribution System Evaluation (IDSE) to select Stage 2 DBP monitoring locations in areas of the distribution system with elevated DBP levels. Additionally, the final Stage 2 DBP Rule requires systems to determine monitoring requirements based on population.
- Establishes DBP operational evaluation levels for each monitoring site which are calculated as 25% of the sum of the two previous quarter's results plus twice the current quarter's monitoring result. A system that exceeds this level is required to conduct an operational evaluation, i.e., evaluating their distribution system operations to determine ways to reduce DBP levels. The system is required to notify the state of an operational evaluation level exceedance and submit evaluation results within 90 days of the exceedance.
- Consecutive systems that purchase drinking water carrying a disinfectant are required to implement Stage 2 DBP requirements on the same schedule as the largest water system in their combined distribution system.

The first step in complying with the Stage 2 DBP Rule was to conduct an IDSE. The goal of the IDSE is to identify areas that have routinely higher DBP concentrations than other areas in the distribution system and use this information to select monitoring locations for long-term Stage 2 DBP compliance monitoring.

Redmond was required to complete a Standard Monitoring Plan by October 1, 2006. This plan was approved by EPA and Redmond began sampling per the Standard Monitoring Plan in October 2007. After completing one year of sampling, Redmond developed an IDSE Report, which summarized the IDSE sample collection results plus Stage 1 DBP monitoring that occurred during the IDSE period, and recommended routine Stage 2 DBP monitoring locations. The IDSE Report was completed by January 1, 2009. Routine monitoring for DBPs at eight selected sites (selected per the protocol described in the Stage 2 Rule) began on April 1, 2012.

The City collects eight quarterly samples for THMs and HAA5s. The City has not had any exceedances for disinfection by-products. The City's DBP monitoring plan is in Appendix K.

8.4.6. Asbestos Rule

Asbestos monitoring is required as part of the Inorganic Monitoring under the Phase II Rule. Distribution system monitoring for asbestos is also required if a distribution system contains more than 10% asbestos-cement (AC) pipe. Systems with AC pipe must sample the distribution system at a tap served by the AC pipe and under conditions where contamination is most likely to occur. Monitoring under the asbestos rule is required once per nine years unless a sample exceeds the MCL of 7 million fibers per liter.

The City has a standard nine-year monitoring requirement. The City most recently sampled for asbestos in 2018 and will sample again in August 2027. The City has not detected asbestos during any sampling event.

8.5. Other Water Quality Regulations

This section summarizes other effective water quality regulations applicable to the City. A discussion of each rule follows.

8.5.1. Consumer Confidence Reports and Public Notification Rule

Under the Consumer Confidence Report (CCR) Rule promulgated in 1998, water systems are required to provide an annual CCR on the source of their drinking water and levels of any contaminants found. The City produces an annual water quality report that meets these requirements; the most recent report is in Appendix L. The annual report must be supplied to all customers and must include:

- Information on the source of drinking water;
- A brief definition of terms;
- If regulated contaminants are detected, the MCLG, MCL, and the level detected;
- If an MCL is violated, information on health effects; and
- If EPA requires it, information on levels of unregulated contaminants.
- Minimum requirements of the contents of the report per WAC 246-290-72001.

While the CCR provides annual "state-of-the-water" reports, the Public Notification Rule (PNR) directs utilities in notifying customers of acute violations when they occur. The PNR was revised in May 2000 and outlines public notification requirements for violations of MCLs, treatment techniques, testing procedures, monitoring requirements, and violations of a variance or exemption. Notification requirements are briefly summarized herein:

IOC/VOC/SOC Reporting Procedures

If routine sampling indicates a violation of primary or secondary MCL violation, then the water purveyor must collect confirmation sample(s), remove the source from service, and report the violation to DOH within 24 hours. If DOH determines the violation poses an acute health effect, then the purveyor must provide notice of the violation to water customers within 24 hours of the violation. If it is determined that the violation does not pose an acute health risk, then the purveyor must mail a notice to customers within 30 days.

Bacteriological Reporting Procedures

If bacteriological presence is detected in a routine sample, the following reporting requirements will take effect:

- Each total coliform-positive routine sample must be tested for the presence of E. coli.
- If fecal coliform or E. coli is detected in routine sample, the City is required to notify DOH by the end of the day that the PWS is notified.
- Within 24 hours of learning a total coliform-positive sample result, at least three repeat samples must be collected and analyzed for total coliform.
- If one or more repeat sample is coliform-positive, the sample must be analyzed for the presence of E. coli. If the repeat sample is also E. coli-positive, the sample result must be reported to the state by the end of the day the PWS is notified.

Unregulated Contaminant Reporting Procedures

Reporting procedures for unregulated contaminants are similar to the reporting requirements for IOCs, VOCs, and SOCs. If the unregulated contaminant has a proposed MCL, then the reporting requirements are the same as those stated for IOCs, VOCs, and SOCs. If a detected unregulated contaminant does not have a proposed MCL, DOH must be contacted, and DOH will determine the reporting procedures.

8.5.2. Operator Certification

The 1996 SDWA amendments require that states develop and implement an operator certification program. The regulation sets out minimum guidelines for such a certification program including operator classification and qualifications. These sections of the regulation require that:

- Each treatment facility and/or distribution system be placed under the direct supervision of a certified operator;
- Operator certification must be equal to or greater than the system classification being operated;
- All process control personnel must be certified;
- At least one certified operator be available on every shift;
- Operators must sit for, and pass, a validated exam demonstrating skills, knowledge, ability, and judgment necessary for the system classification; and
- Each operator has a high school diploma, GED, or State approved experience and training.

While the responsibility for developing the program lies with DOH, systems such as Redmond are required to bring all operators up to the level of certification as required.

Redmond satisfies EPA and DOH operator certification requirements. As discussed in Chapter 11, all water system supervisor and technicians have the appropriate water certification from DOH.

8.6. Anticipated Future Regulations

Anticipated future regulatory requirements are summarized in Table 8-2. This table includes ongoing programs to introduce new regulatory requirements, under the Unregulated Contaminant Monitoring Rule and the Contaminant Candidate List, as well as specific rules and regulations currently under consideration. A brief description of anticipated requirements under each rule is provided herein.

Table 8-2. Anticipated Future Regulations

Proposed Rule	Affected Contaminants	Proposed Publication Date [a]
PFAS	Potential future requirements for monitoring PFAS and PFOA	2023

[a] Effective and compliance dates were obtained from the Federal Register and EPA's Drinking Water Website and represent the best information available as of the date of this report.

8.6.1. Per- and Poly-Flouroalkyl Substances (PFAS)

Under the SDWA, EPA has the authority to set enforceable National Primary Drinking Water Regulations (NPDWRs) for drinking water contaminants and require monitoring of public water supplies. To date, EPA has regulated more than 90 drinking water contaminants but has not established national drinking water regulations for any PFAS. In March 2021, EPA published the Fourth Regulatory Determinations, including a final determination to regulate Perfluorooctanoic acid (PFOA) and Perfluorooctane sulfonic acid (PFOS) in drinking water. The Agency is now developing a proposed NPDWR for these chemicals. As EPA undertakes this action, the Agency is also evaluating additional PFAS and considering regulatory actions to address groups of PFAS. Recent additions of PFAS chemicals considered for regulation include GenX Chemicals and PFBS.

In July 2022, the EPA issued health advisories for two PFAS molecules, GenX Chemicals and PFBS. The current health advisories issued by the EPA for PFAS are:

- PFOA – 0.004 ppt
- PFOS – 0.02 ppt
- GenX Chemicals – 10 ppt
- PFBS – 2,000 ppt

The Agency anticipates issuing a final regulation in Fall 2023 after considering public comments on the proposal. Going forward, EPA will continue to analyze whether NPDWR revisions can improve public health protection as additional PFAS are found in drinking water.

8.7. Laboratory Certification

Redmond uses five certified laboratories for sample analysis. The laboratories and their contact information are listed below.

Am Test Inc.
13600 NE 126th PL
Suite C
Kirkland, WA 98034
Phone: 425-885-1664

Edge Analytical Laboratories
11525 Knudson Road
Burlington, WA 98231
Phone: 1-800-755-9295

City of Seattle Public Utilities
Water Quality Laboratory
800 South Stacy Street
Seattle, WA 98134

Anatek Labs Inc
1282 Alturas Dr
Moscow, ID 83843
Phone: 208-883-2839

OnSite Environmental Inc
14648 NE 95th St
Redmond, WA 98052
Phone: (425) 883-3881

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Chapter 9: Wellhead Protection Program

City of Redmond 2024 Water System Plan

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9. Wellhead Protection Program

The City operates five shallow groundwater wells that deliver between 2.6 and 2.9 million gallons of water per day, comprising approximately 40 percent of the City's total drinking water supply. The wells withdraw water from a shallow alluvial aquifer and are located within Redmond's downtown and industrial areas. Therefore, the wells are susceptible to contamination based on the local hydrogeologic conditions and the proximity of potential pollution sources.

In response to this situation, the City has developed a comprehensive wellhead protection program (WHPP), also referred to as the groundwater protection program, to protect its groundwater supplies. The program was developed in accordance with the regulations of WAC 246-290-135. It includes multiple elements to protect the City's groundwater sources.

This chapter provides a history of the wellhead protection program, followed by a summary of key program elements and current activities. The chapter concludes with an assessment of the program's compliance with DOH regulations, and a description of future activities.

9.1. Background and History

In the early 1950s, the City began using groundwater as a source of supply, replacing its previous, unreliable surface water supply. Presently, five groundwater wells generally serve the portion of the City located east of the Sammamish River, while water obtained from the regional water transmission system of Seattle Public Utilities (SPU) serves the area west of the river and the Novelty Hill Service Area that lies several miles east of the City. For further information on areas served by these sources, see Chapter 3.

The shallow aquifer tapped by the wells is a highly permeable layer of sand and gravel located in the lower Bear Creek and Sammamish River Valleys. Due to the wells' high susceptibility to contamination, the City has developed a robust wellhead protection strategy. Key milestones in the history of the City's WHPP are summarized below.

- 1997. The City prepared and submitted to DOH a Wellhead Protection Report, with funding support from the State of Washington. The report provides:
    - A detailed description of the hydrogeologic setting of the City's groundwater sources.
    - Initial delineation of the groundwater time-of-travel zones for each well, based upon computer modeling.
    - An inventory of potential contaminant sources and an assessment of risk to groundwater supplies.
    - A water supply contingency plan.
    - A spill response plan.
    - Public education and involvement programs.
    - Strategies and actions for future implementation.
- 1999. The City Council adopted the *Wellhead Protection Report* and authorized the development of a wellhead protection ordinance.

- 2003. The City Council adopted the wellhead protection ordinance. The ordinance established wellhead protection zones, based upon the time-of-travel zones identified in the *Wellhead Protection Report*. All areas within the ten-year time-of-travel zones for all public water sources owned by the City are designated as critical aquifer recharge areas under the provisions of the Growth Management Act. Details of the regulations, programs, and enforcement mechanisms established by the ordinance are documented in Chapter 13.07 of the Redmond Municipal Code.
- 2005. Wellhead protection program implementation planning continued. Key items addressed included:
    - Definition of roles of City departments in wellhead protection.
    - Identification of actions to address deficiencies in the existing management framework.
    - Development of protocols for interdepartmental and interdivisional communication.
    - Development of a framework for a monitoring program.
    - Identification of resources needed to support the program.
    - Establishment of a technical assistance program to assist residents, businesses, and organizations in complying with the ordinance.
    - Development of key program strategies to guide the establishment of program components, standards, and best management practices required by the ordinance.
- 2008. The *Sampling and Analysis Plan (SAP)* was developed, describing the detailed procedures used to implement the groundwater monitoring program. Semi-annual groundwater monitoring commenced. An environmental database was built to house the data generated.
- 2008 and 2010. Ordinances were passed to update the requirements for registering, assessing and modifying stormwater infiltration systems that may present a risk to the groundwater resource. The majority of the 100 facilities identified as moderate or high risk to groundwater have been retrofitted to ensure groundwater is protected.
- 2011. Redmond entered into the Local Source Control Inter-Agency Agreement (IAA), now known as the Pollution Prevention Assistance IAA, with Ecology. This IAA provides annual funding for City staff to conduct technical assistance visits at businesses that store hazardous materials. Staff provide businesses with tools to properly store the hazardous materials and ensure surface water and groundwater are protected.
- 2016. Ordinance 2831 was passed adopting RMC 13.25 (Temporary Construction Dewatering). The code provides the City with options to prevent, limit, and respond to dewatering activities that impair the City's ability to deliver drinking water from the City water supply wells, safely convey and treat storm water runoff within the City's municipal separate stormwater sewer system and private storm water systems, and manage the movement and disposal of contaminated groundwater.
- 2016. Redmond code was analyzed for barriers to Low Impact Development (LID) to ensure LID is the preferred and commonly used approach to site development. City staff annually review proposed code changes to ensure this goal is continually met. In the

Critical Aquifer Recharge Area (CARA), LID is only available for infiltration of non-pollution generating surfaces.

- 2019. Updates to RMC 13.07 (Wellhead Protection) were adopted by Redmond City Council. Key items included in the update were:
    - Updated wellhead protection areas using a three-dimensional groundwater flow model informed by best available science (Figure 9-1). The updated wellhead protection areas were used to establish the CARA. CARA delineations were informed by stakeholder input and included a buffer to account for impacts from temporary construction dewatering. Figure 9-2 displays the full CARA that extends beyond the City limits into unincorporated King County.
    - Restricted reclaimed water use within the CARA.
    - Improved risk reduction to groundwater due to high risk activities such as fueling facilities. Changes include tertiary containment of tanks pits for new development and annual tank tightness tests for aging underground storage tanks.
- July 2019. City of Redmond Groundwater Quality Assurance Program Plan was developed. This document focused on supporting investigations for Redmond's Wellhead Protection Monitoring Program.
- 2020. Policy recommendations resulting from the temporary construction dewatering (TCD) triple bottom line analysis were accepted by Council. Staff are currently working to implement these recommendations.
- 2022. Ordinance 3093 was adopted by Council. This amendment to RMC 13.25 (Temporary Construction Dewatering) added limitations to dewatering to the rate, duration, and depth of dewatering within the CARA.

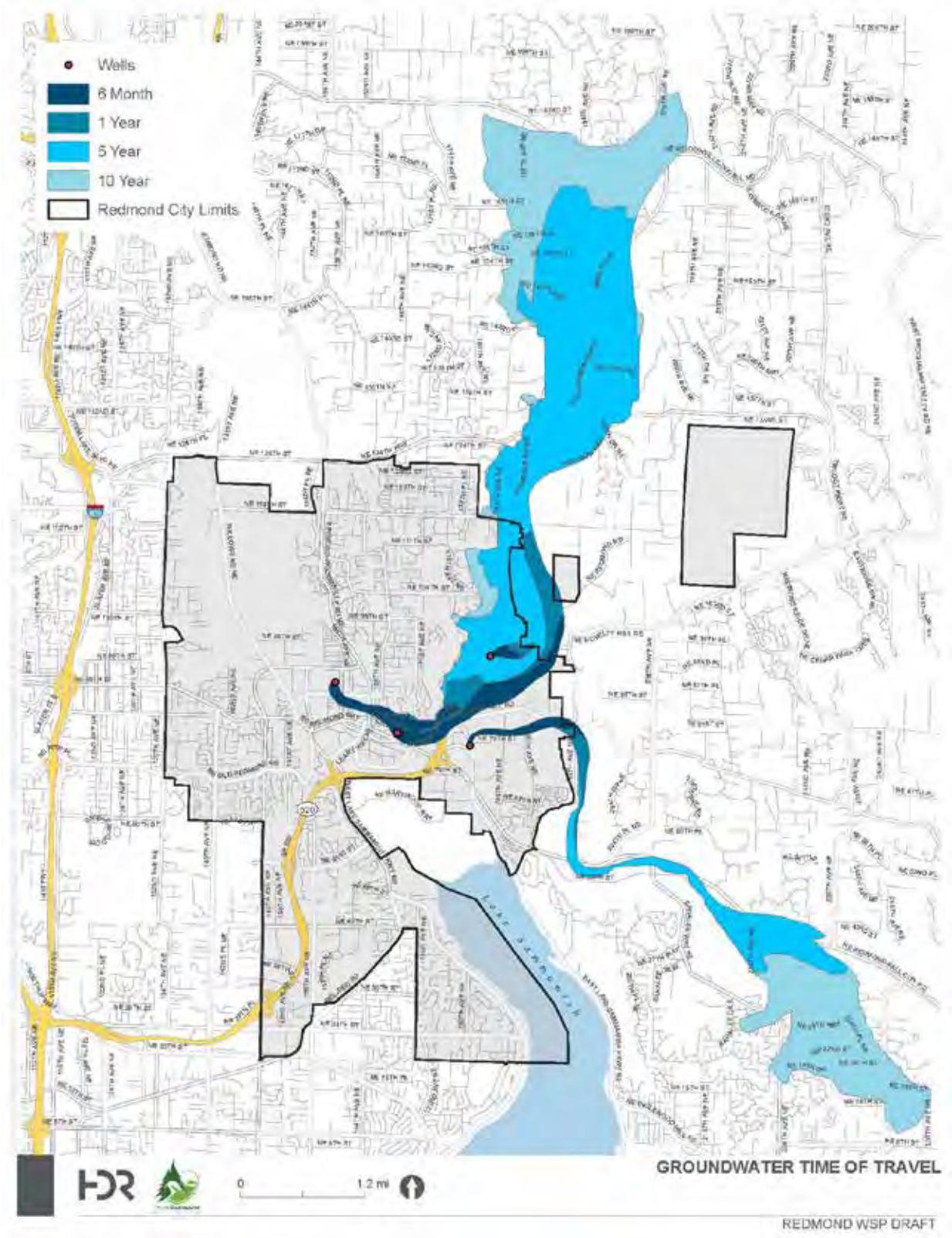


Figure 9-1. Wellhead protection time of travel zones

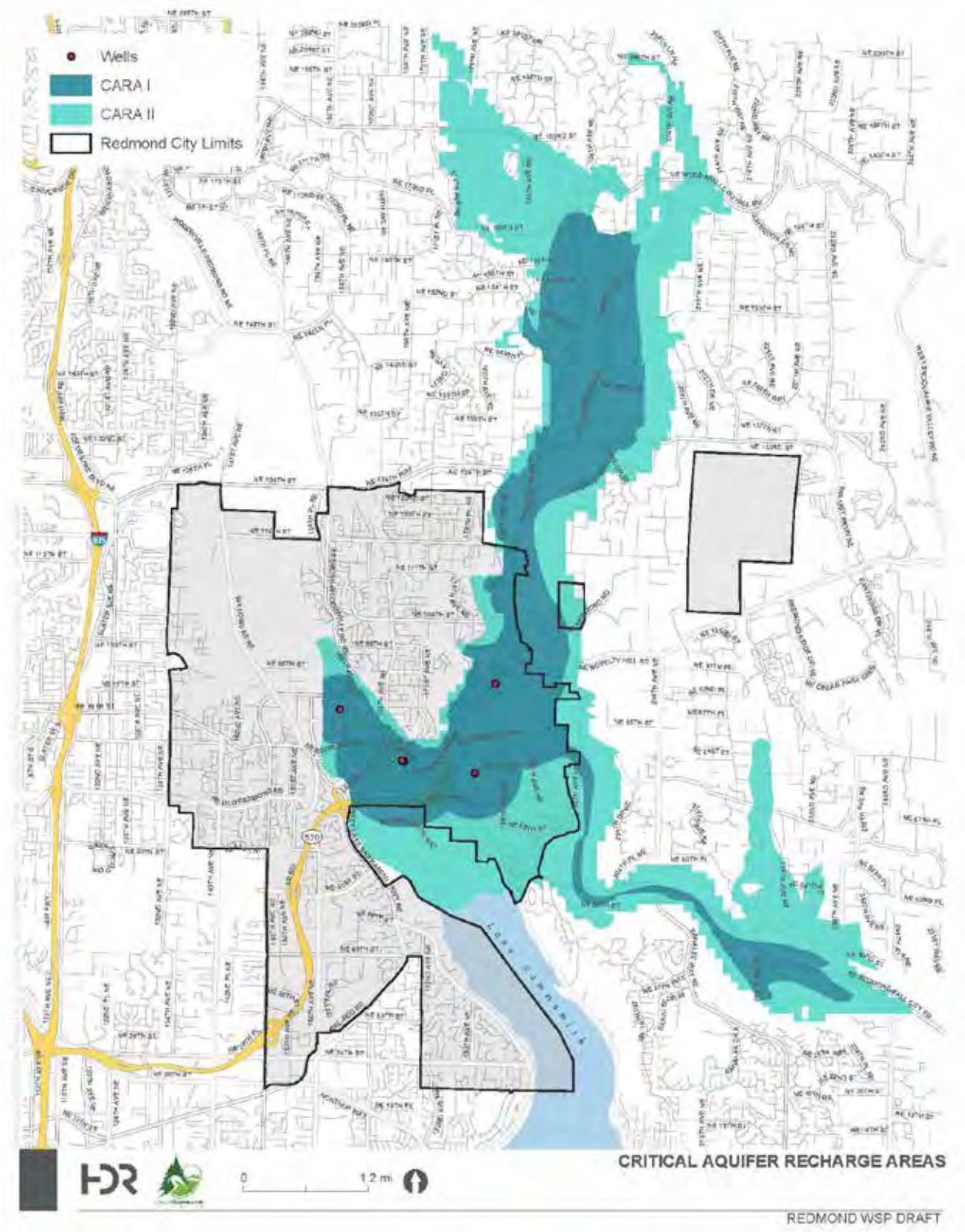


Figure 9-2. Critical Aquifer Recharge Areas

9.2. Key Program Elements and Current Activities

The City's WHPP is a multi-faceted program, with a range of programs and activities that together protect the City's groundwater sources. The primary elements of the program are described below. Additional detail is provided in WHPP working documents, which are on file at the City.

9.2.1. Groundwater Monitoring Program

The objective of the groundwater monitoring program is to serve as an early warning system for Redmond's drinking water supply wells. The groundwater monitoring program identifies potential contaminants in the groundwater so Redmond can take action before they reach a supply well. Additionally, the City tracks declines in water table levels. The program's objective is accomplished through utilization of an integrated network of monitoring wells to track the movement of groundwater and degraded water quality (ex. potential contaminants) within the City's Critical Aquifer Recharge Area (CARA), shown in Figure 9-2. Approximately 90 groundwater monitoring wells, the majority of which are located within the CARA, are maintained by the City. In addition to the city-owned monitoring network, Groundwater Protection staff have access agreements for several privately-owned wells that can be monitored for water level measurements. These agreements are cost-effective for the City to help fill data gaps.

The first complete sampling event occurred during early 2007. The monitoring wells are sampled on a semiannual basis. During each event, field staff take water level measurements at all monitoring wells. In addition, the following water quality parameters are evaluated at approximately 25 of the wells: pH, temperature, dissolved oxygen, oxidation-reduction potential, turbidity, specific conductivity, metals; volatile organic compounds (VOCs); fluoride, chloride, sulfate, nitrate (as N); bicarbonate; and total dissolved solids. Select wells may be sampled for additional analytes, including coliform bacteria, hydrocarbons, total organic carbon, phosphate, semi-volatile organic compounds, herbicides (including glyphosate), pharmaceuticals and personal care products, and per- and polyfluoroalkyl substances.

Groundwater data collected from sampling events and historic third-party information is stored and organized in a combination of the city's environmental database and electronic and paper files. Currently the City is using the EQuIS software application as its central repository for city collected data. Use of the database facilitates expanded analysis and water resource protection and assists with fulfilling public records requests. Data are analyzed to determine trends, develop relationships, and evaluate the condition of the aquifer.

The groundwater monitoring program allows the City to better understand the groundwater flow regime and groundwater interaction with surface water, track contaminant plumes, track potential water level and quality impacts from temporary construction dewatering pumping, and monitor cleanup efforts. It also supports evaluation of the effectiveness of the WHPPs' hazardous materials management processes and helps determine locations for additional monitoring wells in the future.

9.2.2. Contamination Reporting, Response, & Clean Up

Groundwater Protection staff collect and review data on investigation and cleanup activities and provide third party oversight of these activities in coordination with the Washington State

Department of Ecology (Ecology) and other agencies and city departments or divisions, to the extent necessary and practical. Owners or operators of facilities involved with a contamination event are required by code to provide notice to the City at the same time such an event is reported under either Ecology's Model Toxics Control Act (MTCA) cleanup regulations or the U.S. Environmental Protection Agency's (USEPA's) Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA). Notice must also be provided to the City within five days of receiving notification from Ecology or the USEPA that cleanup has been finished and no further actions are required.

9.2.3. Public Outreach, Technical Assistance, and Inspection Program

The City has established a public outreach program to inform customers and the general public about the City's wellhead and groundwater protection efforts and to provide avenues by which the public can contact City staff in order to obtain more information. The program involves the City's web page (www.redmond.gov/groundwater) and social media, articles in local periodicals, newsletters, and newspapers, and direct mailings to facilities. The web page provides background on the wellhead and groundwater protection program, maps, the wellhead protection municipal code, staff contact information, and links to related federal, State, and local programs.

City technical assistance and inspection programs provide stormwater and groundwater pollution prevention at sites Citywide, with additional emphasis placed on sites within the CARA. City Environmental Programs staff identify these sites during the business license review process, collecting information on hazardous materials use, storage, handling, and disposal. Businesses that handle hazardous materials are identified, evaluated, and assigned a reoccurring inspection frequency based upon the site's potential pollution risk.

Redmond Municipal Code 13.07 (Wellhead Protection) authorizes the City to inspect sites to determine compliance with City requirements. Inspections may include visual evaluation, inspections of hazardous materials storage and disposal, and sampling of soils, surface water, and groundwater at the site. In addition, the City encourages sites to minimize pollution risks by reducing hazardous materials quantities stored on-site, placing hazardous materials in secondary containment, and improving spill preparedness and spill response capabilities.

The City technical assistance and inspection programs have conducted 2,723 inspections from 2008 – 2022 throughout the City. As a result of these inspections:

- 66,106 gallons of hazardous materials have been secondarily contained.
- 18,509 gallons of hazardous materials have been removed from sites.
- 187 spill kits have been distributed.
- 33 containment pallets of secondary containment have been distributed.

9.2.4. Development Review and Capital Improvements

Groundwater Protection staff provides review of development and construction activities within the CARA, to ensure performance standards are met and to prevent activities that may potentially impact groundwater resources. Project plans and documents are reviewed to ensure that regulatory requirements are adhered to and groundwater resources are considered during

development review, tenant improvement and building permitting, construction and property acquisitions.

9.2.5. Stormwater Infiltration

This element of the WHPP involves review of the City's stormwater systems, private and public, to identify discharges of stormwater from pollution-generating surfaces into groundwater infiltration systems. The City has coordinated its stormwater infiltration modification program with the State's underground injection control (UIC) registration and retrofitting program. Assessments have been completed at the 100+ known infiltration facilities in the CARA. Most facilities that were identified as being a risk to groundwater have either been redeveloped and or will soon be redeveloped and brought up to current standards, which protects groundwater. Thirteen facilities have retrofitted their stormwater infiltration system and one facility is currently in the process of updating their stormwater infiltration system to protect groundwater. Three facilities, two of which are owned by the same entity, still need to be addressed.

9.3. Compliance with Source Water Protection Regulations

WAC 246-290-135 requires that the specific elements listed below be included in a WHPP. The various program elements, activities, and documents described above fulfill these source protection requirements.

9.3.1. Susceptibility Assessments

Assessments of the susceptibility of the City's well sources to contamination are included in Chapter 6 of the 1997 *Wellhead Protection Report*. This section of the report inventories potential groundwater contamination sources and prioritizes contaminant risks to groundwater in the wellhead protection zones. In 2018 a groundwater model was used to update the time of travel zone (also referred to as wellhead protection zones). An updated susceptibility evaluation is included in Appendix A of the Analysis of Groundwater Supply Protection Measures in the City of Redmond, Washington (March 2018).

9.3.2. Wellhead Protection Area Information

Chapter 4 of the 1997 *Wellhead Protection Report* and Chapter 2 of the 2018 Groundwater Flow Model Development Report provide a detailed description of the hydrogeologic setting of the City's groundwater sources. Wellhead protection zones were first delineated in the *Wellhead Protection Report* and have been subsequently updated in 2018. These updated areas were used to delineate the CARA. Current maps of the CARA are shown in Figure 9-2. Figure 9-1 depicts the current delineation of the protection, or time of travel, zones.

The land uses within the wellhead protection zones have not significantly changed since the writing of the *Wellhead Protection Report* and the *Analysis of Groundwater Supply Protection Measures.* However, the intensity of land use has increased. The area near Wells 1, 2 and 3 have become more dense, with mixed-use residential buildings being the majority of the development. The land near Well 5 has seen increases in the amount of commercial and industrial land uses. As a result, recent outreach, education, technical assistance, and pollution

prevention efforts have been focused within the Wells 1, 2, 4 and 5 time of travel zones, and within the CARA as a whole.

Another change that has occurred within the wellhead protection area in the past decade is the transition of some areas (e.g., along Union Hill Road and in the east Redmond industrial area) from septic systems to sewered wastewater collection. This change provides improved protection to the City's groundwater sources. The redevelopment occurring near Wells 1, 2, 4, and 5 have resulted in historic infiltration systems being updated to current standards, reducing the risk to groundwater. Redevelopment has also resulted in historical contaminated sites being remediated. Additionally, LID requirements have resulted in redeveloped properties infiltrating more of their clean stormwater runoff, providing more recharge to the aquifer.

9.3.3. Contaminant Source Inventory

Every two years the City must produce a Contaminant Inventory to meet State requirements. The Inventory must identify the locations of all known and potential groundwater contamination sources located within the CARA having the potential to contaminate the source water of the City's five drinking water wells. The most recent inventory (2023) was submitted to DOH and contained information provided by Lightbox Environmental Data Resources (EDR), which summarizes data from Federal, State, County, Local, and Tribal records. The City notified the appropriate regulatory agencies, local governments, and local emergency incident responders of the boundaries of the CARA and the findings of the Inventory. The next inventory will occur in 2025 and will be updated every two years per DOH's requirements.

The Contaminant Inventory is mapped by Groundwater Protection staff. This information will drive inspection, technical assistance visits, outreach, future monitoring locations, and clean-up activities.

9.3.4. Notification of Findings

The results of the contaminant source inventory are made available to Redmond residents and businesses through the annual Water Quality Report (also referred to as the Consumer Confidence Report). In 2022 the Water Quality Report included a map of the CARA, a description of the wellhead protection program, and tips of what residents and businesses can do to protect the groundwater. Water Quality Reports on even years have at least one page of the report dedicated to groundwater protection. The City continues public outreach and education through environmental awareness in school programs, adult educational opportunities, and exhibits at local fairs and events.

The City's technical assistance program, described earlier, is an important mechanism by which City staff can communicate with owners and operators of sites and facilities that handle materials that could potentially contribute to groundwater contamination.

9.3.5. Contingency Plan

State requirements specify that water systems using groundwater or springs must have a contingency plan to ensure that customers have an adequate supply of potable water in the event that contamination results in the temporary or permanent loss of the principal source of supply. The City's *Water Shortage Contingency Plan* (May 2009) and *Emergency Response Plan* (September 2020) provide a framework for responding to a loss of primary supply.

In the event that the City's groundwater sources become unavailable, the City can obtain additional water from its connections to Seattle Public Utilities' (SPU's) regional transmission system to meet needs normally supported by the wells.

9.4. Future Activities

The City intends to continue implementation of the key programs and activities described in Section 9.2. Program strategies will be revisited periodically, with modifications made as necessary to guide implementation. Key areas where program focus is anticipated to change include the following:

- *Policy.* Based on the findings from the TCD triple bottom line analysis and policy analysis, City staff have been working to implement policy updates. These updates are occurring through the Redmond Zoning Code ReWrite and Redmond 2050 comprehensive planning processes. Updates to RMC 13.25 (Temporary Construction Dewatering) to restrict TCD within the CARA is anticipated to occur in 2024.
- *Evaluation.* Staff will evaluate new land uses, developments, and construction techniques that could have an impact on groundwater quality or quantity. Issues that have been of recent concern pertain to the shift towards sustainable building including rainwater harvesting, geothermal systems, and grey water systems.
- *Water Conservation.* Redmond staff will conduct a water evaluation to meet the Climate Emergency Declaration adopted by the Redmond City Council on October 6, 2020. The declaration states that Redmond will Increase water conservation practices, reduce water intensity, and implement strategies to minimize use of potable water in municipal operations to achieve a net positive water footprint by 2030.
- *Integrated Pest Management*. Staff have assisted with creation of an Integrated Pest Management Plan for the City. The plan identifies specific pest management practices that should be implemented within the CARA to protect groundwater. The plan is anticipated to be adopted by the Public Works Director in 2024.

Chapter 10: Source, Storage, and Distribution System Analysis

City of Redmond 2024 Water System Plan

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10. Source, Storage, and Distribution System Evaluation

10.1. Introduction

This chapter provides an evaluation of the water system's ability to meet current and projected water supply needs of the City's water service area. Source and storage capacity analyses are presented, followed by an evaluation of the distribution system piping network. Required system improvements are also described throughout the chapter.

Throughout this chapter, capacity analyses are presented for 2023 (base year), 2033 (10-year forecast), and 2043 (20-year forecast).

10.2. Source Capacity Evaluation

The source capacity analyses presented in the following sections compare projected demands with current source capacities relative to DOH source capacity requirements. The demands used in this analysis are based on the demand forecast presented in Chapter 4. The total demand for the City Service Area was distributed amongst the Well, Rose Hill, and Overlake service areas based on the average proportion of demands in each service area as recorded in meter data for 2019 – 2021.

DOH requires different analyses for "open" pressure zones (i.e., pressure zones with storage open to the atmosphere) and "closed" zones (i.e., zones without storage where pressure is maintained via pumping). In open pressure zones, sources of supply must be sufficient to meet maximum day demands (MDD). In addition, DOH recommends calculating other supply metrics that evaluate system reliability under various adverse or emergency conditions. This WSP analyzes the following criteria for source capacity, consistent with requirements and recommendations set forth in the DOH 2020 Water System Design Manual:

- Provide maximum day demand with sources operating 24 hours per day (DOH requirement)
- Provide maximum day demand with sources operating 20 hours per day (DOH recommendation)
- Provide average day demand with sources operating 24 hours a day, but with the largest source offline (DOH recommendation)
- Provide maximum day demand while replenishing fire storage over 72 hours (DOH recommendation)

For closed pressure zones, sources of supply must be sufficient to meet peak hour demands (PHD) as well as supply fire flows during MDD conditions. The City analyzed closed zones using a stricter criteria of meeting PHD during fire flow conditions, which exceeds the DOH requirements for closed zones. Since the City is in a public water system coordination act area, the fire flow calculations must be conducted with the largest source out of service.

10.2.1. Well Service Area

Water supply for the Well Service Area is provided by the City's five groundwater wells and two connections to the Tolt 2 Supply Line (Tolt 2), i.e., the NE 172nd Street and NE 104th Street Supply Stations.

In addition, the Well Service Area can receive water from the Rose Hill Service Area through three metered connections located at: 1) Leary Way, 2) NE 90th Street, and 3) NE 85th Street. These supply connections are not included in the source capacity analysis, as they are not used during normal operations.

As summarized in Table 10-1, the combined capacity of the City's wells and Tolt 2 connections exceeds current and future source capacity requirements for the Well Service Area.

Table 10-1. Source Capacity – Well Service Area

	Year		
	2023	**2033**	**2043**
Projected ERUs and Demand[1]			
Equivalent Residential Units (ERU's)	22,647	26,800	30,797
Average Day Demand (gpd)	3,740,209	4,388,675	5,037,553
Maximum Day Demand (gpd)	9,421,142	11,148,678	12,811,599
Fire Flow Requirement (gpd)	840,000	840,000	840,000
Peak Hour Demand (gpm)[2]	10,551	12,470	14,318
Evaluation of Existing Sources (gpd)			
Available Existing Source [3]			
NE 172nd Street Supply Station (5,000 gpm)[4]	7,200,000	7,200,000	7,200,000
NE 104th Street Supply Station (5,000 gpm)[4]	7,200,000	7,200,000	7,200,000
Wells #1 (900 gpm)[5]	1,296,000	1,296,000	1,296,000
Wells #2 (500 gpm)[5]	720,000	720,000	720,000
Wells #3 (480 gpm)[5]	691,200	691,200	691,200
Wells #4 (400 gpm)[5]	576,000	576,000	576,000
Wells #5 (1,000 gpm)[5]	1,440,000	1,440,000	1,440,000
Total Available Source - 24 hour operation (gpd)	19,123,200	19,123,200	19,123,200
Total Available Source - 20 hour operation (gpd)	15,936,000	15,936,000	15,936,000
Total Available Source - Largest Offline (gpd)	11,923,200	11,923,200	11,923,200
Source Surplus/(Deficiency) (gpd)[6]			
Maximum Day Demand - 24 hour source operation	9,702,058	7,974,522	6,311,601
Maximum Day Demand - 20 hour source operation	6,514,858	4,787,322	3,124,401
Average Day Demand with Largest Source Offline	8,182,991	7,534,525	6,885,647
Fire Storage Replenishment During Max Day Demand[7]	9,422,058	7,694,522	6,031,601

Notes:

1. Projected demands are generated by multiplying the forecasted demands described in Chapter 4 by service area allocations developed using billing data. The demands include all of the Redmond Well Service Area (WSA). ERUs for the City Service Area calculated as Maximum Day Demand / Maximum Day ERU water use factor (416 gpd/ERU).
2. Peak hour demand calculated using Equation 3-1 in the 2020 Water System Design Manual, DOH publication 331-123.
3. Sources are assumed to be operating for 24 hours a day.
4. The capacity of the NE 172nd Street and NE 104th Street Supply Stations is each 5,000 gpm as documented in Chapter 3 - System Description.
5. The capacity of Wells #1 - #5 are estimated from Chapter 7 - Source Resource Evaluation. The following flow rates are the maximum permitted pumping rate. Well #1 is 900 gpm, Well #2 is 500 gpm, Well #3 is 480 gpm, Well #4 is 400 gpm, and Well #5 is 1,000 gpm.
6. The DOH requirement is that MDD be met by existing sources operating at 24 hours per day. The other comparisons shown are based on DOH recommendations.
7. Fire storage replenishment assumes 72 hour replenishment period. Fire suppression requirement is 3,500 gpm for 4 hours, or 840,000 gallons.

Within the Well Service Area, water is conveyed amongst multiple pressure zones through Pressure Reducing Valves (PRVs) and pump stations. The distribution system hydraulic analysis discussed in Section 10.4 examines the ability of these facilities to move water as needed to meet system demands.

10.2.2. Rose Hill Service Area

Water supply for the Rose Hill Service Area is provided by three connections to the Tolt Eastside Supply Line (TESSL), i.e., the Rose Hill Supply Stations Nos. 1, 2, and 3. These connections are shared with the City of Kirkland, so the total available source capacity for each source is reduced per the source descriptions in Chapter 3, Table 3-7.

In addition to the demands of the Rose Hill Service Area, water entering this service area may also be conveyed into the Well Service Area (through the three connections noted previously) and into the Bellevue-Overlake-Viewpoint Service Area (through two metered connections, at 156th Avenue NE and NE 51st Street). With the exception of the NE 51st Street connection, none of these connections are used during normal operations. Although the NE 51st Street connection does convey flow from Rose Hill to the 335 pressure zone of Bellevue-Overlake-Viewpoint on a more routine basis, it is assumed to be closed for the purpose of clarity in this source capacity analysis. For consistency, this same assumption is made in the analysis of the Bellevue-Overlake-Viewpoint Service Area, discussed in the following section. The flow of water between these zones was considered in the hydraulic analysis presented in Section 10.4.

As summarized in Table 10-2, the combined capacity of the City's three Rose Hill TESSL connections exceeds current source capacity requirements. On the 20 year planning horizon, sources will be insufficient to meet maximum day demands if operated for 24 hours a day. This deficiency occurs within the 10 year planning horizon, as sources are assumed to operate 20 hours a day. Therefore, the City will monitor water consumption in this service area and if it increases as anticipated, potential modifications to the agreement with Kirkland will be pursued to increase Redmond's capacity through the TESSL connections.

Table 10-2. Source Capacity Analysis – Rose Hill Service Area

	Year		
	2023	**2033**	**2043**
Projected ERUs and Demand[1]			
Equivalent Residential Units (ERU's)	13,403	15,978	18,462
Average Day Demand (gpd)	2,213,485	2,616,458	3,019,842
Maximum Day Demand (gpd)	5,575,506	6,646,664	7,680,120
Fire Flow Requirement (gpd)	840,000	840,000	840,000
Peak Hour Demand (gpm)[2]	6,278	7,468	8,616
Evaluation of Existing Sources (gpd)			
Available Existing Source [3]			
Rose Hill Supply Station #1 (1,029 gpm)[4]	1,481,760	1,481,760	1,481,760
Rose Hill Supply Station #2 (2,720 gpm)[4]	3,916,800	3,916,800	3,916,800
Rose Hill Supply Station #3 (1,530 gpm)[4]	2,203,200	2,203,200	2,203,200
Total Available Source - 24 hour operation (gpd)	7,601,760	7,601,760	7,601,760
Total Available Source - 20 hour operation (gpd)	6,334,800	6,334,800	6,334,800
Total Available Source - Largest Offline (gpd)	3,684,960	3,684,960	3,684,960
Source Surplus/(Deficiency) (gpd)[5]			
Maximum Day Demand - 24 hour operation	2,026,254	955,096	(78,360)
Maximum Day Demand - 20 hour operation	759,294	(311,864)	(1,345,320)
Average Day Demand with Largest Source Offline	1,471,475	1,068,502	665,118
Fire Storage Replenishment During Max Day Demand[6]	1,953,958	882,800	(150,656)

Notes:

1. Projected demands are generated by multiplying the forecasted demands described in Chapter 4 by service area allocations developed using billing data. The demands include all of the Redmond Rose Hill Service Area (RHSA). ERUs for the City Service Area calculated as Maximum Day Demand / Maximum Day ERU water use factor (416 gpd/ERU).
2. Peak hour demand calculated using Equation 3-1 in the 2020 Water System Design Manual, DOH publication 331-123.
3. Sources are assumed to be operating for 24 hours a day.
4. The capacity of the three Rose Hill Supply stations, and the City's share of the total capacity (shared with Kirkland) are documented in Chapter 3 - System Description, Table 3-7.
5. The DOH requirement is that MDD be met by existing sources operating at 24 hours per day. The other comparisons shown are based on DOH recommendations.
6. Fire storage replenishment assumes 72 hour replenishment period. Fire suppression requirement is 3,500 gpm for 4 hours, or 840,000 gallons.

Within the Rose Hill Service Area, water is conveyed amongst multiple pressure zones through PRVs and pump stations. The distribution system hydraulic analysis discussed in Section 10.4 examines the ability of these facilities to move water as needed to meet system demands.

A deficiency identified during a prior planning cycle within this service area that is related to supply is the limited capacity of the North Rose Hill Reservoir and Booster Pump Station to maintain the hydraulic grade line (HGL) in the 545 zone under very low Tolt system heads. During normal operating conditions, the 545 zone is fed directly from the three Rose Hill supply stations, as noted previously. However, during periods of maximum demand upon the Tolt

supply system as a whole, the head in the transmission system could drop below 545 feet to the minimum contract head of 530 feet. The North Rose Hill Booster Pump Station is intended to draw water from the North Rose Hill Reservoir (HGL of 450) and pump into the 545 zone, thus allowing the HGL to be maintained in the 545 zone when the Tolt system head drops below 545. Both the pump station and reservoir are presently undersized to operate under this circumstance while meeting MDD throughout the service area. Redmond and Kirkland are considering a project to upgrade Supply Station No. 3. A potential solution to this issue to be considered at the time of the supply station upgrade, is construction of a dedicated transmission main that would connect Supply Station 3 to the 450 zone, allowing water to flow directly into that zone and the North Rose Hill Reservoir under depressed Tolt head conditions. This, in conjunction with an appropriately sized upgraded North Rose Hill Booster Pump Station, would bolster the ability of the system to support the 545 zone during times of lowered Tolt head.

10.2.3. Bellevue-Overlake-Viewpoint Service Area

Water supply for the Bellevue-Overlake-Viewpoint Service Area is provided by five connections to the TESSL, as listed in Table 10-3. Of these, the NE 40th Street connection is located closest to the area served by Redmond. The remaining four connections are located in areas served by the City of Bellevue. Because these connections are shared with Bellevue, both Redmond and Bellevue demands are included in the source capacity analysis. Bellevue's demands are based on information presented in the Bellevue 2016 Water System Plan and hydraulic model.

In addition, the Bellevue-Overlake-Viewpoint Service Area can receive water from the Rose Hill Service Area through the two connections discussed in the previous section. For the purpose of clarity, no supply from these two connections is considered in this analysis.

As summarized in Table 10-3, the combined capacity of the City's five Bellevue-Overlake-Viewpoint TESSL connections exceeds current and future source capacity requirements for this service area.

Table 10-3. Source Capacity Analysis – Bellevue-Overlake-Viewpoint Service Area

	Year		
	2023	**2033**	**2043**
Projected ERUs and Demand[1]			
Equivalent Residential Units (ERU's)[2]	7,651	9,244	10,787
Average Day Demand - Redmond (gpd)	1,263,622	1,513,859	1,764,508
Maximum Day Demand - Redmond (gpd)	3,182,913	3,845,701	4,487,531
Average Day Demand - Bellevue (gpd)[3]	3,100,012	4,028,093	5,209,046
Maximum Day Demand - Bellevue (gpd)[3]	6,819,935	8,822,650	11,643,622
Fire Flow Requirement (gpd)	840,000	840,000	840,000
Peak Hour Demand - Redmond (gpm)	3,620	4,356	5,069
Evaluation of Existing Sources			
Available Existing Source (gpd)[4]			
NE 8th Street Supply Station (4,200 gpm)	6,048,000	6,048,000	6,048,000
NE 40th Street Supply Station (5,000 gpm)	7,200,000	7,200,000	7,200,000

	Year		
	2023	2033	2043
161st Pump Station (3,500 gpm)	5,040,000	5,040,000	5,040,000
Eastgate Supply Station (4,000 gpm)	5,760,000	5,760,000	5,760,000
SE 28th Supply Station (4,700 gpm)	6,768,000	6,768,000	6,768,000
Total Available Source - 24 hour operation (gpd)	30,816,000	30,816,000	30,816,000
Total Available Source - 20 hour operation (gpd)	25,680,000	25,680,000	25,680,000
Total Available Source - Largest Offline(gpd)	23,616,000	23,616,000	23,616,000
Source Surplus/(Deficiency) (gpd)[5]			
Maximum Day Demand - 24 hour operation	20,813,152	18,147,649	14,684,848
Maximum Day Demand - 20 hour operation	15,677,152	13,011,649	9,548,848
Average Day Demand with Largest Source Offline	19,252,366	18,074,047	16,642,446
Fire Storage Replenishment During Max Day Demand[6]	20,533,152	17,867,649	14,404,848

Notes:

1. Projected demands are generated by multiplying the forecasted demands described in Chapter 4 by service area allocations developed using billing data. The demands include all of the Redmond Well Service Area (WSA). ERUs for the City Service Area calculated as Maximum Day Demand / Maximum Day ERU water use factor (416 gpd/ERU).
2. ERUs based on Redmond demands only.
3. Demands for the Bellevue portion of the OSA were taken from the Redmond allocations of the Bellevue zone LH520 demands, described in tables 3-16 through 3-18 of Bellevue's 2016 Water System Plan.
4. Sources are assumed to be operating for 24 hours a day. Source capacities are the total capacities shared between Bellevue and Redmond.
5. The DOH requirement is that MDD be met by existing sources operating at 24 hours per day. The other comparisons shown are based on DOH recommendations.
6. Fire storage replenishment assumes 72 hour replenishment period. Fire suppression requirement is 3,500 gpm for 4 hours, or 840,000 gallons.

Within the Bellevue-Overlake-Viewpoint Service Area, water is conveyed amongst multiple pressure zones through PRVs and the NE 40th Street Pump Station. The distribution system hydraulic analysis discussed in Section 10.4 examines the ability of these facilities to move water as needed to meet system demands.

10.2.4. Novelty Hill Service Area

Water supply for the Novelty Hill Service Area is provided by a connection to the Tolt Tie Line, at the supply station located at Trilogy Parkway NE and NE 125th Street. Water from this supply station is used to meet demands within Novelty Hill and is also wheeled through Redmond's system to a portion of the Sammamish Plateau Water.

The Tolt Tie Line connection serves the 730 pressure zone through a flow- and pressure-reducing control valve, which maintains pressures and supply flow rates appropriate for the pressure zone. In addition, the City's Novelty Hill Pump Station's function is to supply the 730 pressure zone from the Tolt Tie Line should pressures in the Tie Line fall below the level required to supply the 730 pressure zone by gravity. The pump station can operate in three different modes: 1. Pump from the Tolt Tie Line to the Novelty Hill Reservoirs using flow control based on a level indicator. 2. Pump from the Tolt Tie Line to the distribution system using a

variable flow to maintain pressure. 3. Pump from the reservoirs to the distribution system using a variable flow to maintain pressure.

As summarized in Table 10-4, the capacity of the Tolt Tie Line supply connection exceeds current source capacity requirements for Novelty Hill. No future demand scenarios are analyzed because Novelty Hill is considered built out and does not anticipate demand increases throughout the 20-year planning horizon.

Table 10-4. Source Capacity Analysis – Novelty Hill Service Area

	Year
	Current
Projected ERUs and Demand[1]	
Equivalent Residential Units (ERU's)	5,876
Average Day Demand (gpd)	885,495
Maximum Day Demand (gpd)	2,230,456
Fire Flow Requirement (gpd)	840,000
Peak Hour Demand (gpm)[2]	2,556
Evaluation of Existing Sources (gpd)	
Available Existing Source[3]	
Seattle Tolt Tie Supply Line (7,900 gpm)[4]	11,376,000
Total Available Source - 24 hour operation (gpd)	11,376,000
Total Available Source - 20 hour operation (gpd)	9,480,000
Source Surplus/(Deficiency) (gpd)[5]	
Maximum Day Demand - 24 hour operation	9,145,544
Maximum Day Demand - 20 hour operation	7,249,544
Average Day Demand with Largest Source Offline	N/A
Fire Storage Replenishment During Max Day Demand[6]	8,865,544

Notes:

1. Projected demands are generated by multiplying the forecasted demands described in Chapter 4 by service area allocations developed using billing data. The demands include all of the Novelty Hill Service Area (NHSA). ERUs for the NHSA Service Area calculated as Maximum Day Demand / Maximum Day ERU water use factor for Novelty Hill (380 gpd/ERU).
2. Peak hour demand calculated using Equation 3-1 in the 2020 Water System Design Manual, DOH publication 331-123.
3. Sources are assumed to be operating for 24 hours a day.
4. The capacity of the Tolt Tie Supply Line is 7,900 as documented in Chapter 3 - System Description, Table 3-7.
5. The DOH storage capacity requirement for open pressure zones is to meet maximum day demands with existing sources. Average day demand with largest source offline and fire storage replenishment over 72 hours + maximum day demand are DOH recommended source capacity criteria.
6. Fire storage replenishment assumes 72 hour replenishment period. Fire suppression requirement is 3,500 gpm for 4 hours, or 840,000 gallons.

10.3. Storage Capacity Evaluation

The City's storage facilities reliably provide water supply for peak demands in excess of the City's supply capacity and provide supply during fires and other types of emergencies. The

storage facilities have been designed to include the storage components required by DOH. Details regarding DOH requirements and the City's design criteria for the various components are provided in Section 6.4.

The City's existing storage facilities and component volumes are summarized below, followed by an analysis of the ability of these storage volumes to meet current and projected buildout needs.

10.3.1. Existing Storage Facilities

The City's ten storage facilities contain operating, equalizing, fire suppression, standby, and dead storage components. Details regarding key design criteria and assumptions that form the basis for the storage volumes are provided below.

Operating Storage

For most of the City's reservoirs, the top five feet is reserved for operating storage (i.e., that volume that lies between low and high water storage elevations set by City operations staff to control system pumps and flow-control valves). Exceptions are:

- Perrigo Springs and Reservoir Park tanks, for which the top three feet are considered operating storage.
- Rose Hill North Reservoir, for which the top six feet defines the operating storage band.

Equalizing Storage

For reservoirs located within the In-City Service Area, the equalizing storage band was defined during design as the volume of water above the elevation required to provide a static pressure of 40 psi to the highest service connection fed by gravity from the tank, minus the operating storage.

Therefore, the equalizing storage volumes are based in part on the controlling highest service connection elevations, as obtained from the hydraulic model used in the distribution system analysis. Further description regarding certain highest service connection elevations are summarized below:

- *Well Service Area*. In the 238 Zone, there are existing services located above the highest elevation (125 feet). However, these services, which are located northeast of the SE Redmond Reservoir at elevations between 125 and 183 feet, are in fully built-out areas that are planned to be converted to higher pressure zones (300 and 350) in the future.
- *Rose Hill Service Area*. In the 545 Zone, there are seven existing service nodes in the hydraulic model with elevations between the highest elevation (425 feet) and 510 feet. However, these services are located along the north-south transmission line with no feasible means of providing higher pressures via gravity service from the South Rose Hill Reservoir. Similarly, in the 450 Zone, there are three existing service nodes with elevations slightly higher than that noted in the table (340 feet). These services (with elevations of 348 feet) are located near the North Hill Reservoir.

- *Overlake/Viewpoint Service Area*. The NE 40th Street Reservoir does not provide gravity flow to any services. All water from this tank is conveyed into the distribution system through the NE 40th Street Booster Pump Station. As such, there is no highest controlling elevation in this service area. The equalizing storage is therefore calculated as the entire storage volume less operating storage and that amount reserved for fire flow.

Fire Suppression Storage

As discussed in Section 6.4, the City's largest fire flow requirement is 3,500 gpm for four hours, or 840,000 gallons. This fire suppression volume is provided in each service area and is a part of that volume of the tank(s) in a given service area that provide between 20 and 40 psi to the highest customer elevation.

Standby Storage

Standby storage is the tank volume that can provide above 20 psi to the highest customer elevation, minus the operating, equalizing, and fire suppression storage volumes. In addition, where permanently installed or portable pumping equipment with backup power supplies can be used to boost pressures, storage below 20 psi can be considered standby storage, down to the elevation that the pumping equipment can draw from. With the exception of the Novelty Hill Reservoirs, which have dead storage as described below, the City is able to pump down to the bottom of its reservoirs.

It is also important to note that storage volumes located within the equalizing storage band are available for standby and fire suppression storage, in the event that the entire equalizing band is not needed to meet the calculated equalizing storage requirements.

Dead Storage

Any storage volume that cannot provide a minimum of 20 psi to the highest customer elevation fed by gravity from the tank or through pumps, as described above, is considered dead storage. Only the Novelty Hill Reservoirs have dead storage (a five-foot band at the bottom), since the Novelty Hill Pump Station is set to not operate at suction pressures lower than that provided by five feet of storage volume. This volume is removed from the total available for standby storage in this service area.

10.3.2. Required Storage Volumes

The City's storage facilities were designed to meet the level of service standard that was in place at the time the facility was built. They continue to meet their original design standards. In this analysis, they are also evaluated against current levels of service based on both existing and future water demands. The objective is to identify current and future deficiencies.

Within each of the reservoirs, the operating storage band has been defined and reserved for that purpose. Similarly, required fire suppression storage volumes have also been reserved. Therefore, the existing volumes associated with the remaining storage components (equalizing and standby) have been compared against equalizing and standby storage requirements, which are a function of water demand. Equalizing storage requirements are calculated as 22.75% of maximum day demand. Standby storage is calculated as 400 gallons per ERU (or 800 gallons for Novelty Hill). Additional discussion regarding these methodologies is provided in Section 6.4.

The demand data used in this analysis are the same as those presented in Chapter 4.

The analyses are done amongst pressure zone groupings within the service areas, based on the locations of tanks and the primary zones that they serve, in order to account for the pressure requirements associated with equalizing storage. Although equalizing and standby storage requirements are calculated and compared with their associated existing storage volumes separately, they are then also shown in a combined fashion, acknowledging that surplus equalizing storage volume is available to aid in meeting standby storage requirements.

Results summaries for each service area are provided below.

In-City Service Area

Each service area within the In-City service area is analyzed separately. Due to the interconnectivity of the In-City service areas, a summary of total In-City service area storage is also included after the service area-specific analyses.

Well Service Area. The analysis for this service area considers two pressure zone groupings: the upper pressure zones served primarily by the Education Hill Reservoirs (470, 565, 390, 350, and 315 zones) is shown in Table 10-5, and the lower pressure zones served primarily/directly by the three 238 zone tanks (238 and 300 zones) is shown in Table 10-6. While this provides an accurate depiction of the equalizing storage analysis, it is noted that due to the connectivity of the pressure zones through PRVs and pump stations, standby storage in all reservoirs is available throughout the service area.

Table 10-5. Upper Well Service Area Storage Analysis

	Year		
	2023	**2033**	**2043**
Projected ERUs and Demand[1]			
Equivalent Residential Units (ERU's)[2]	8,810	10,425	11,980
Average Day Demand (gpd)	1,454,984	1,707,244	1,959,665
Maximum Day Demand (gpd)	3,664,931	4,336,962	4,983,857
Peak Hour Demand (gpm)	4,155	4,902	5,621
Available Source (gpd)			
NE 172nd Street Supply Station[3]	7,200,000	7,200,000	7,200,000
NE 104th Street Supply Station[3]	7,200,000	7,200,000	7,200,000
Wells #1[4]	1,296,000	1,296,000	1,296,000
Wells #2[4]	720,000	720,000	720,000
Wells #3[4]	691,200	691,200	691,200
Wells #4[4]	576,000	576,000	576,000
Wells #5[4]	1,440,000	1,440,000	1,440,000
Total Available Source (gpd)	19,123,200	19,123,200	19,123,200
Multi-Source Credit (gpd)[5]	11,923,200	11,923,200	11,923,200

	Year		
	2023	**2033**	**2043**
Required Storage Calculations			
Operational Storage (gal)[6]	355,424	355,424	355,424
Equalizing Storage (gal)[7]	833,772	986,659	1,133,828
Standby Storage (gal)[8]	3,523,972	4,170,156	4,792,170
Fire Flow Storage (gal)[9]	840,000	840,000	840,000
Required Storage			
During Typical Operation (Greater than 40 or 30 psi at highest meter) (gal)[10]	1,189,196	1,342,083	1,489,252
During a Fire Event (Greater than 20 psi at highest meter) (gal)[11]	2,029,196	2,182,083	2,329,252
During Emergency Operation (gal)[12]	4,713,168	5,512,239	6,281,422
Available Storage (gal) to Maintain 40 psi [Operational and Equalizing]			
Education Hill Tank #1 and #2[13]	2,035,750	2,035,750	2,035,750
Total Existing Storage at 40 psi (gal)	2,035,750	2,035,750	2,035,750
Storage Surplus/(Deficiency) at 40 psi (gal)	**846,554**	**693,667**	**546,498**
Available Storage (gal) to Maintain 20 psi [Fire Suppression]			
Education Hill Tank #1 and #2[13]	3,681,868	3,681,868	3,681,868
Total Existing Storage at 20 psi (gal)	3,681,868	3,681,868	3,681,868
Storage Surplus/(Deficiency) at 20 psi (gal)	**1,652,672**	**1,499,785**	**1,352,617**
Available Storage (gal) for Emergency Operation [Standby][14]			
Education Hill Tank #1 and #2	5,000,000	5,000,000	5,000,000
Total Existing Storage (gal)	5,000,000	5,000,000	5,000,000
Storage Surplus/(Deficiency) (gal)	**286,832**	**(512,239)**	**(1,281,422)**

Notes:

1. Projected demands are generated by multiplying the forecasted demands described in Chapter 4 by service area allocations developed using billing data. The demands include demands forecast for pressure zones 470, 565, 390, 350, and 315. ERUs for the City Service Area calculated as Maximum Day Demand / Maximum Day ERU water use factor (416 gpd/ERU).
2. Number of ERUs are based on Maximum Day Demand divided by 416 gpd per Max Day ERU.
3. The capacity of the NE 172nd Street and NE 104th Street Supply Stations is each 5,000 gpm as documented in Chapter 3 - System Description.
4. The capacity of Wells #1 - #5 are estimated from Chapter 7 - Source Resource Evaluation. The following flow rates are the maximum permitted pumping rate. Well #1 is 900 gpm, Well #2 is 500 gpm, Well #3 is 480 gpm, Well #4 is 400 gpm, and Well #5 is 1,000 gpm.
5. Multi source credit calculation assumed largest source is off-line, in this case, both the NE 172nd Street Supply Station, or the NE 104th Street Supply Station.
6. Required Operational Storage is based on Storage Tank level when pump turns on. For the Education Hill #1 and #2 and SE Redmond Reservoirs, this is a band or 5 feet or level of 65, 65, and 62.4 feet respectively.
7. Required equalization storage equals the greater of peak hour demand minus total available source or 22.75% of total maximum day demand.
8. Required standby storage is defined for Redmond's Well Service Area as 400 gallons per ERU.

9. Required fire flow storage = 3,500 gpm x 4 hours.
10. Total required storage during typical operations is equal to the total of operational and equalizing storage. This storage must be at an elevation to provide 40 psi to highest service except in the 470 zone where a pressure requirement of 30 psi is used.
11. Total required storage greater than 20 psi is equal to the total of operational, equalizing, and fire flow storage. A minimum pressure of 20 psi when all standby storage volume is depleted is a recommended practice, but not a requirement.
12. Total storage required during an emergency is equal to the total of operational, equalizing, standby, and fire flow storage.
13. The 20 psi and 40 psi requirement is based on the highest service in the 470 Zone. The 470 Zone is used for this analysis as this is the only zone that receives water directly (i.e. not though a pressure reducing station) by gravity from the Education Hill #1 and #2 Reservoirs. The highest elevation in the 470 Zone is 372.3 feet.
14. Total available storage to meet operational, equalizing, and the greater of fire suppression or standby (fire suppression storage can be nested in standby storage). Total available storage is the entire reservoir capacity because the reservoirs can be pumped.

Table 10-6. Lower Well Service Area Storage Analysis

	Year		
	2023	**2033**	**2043**
Projected ERUs and Demand[1]			
Equivalent Residential Units (ERU's)[2]	13,837	16,374	18,817
Average Day Demand (gpd)	2,285,225	2,681,431	3,077,888
Maximum Day Demand (gpd)	5,756,211	6,811,716	7,827,742
Peak Hour Demand (gpm)	6,479	7,652	8,780
Available Source (gpd)			
NE 172nd Street Supply Station[3]	7,200,000	7,200,000	7,200,000
NE 104th Street Supply Station[3]	7,200,000	7,200,000	7,200,000
Wells #1[4]	1,296,000	1,296,000	1,296,000
Wells #2[4]	720,000	720,000	720,000
Wells #3[4]	691,200	691,200	691,200
Wells #4[4]	576,000	576,000	576,000
Wells #5[4]	1,440,000	1,440,000	1,440,000
Total Available Source (gpd)	19,123,200	19,123,200	19,123,200
Multi-Source Credit (gpd)[5]	11,923,200	11,923,200	11,923,200
Required Storage Calculations			
Operational Storage (gal)[6]	836,991	836,991	836,991
Equalizing Storage (gal)[7]	1,309,538	1,549,665	1,780,811
Standby Storage (gal)[8]	5,534,818	6,549,727	7,526,675
Fire Flow Storage (gal)[9]	840,000	840,000	840,000
Required Storage			
During Typical Operation (Greater than 40 or 30 psi at highest meter) (gal)[10]	2,146,529	2,386,657	2,617,803
During a Fire Event (Greater than 20 psi at highest meter) (gal)[11]	2,986,529	3,226,657	3,457,803
During Emergency Operation (gal)[12]	7,681,348	8,936,384	10,144,478

	Year		
	2023	2033	2043
Available Storage (gal) to Maintain 40 psi [Operational and Equalizing]			
Reservoir Park[13]	3,110,100	3,110,100	3,110,100
Perrigo Springs[13]	345,567	345,567	345,567
SE Redmond [13]	1,384,318	1,384,318	1,384,318
Total Existing Storage at 40 psi (gal)	4,839,984	4,839,984	4,839,984
Storage Surplus/(Deficiency) at 40 psi (gal)	**2,693,455**	**2,453,327**	**2,222,181**
Available Storage (gal) to Maintain 20 psi [Fire Suppression]			
Reservoir Park[13]	4,200,000	4,200,000	4,200,000
Perrigo Springs[13]	500,000	500,000	500,000
SE Redmond [13]	4,463,022	4,463,022	4,463,022
Total Existing Storage at 20 psi (gal)	9,163,022	9,163,022	9,163,022
Storage Surplus/(Deficiency) at 20 psi (gal)	**6,176,493**	**5,936,365**	**5,705,219**
Available Storage (gal) for Emergency Operation [Standby][14]			
Reservoir Park	4,200,000	4,200,000	4,200,000
Perrigo Springs	500,000	500,000	500,000
SE Redmond	4,500,000	4,500,000	4,500,000
Total Existing Storage (gal)	9,200,000	9,200,000	9,200,000
Storage Surplus/(Deficiency) (gal)	**1,518,652**	**263,616**	**(944,478)**

Notes:

1. Projected demands are generated by multiplying the forecasted demands described in Chapter 4 by service area allocations developed using billing data. The demands include demands forecasted for pressure zones 238 and 300. ERUs for the City Service Area calculated as Maximum Day Demand / Maximum Day ERU water use factor (416 gpd/ERU).
2. Number of ERUs are based on Maximum Day Demand divided by 416 gpd per Max Day ERU.
3. The capacity of the NE 172nd Street and NE 104th Street Supply Stations is each 5,000 gpm as documeted in Chapter 3 - System Description.
4. The capacity of Wells #1 - #5 are estimated from Chapter 7 - Source Resource Evaluation. The following flow rates are the maximum permitted pumping rate. Well #1 is 900 gpm, Well #2 is 500 gpm, Well #3 is 480 gpm, Well #4 is 400 gpm, and Well #5 is 1,000 gpm.
5. Multi source credit calculation assumed largest source is off-line, in this case, both the NE 172nd Street Supply Station, or the NE 104th Street Supply Station.
6. Required Operational Storage is based on Storage Tank level when pump turns on. For the Reservoir Park and Perrigo Spring Reservoirs, this is a band or 3 feet or level of 25 and 27 feet respectively. For the Education Hill #1 and #2 and SE Redmond Reservoirs, this is a band or 5 feet or level of 65, 65, and 62.4 feet respectively.
7. Required equalization storage equals the greater of peak hour demand minus total available source or 22.75% of total maximum day demand.
8. Required standby storage is defined for Redmond's Well Service Area as 400 gallons per ERU.
9. Required fire flow storage = 3,500 gpm x 4 hours.
10. Total required storage during typical operations is equal to the total of operational and equalizing storage. This storage must be at an elevation to provide 40 psi to highest service except in the 470 zone where a pressure requirement of 30 psi is used.
11. Total required storage greater than 20 psi is equal to the total of operational, equalizing, and fire flow storage. A minimum pressure of 20 psi when all standby storage volume is depleted is a recommended practice, but not a requirement.
12. Total storage required during an emergency is equal to the total of operational, equalizing, standby, and fire flow

storage.

13. The 20 psi and 40 psi requirement is based on the highest service in the 238 Zone. The 238 Zone is used for this analysis as this is the only zone that receives water directly (i.e. not though a pressure reducing station) by gravity from the Perrigo Springs, SE Redmond, and Reservoir Park Reservoirs. The highest elevation in the 238 Zone is 183 feet, however, areas of low pressure in this zone will be addressed in distribution system analysis. Excluded from this pressure requirement are to the northeast of the SE Redmond Reservoir, four nodes in distribution system, three nodes by PRV-47, and many nodes by the SE Redmond Reservoir in the 238 zone which have an elevation greater than 125 feet.
14. Total available storage to meet operational, equalizing, and the greater of fire suppression or standby (fire suppression storage can be nested in standby storage). Total available storage is the entire reservoir capacity because the reservoirs can be pumped.

There are currently storage surpluses for the 40 and 20 psi requirements in both the upper and lower Well Service Area pressure zone groupings, which will remain in surplus through the end of the planning period. However, the analysis indicates that standby storage becomes insufficient in the upper zone at the 10-year planning horizon, and that standby storage becomes insufficient for both zone groupings in the 20-year planning horizon. However, water from storage can be moved between the upper and lower zone groupings through booster pumps and PRVs, providing additional redundancy to meet supply requirements during an emergency.

Rose Hill Service Area. The analysis for this service area considers two pressure zone groupings: the upper pressure zones served most directly by the South Rose Hill Reservoir (545, 650, 425, and 335 zones), and the lower pressure zones served primarily/directly by the North Rose Hill Reservoir (450, 395, and 285). Table 10-7 and Table 10-8 display the storage analyses for the upper and lower Rose Hill Service Area, respectively.

Table 10-7. Upper Rose Hill Storage Capacity Analysis

	Year		
	2023	**2033**	**2043**
Projected ERUs and Demand[1]			
Equivalent Residential Units (ERU's)[2]	9,376	11,178	12,915
Average Day Demand (gpd)	1,548,500	1,830,410	2,112,608
Maximum Day Demand (gpd)	3,900,488	4,649,844	5,372,825
Peak Hour Demand (gpm)	4,392	5,225	6,028
Available Source (gpd)			
Rose Hill Supply Station #1 (1,029 gpm)[4]	1,481,760	1,481,760	1,481,760
Rose Hill Supply Station #2 (2,720 gpm)[4]	3,916,800	3,916,800	3,916,800
Rose Hill Supply Station #3 (1,530 gpm)[4]	2,203,200	2,203,200	2,203,200
Total Available Source (gpd)	7,601,760	7,601,760	7,601,760
Multi-Source Credit (gpd)[4]	3,684,960	3,684,960	3,684,960
Required Storage Calculations			
Operational Storage (gal)[5]	328,381	328,381	328,381
Equalizing Storage (gal)[6]	887,361	1,057,840	1,222,318
Standby Storage (gal)[7]	3,750,469	4,471,004	5,166,178

	Year		
	2023	2033	2043
Fire Flow Storage (gal)[8]	268,800	268,800	268,800
Required Storage			
During Typical Operation (Greater than 40 psi at highest meter) (gal)[9]	1,215,742	1,386,221	1,550,699
During a Fire Event (Greater than 20 psi at highest meter) (gal)[10]	1,484,542	1,655,021	1,819,499
During Emergency Operation (gal)[11]	4,966,211	5,857,224	6,716,876
Available Storage (gal) to Maintain 40 psi [Operational and Equalizing]			
South Rose Hill Reservoir[12,13]	1,806,694	1,806,694	1,806,694
Total Existing Storage at 40 psi (gal)	1,806,694	1,806,694	1,806,694
Storage Surplus/(Deficiency) at 40 psi (gal)	**193,718**	**23,239**	**(141,239)**
Available Storage (gal) to Maintain 20 psi [Fire Suppression]			
South Rose Hill Reservoir[12,13]	3,292,800	3,292,800	3,292,800
Total Existing Storage at 20 psi (gal)	3,292,800	3,292,800	3,292,800
Storage Surplus/(Deficiency) at 20 psi (gal)	**1,063,608**	**893,130**	**728,652**
Available Storage (gal) for Emergency Operation [Standby][14]			
South Rose Hill Reservoir[11]	3,292,800	3,292,800	3,292,800
Total Existing Storage (gal)	3,292,800	3,292,800	3,292,800
Storage Surplus/(Deficiency) (gal)	**(1,673,411)**	**(2,564,424)**	**(3,424,076)**

Notes:

1. Projected demands are generated by reviewing available land, zone by parcel data, and meter use. The demands include demands forecast for pressure zones 545, 650, 425, and 335 of the RHSA.
2. Number of ERUs are based on Maximum Day Demand divided by 416 gpd per Max Day ERU.
3. The capacity of shared Rose Hill Supply Station #1, #2, and #3 is 29.4%, 34%, and 34% respectively, as documented in Chapter 2 - System Description. Redmond's portions of these supply stations are 1,029 gpm, 2,720 gpm, and 1,530 gpm respectively.
4. Multi source credit assumes the largest interconnection with the TESSL is out of service.
5. Required Operational Storage is based on Storage Tank level when pump turns on. For South Rose Hill Reservoir this is a band of 5 feet or a level of 45 feet. The reservoir is shared with Kirkland and 29.4% of the South RS Reservoir is available to Redmond.
6. Required equalization storage equals 22.75% of total maximum day demand.
7. Required standby storage is defined for Redmond's Rose Hill Service Area as 400 gallons per ERU.
8. Required fire flow storage = 3,500 gpm x 4 hours. This requirement is shared with Kirkland with Redmond responsible for 32% of the fire storage and Kirkland responsible for 68% of the total fire storage requirement. Redmond's percentage of fire storage requirement is the weighted average of Redmond's percentage of the North and South Rose Hill Reservoir
9. Total required storage greater than 40 psi is equal to the total of operational and equalizing storage.
10. Total required storage greater than 20 psi is equal to the total of operational, equalizing, and fire flow storage. A minimum pressure of 20 psi when all standby storage volume is depleted is a recommended practice, but not a requirement.
11. Total storage required during an emergency is equal to the total of operational, equalizing, standby, and fire flow storage.

12. The volume of the South Rose Hill Reservoir is 11.2 Million Gallons. This facility is shared with Kirkland and 29.4% or 3.29 Million Gallons is available to Redmond.
13. The 20 psi and 40 psi requirement is based on the highest service in the 545 Zone. The 545 Zone is used for this analysis as this is the only zone that receives water directly (i.e. not though a pressure reducing station) by gravity from the South Rose Hill Reservoir. The highest service elevation in the Redmond Rose Hill and Kirkland 545 Zone is 510 feet, however, there are only seven service nodes with elevations greater than 425 feet. They are around the along the north-south transmission line, one southeast of South RH Reservoir, and supply PRV, therefore, an elevation of 425.3 feet is used to calculate the pressure requirements.
14. Total available storage to meet operational, equalizing, and the greater of fire suppression or standby (fire suppression storage can be nested in standby storage). Total available storage is the entire reservoir capacity because the reservoirs can be pumped.

Table 10-8. Lower Rose Hill Storage Analysis

	Year		
	2023	**2033**	**2043**
Projected ERUs and Demand[1]			
Equivalent Residential Units (ERU's)[2]	4,026	4,800	5,546
Average Day Demand (gpd)	664,985	786,048	907,234
Maximum Day Demand (gpd)	1,675,018	1,996,819	2,307,295
Peak Hour Demand (gpm)	1,886	2,244	2,589
Available Source (gpd)			
Rose Hill Supply Station #1 (1,498 gpm)[4]	1,481,760	1,481,760	1,481,760
Rose Hill Supply Station #2 (2,720 gpm)[4]	3,916,800	3,916,800	3,916,800
Rose Hill Supply Station #3 (1,530 gpm)[4]	2,203,200	2,203,200	2,203,200
Total Available Source (gpd)	7,601,760	7,601,760	7,601,760
Multi-Source Credit (gpd)[4]	3,684,960	3,684,960	3,684,960
Required Storage Calculations			
Operational Storage (gal)[5]	284,226	284,226	284,226
Equalizing Storage (gal)[6]	381,066	454,276	524,910
Standby Storage (gal)[7]	1,610,594	1,920,019	2,218,553
Fire Flow Storage (gal)[8]	268,800	268,800	268,800
Required Storage			
During Typical Operation (Greater than 40 psi at highest meter) (gal)[9]	665,292	738,502	809,135
During a Fire Event (Greater than 20 psi at highest meter) (gal)[10]	934,092	1,007,302	1,077,935
During Emergency Operation (gal)[11]	2,275,886	2,658,521	3,027,688
Available Storage (gal) to Maintain 40 psi [Operational and Equalizing]			
North Rose Hill Reservoir[12,13]	842,968	842,968	842,968
Total Existing Storage at 40 psi (gal)	842,968	842,968	842,968
Storage Surplus/(Deficiency) at 40 psi (gal)	**177,676**	**104,466**	**33,832**
Available Storage (gal) to Maintain 20 psi [Fire Suppression]			
North Rose Hill Reservoir[12,13]	3,034,862	3,034,862	3,034,862
Total Existing Storage at 20 psi (gal)	3,034,862	3,034,862	3,034,862
Storage Surplus/(Deficiency) at 20 psi (gal)	**2,100,770**	**2,027,560**	**1,956,927**
Available Storage (gal) for Emergency Operation [Standby][14]			
North Rose Hill Reservoir[12]	4,896,000	4,896,000	4,896,000
Total Existing Storage (gal)	4,896,000	4,896,000	4,896,000
Storage Surplus/(Deficiency) (gal)	**2,620,114**	**2,237,479**	**1,868,312**

Notes:

1. Projected demands are generated by reviewing available land, zone by parcel data, and meter use. The demands include demands forecast for pressure zones 450, 395, and 285 of the RHSA.
2. Number of ERUs are based on Maximum Day Demand divided by 416 gpd per Max Day ERU.
3. The capacity of shared Rose Hill Supply Station #1, #2, and #3 is 29.4%, 34%, and 34% respectively, as documented in Chapter 2 - System Description. Redmond's portions of these supply stations are 1,029 gpm, 2,720 gpm, and 1,530 gpm respectively.
4. Multi source credit assumes the largest interconnection with the TESSL is out of service.
5. Required Operational Storage is based on Storage Tank level when pump turns on. The North Rose Hill Reservoir has an operational band of 6 feet or a level of 97 feet. The reservoir is shared with Kirkland; 34% of the North RH Reservoir is available to Redmond.
6. Required equalization storage equals 22.75% of total maximum day demand.
7. Required standby storage is defined for Redmond's Rose Hill Service Area as 400 gallons per ERU.
8. Required fire flow storage = 3,500 gpm x 4 hours. This requirement is shared with Kirkland with Redmond responsible for 32% of the fire storage and Kirkland responsible for 68% of the total fire storage requirement. Redmond's percentage of fire storage requirement is the weighted average of Redmond's percentage of the North and South Rose Hill Reservoir
9. Total required storage greater than 40 psi is equal to the total of operational and equalizing storage.
10. Total required storage greater than 20 psi is equal to the total of operational, equalizing, and fire flow storage. A minimum pressure of 20 psi when all standby storage volume is depleted is an accepted practice, but not a requirement.
11. Total storage required during an emergency is equal to the total of operational, equalizing, standby, and fire flow storage.
12. The volume of the North Rose Hill Reservoir is 14.3 Million Gallons. This facility is shared with Kirkland and 34% or 4.9 Million Gallons is available to Redmond.
13. The 20 psi and 40 psi requirement is based on the highest service in the 450 Zone. The 450 Zone is used for this analysis as this is the only zone that receives water directly (i.e. not though a pressure reducing station) by gravity from the North Rose Hill Reservoir. The highest service elevation in the Remond Rose Hill and Kirkland 450 Zone is 348 feet, however, there are only three service nodes with elevations greater than 340 feet. They are around the North Rose Hill Reservoir, therefore, an elevation of 340 feet is used to calculate the pressure requirements.
14. Total available storage to meet operational, equalizing, and the greater of fire suppression or standby (fire suppression storage can be nested in standby storage). Total available storage is the entire reservoir capacity because the reservoirs can be pumped.

Storage is sufficient for 40 and 20 psi requirements through the 20-year planning horizon. Storage is insufficient to cover standby storage requirements in the upper pressure zone grouping during all planning horizons. Storage is sufficient to cover standby storage requirements in the lower pressure zone grouping throughout the planning horizon. Water from storage can be moved between the upper and lower zone groupings through booster pumps and PRVs, providing additional redundancy to meet supply requirements during an emergency.

Bellevue/Overlake/Viewpoint Service Area. The analysis for this service area is not broken out by pressure zones, because there is only one reservoir, and it does not provide gravity flow to any services. Because of the interconnectivity of the Redmond and Bellevue systems in this service area, the two cities essentially share all of their storage. However, the two systems have different level-of-service criteria for standby storage, with Redmond's standard requiring a greater volume of storage. For the purpose of this analysis, it was assumed that Redmond owns 44% of the tank, or approximately 2.09 million gallons of storage. Table 10-9 displays the storage capacity analysis for the Overlake Service Area.

Table 10-9. Overlake Storage Analysis

	Year		
	2023	**2033**	**2043**
Projected ERUs and Demand[1]			
Equivalent Residential Units (ERU's)[2]	7,651	9,244	10,787
Average Day Demand (gpd)	1,263,622	1,513,859	1,764,508
Maximum Day Demand (gpd)	3,182,913	3,845,701	4,487,531
Peak Hour Demand (gpm)	3,620	4,356	5,069
Available Source (gpd)[3]			
NE 40th Pump Station (5,000 gpm)	8,640,000	8,640,000	8,640,000
Total Available Source (gpd)[4]	8,640,000	8,640,000	8,640,000
Multi-Source Credit (gpd)	8,640,000	8,640,000	8,640,000
Required Storage Calculations			
Operational Storage (gal)[5]	373,518	373,518	373,518
Equalizing Storage (gal)[6]	724,113	724,113	1,020,913
Standby Storage (gal)[7]	3,060,494	3,697,789	4,314,933
Fire Flow Storage (gal)[8]	369,600	369,600	369,600
Required Storage			
During Typical Operation (Greater than 40 psi at highest meter) (gal)[9]	1,097,631	1,097,631	1,394,432
During a Fire Event (Greater than 20 psi at highest meter) (gal)[10]	1,467,231	1,467,231	1,764,032
During Emergency Operation (gal)[11]	4,158,125	4,795,420	5,709,365
Available Storage (gal) to Maintain 40 psi [Operational and Equalizing]			
NE 40th Street Reservoir[12]	2,086,371	2,086,371	2,086,371
Total Existing Storage during Typical Operation (gal)	2,086,371	2,086,371	2,086,371
Storage Surplus/(Deficiency) during Typical Operation (gal)	**988,739**	**988,739**	**691,939**
Available Storage (gal) to Maintain 20 psi [Fire Suppression][11]			
NE 40th Street Reservoir[12]	2,086,371	2,086,371	2,086,371
Total Existing Storage during a Fire Event (gal)	2,086,371	2,086,371	2,086,371
Storage Surplus/(Deficiency) during Fire Event (gal)	**619,139**	**619,139**	**322,339**
Available Storage (gal) for Emergency Operation [Standby][11]			
NE 40th Street Reservoir[12]	2,086,371	2,086,371	2,086,371
Total Existing Storage during Emergency Operation (gal)	2,086,371	2,086,371	2,086,371
Storage Surplus/(Deficiency) during Emergency Operation (gal)	**(2,071,754)**	**(2,709,050)**	**(3,622,994)**

Notes:

1. Projected demands are generated by multiplying the forecasted demands described in Chapter 4 by service area allocations developed using billing data. The demands include all of the Redmond Overlake Service Area (OSA). ERUs for the City Service Area calculated as Maximum Day Demand / Maximum Day ERU water use factor (416 gpd/ERU).
2. Number of ERUs are based on Maximum Day Demand divided by 416 gpd per Max Day ERU.
3. The reservoir is only accessible through the NE 40th Pump Station. Source is assumed to be operating for 24 hours a day.
4. No multi source credit is taken for the Bellevue-Overlake-Viewpoint Service Area.
5. Required Operational Storage is based on Storage Tank level when pump turns on, for the NE 40th Street Reservoir this is a level of 31 feet or the top 5 feet of the reservoir. These reservoirs are shared with Bellevue and 44% is available to Redmond. This analysis only requires the percentage of operational storage (44%) that is Redmond's responsibility.
6. Required equalization storage equals 22.75% of total maximum day demand.
7. Required standby storage is defined for Redmond's BOV Service Area as 400 gallons per ERU.
8. Required fire flow storage = 3,500 gpm x 4 hours. This requirement is shared with Bellevue with Redmond responsible for 44% of the fire storage and Bellevue responsible for 56% of the total fire storage requirement. Redmond's percentage of fire storage requirement is Redmond's portion of the NE 40th Street Reservoir
9. Total required storage during typical operation is equal to the total of operational and equalizing storage.
10. Total required storage during emergency operation is equal to the total of operational, equalizing, and fire flow storage.
11. The 20 psi and 40 psi pressure requirements are not applicable in this analysis as the NE 40th Street Reservoir does not serve any zones via gravity. The bottom 8 feet or 1.4 MG are considered dead storage that the NE 40th Street Pump Station can not be utilized.
12. The total volume of the NE 40th Street Reservoir is 6 Million Gallons. As stated in footnote 11 the dead storage is 1.36 MG. The total usable volume is 4.64 MG. This facility is shared with Bellevue and Redmond owns 44% of the tank or 2.09 million gallons is available to Redmond.

There are currently storage surpluses for the 40 and 20 psi requirements throughout the entire planning period. Standby storage is insufficient by 2.07 million gallons with present demands, which grows to a deficiency of approximately 3.6 million gallons by 2043. Redmond and Bellevue will consider additional storage in their combined service area. It would be impractical for Redmond alone to construct additional storage to meet its higher level of service standard as this water would also be used by Bellevue in the event the utilities need to sustain operations on standby storage.

Combined In-City Storage. The interconnectivity of each In-City service area allows for transfer of water between zones during an emergency, thereby supplementing standby storage in those zone groupings that are currently deficient. Table 10-10 displays a summary of standby storage requirements and available storage for the entire In-City service area.

Table 10-10. In-City Service Area Standby Storage Analysis

Service Area	Standby Storage Requirement[1]		
	2023	2033	2043
Well[2]	12,394,516	14,448,623	16,425,900
Rose Hill[2]	7,242,097	8,515,745	9,744,564
Overlake	4,158,125	4,795,420	5,709,365
Total Available Storage[3]	*24,475,171*	*24,475,171*	*24,475,171*
Standby Storage Surplus/(Deficiency)[4]	680,433	(3,284,618)	(7,404,658)

Notes:
[1] Standby storage requirement, for the sake of this evaluation, is the sum of operational, equalizing, and standby storage, per the storage design requirements.
[2] Standby storage requirements are the sum of the requirements of the two sub-zones in the identified service areas.
[3] Total available storage in the entire In-City Service Area. All storage is accessible through pumping out of the reservoirs.
[4] Total available storage minus the sum of standby storage requirements of the three In-City service areas.

There is a current surplus of standby storage in the In-City Service Area of approximately 0.68 million gallons. By 2033, this changes to a deficiency of approximately 3.3 million gallons, which grows to a deficiency of 7.4 million gallons in 2043. This deficiency is based on the City's standby storage standard of 400 gpd/ERU rather than DOH's planning standard of 200 gpd/ERU. Using the DOH standard, no deficiencies are forecast in the 20-year planning horizon. However, the City will continue to plan for future facilities using its own, stricter standard. The City is considering additional storage to meet the standby storage needs identified in these analyses.

Novelty Hill Service Area

Table 10-11 displays the storage capacity analysis for the Novelty Hill Service Area. The service area is considered built-out. Therefore, only current demands are analyzed for storage sufficiency. The existing storage facilities in Novelty Hill provide sufficient storage volumes to meet current requirements.

Table 10-11. Novelty Hill Storage Analysis

	Year
	Current
Projected ERUs and Demand[1]	
Equivalent Residential Units (ERU's)[2]	5,876
Average Day Demand (gpd)	885,495
Maximum Day Demand (gpd)	2,230,456
Peak Hour Demand (gpm)	2,556
Available, Existing Source (gpd)	
Seattle Tolt Tie Supply Line[3]	11,376,000
Total Available Source (gpd)	11,376,000
Multi-Source Credit (gpd)[4]	0
Required Storage Calculations	
Operational Storage (gal)[5]	321,615
Equalizing Storage (gal)[6]	507,429
Standby Storage (gal)[7]	4,700,645
Fire Flow Storage (gal)[8]	840,000
Required Storage	
During Typical Operation (Greater than 40 psi at highest meter) (gal)[9]	829,044
During a Fire Event (Greater than 20 psi at highest meter) (gal)[10]	1,669,044
During Emergency Operation (gal)[11]	5,529,689
Available Storage (gal) to Maintain 40 psi [Operational and Equalizing]	
Novelty Hill Tank #1	767,705
Novelty Hill Tank #2	1,219,296
Total Existing Storage at 40 psi (gal)	1,987,001
Storage Surplus/(Deficiency) at 40 psi (gal)	**1,157,958**

	Year
	Current
Available Storage (gal) to Maintain 20 psi [Fire Suppression]	
Novelty Hill Tank #1	1,912,094
Novelty Hill Tank #2	3,036,856
Total Existing Storage at 20 psi (gal)	4,948,950
Storage Surplus/(Deficiency) at 20 psi (gal)	**3,279,907**
Available Storage (gal) for Emergency Operation [Standby][(12)]	
Novelty Hill Tank #1	3,057,518
Novelty Hill Tank #2	4,856,058
Total Existing Storage During Emergency Event (gal)	7,913,577
Storage Surplus/(Deficiency) During Emergency Event (gal)	**2,383,888**

Notes:

1. Projected demands are generated by reviewing available land, zone by parcel data, and meter use. The demands include demands forecast for pressure zones 450, 395, and 285 of the RHSA.
2. Number of ERUs are based on Average Day Demand divided by 169 gpd per ERU.
3. The capacity of the Novelty Hill Supply Stations is 7,900 gpm as documeted in Chapter 3 - System Description.
4. Multi source credit is not available as there is only one transmission system (i.e. one source), the Seattle Tolt Tie Line, serving the Novelty Hill Service Area.
5. Required Operational Storage is based on Storage Tank level when pump turns on, for the Novelty Hill Reservoirs this is a level of 132 feet or the top 5 feet of the reservoir.
6. Required equalization storage equals 22.75% of total maximum day demand.
7. Required standby storage is defined for Redmond's Novelty Hill Service Area as 800 gallons per ERU.
8. Required fire flow storage = 3,500 gpm x 4 hours.
9. Total required storage greater than 40 psi is equal to the total of operational and equalizing storage.
10. Total required storage greater than 20 psi is equal to the total of operational, equalizing, and fire flow storage.
11. Total storage required during an emergency is equal to the total of operational, equalizing, and the greater of standby or fire suppression storage.
12. Total available storage to meet operational, equalizing, and the greater of standby storage or fire suppression storage during an emergency event. Novelty Hill Pump Station has an emergency event operating mode which allows the Novelty Hill Reservoirs to be isolated from the 730 zone and emptied via the pump station into the 730 zone without causing low pressure issues. Total available storage is equal to the volume of the storage tank with a 5 feet band of dead storage removed.

10.4. Distribution System Evaluation

The City's distribution system was analyzed with hydraulic models to identify areas unable to meet the following levels of service, as defined in more detail in Chapter 5:

1. Maintain pressures of 40 psi or greater at each service connection during periods of maximum use.
2. During fire flow events, assuming maximum instantaneous demands:
    a. Maintain minimum pressures of 20 psi at all locations
    b. Maximum velocity of 10 feet per second (fps) in distribution system network pipes

10.4.1. Hydraulic Analysis Methodology

The City's distribution system is represented in three separate hydraulic models: the Rose Hill – Well Service Area (RH-WSA), the Bellevue-Overlake-Viewpoint Service Area (BOV), and the Novelty Hill Service Area (NVH). The models are constructed in the modeling software platform WaterGEMS by Bentley.

The models were calibrated in 2011 using Supervisory Control and Data Acquisition (SCADA) data and fire flow tests conducted at hydrants. During this steady-state calibration minor loss components were added to pressure reducing valves (PRV) and settings were adjusted for control valves and pump curves to replicate system boundary conditions and headloss. In 2018, the BOV model was updated with piping added since 2011, and was calibrated using data from five hydrant flow tests. In 2019, the RH-WSA model was updated with piping added since 2011, and was calibrated using data from 12 hydrant flow tests. Additional analyses conducted using the model between 2019 and 2021 involved minor additional updates to the model to reflect small physical piping changes.

As part of the WSP update effort in early 2023, the calibrated model demands were updated for each planning scenario and deficiencies were identified based on criteria stated above. No other calibration was conducted due to the recent calibration efforts as noted above.

System Components

Three existing hydraulic models were used in this analysis: one for the Well Service and Rose Hill Service Areas, one for the Bellevue/Overlake/Viewpoint Service Area, and one for the Novelty Hill Service Area. Each model contained the following primary system components:

- Pipes
- Junctions
- Pressure reducing valves
- Reservoirs
- Pump stations
- Supply Station and Well source information

Hazen Williams C values were assigned to each pipe, to characterize the friction loss attributable to different pipe materials. These values are summarized in Table 10-12.

Table 10-12. Hazen Williams C Values for Pipe Materials

Material	C Value
Asbestos Cement	120
Cast iron	100
Ductile iron	130
PVC	130
Steel	100
Unknown	100

As part of this Water System Plan update, Redmond's existing WaterGEMS models were updated to include pipes installed in the system since the last modeling analysis (e.g., portions of the Novelty Hill infrastructure, adding 8-inch pipe along 183rd Ave), update closed/abandoned pipes in the system (abandoned 12-inch pipe near Microsoft complex and updating pipe sizes) and update pressure reducing station locations based on input from City staff. Updated GIS information was used as a basis for defining the new facilities placed into the model.

Water Demand Allocation

The demand data used in the hydraulic analyses were developed through analysis of parcel-level data for existing and future modeling scenarios. This was done in order to support spatial distribution of demands across the water system's various service areas and pressure zones.

Existing (2023) Demands

Meter consumption data for 2019 were used to allocate demands in the hydraulic models. These spatially-allocated demands were then adjusted based on the demand forecasts mentioned in Chapter 4 to arrive at existing demands that reflect demands for year 2023. The existing water demand for Redmond City service area in the three models is shown in Table 10-13.

Table 10-13. 2023 Demands from Demand Allocation

Planning Year	RH-WSA Average Day Demand (gpm)	BOV Average Day Demand (gpm)	NVH Average Day Demand (gpm)
2019	3,260	1,020	530
Existing (2023)	3,810	1,190	520

For the Novelty Hill Service Area (NVH), the same methodology was followed, and demands were allocated throughout the entire service area. The NVH system provides water to a golf course that can draw relatively large amounts of water from the system.

For the Bellevue-Overlake-Viewpoint Service Area (BOV), the City's demand database includes nodes only in the Redmond portion of the service area, whereas the BOV model itself includes other areas served by the City of Bellevue. The demands outside the Redmond portion of the service area were not adjusted for planning year 2019. Demands for areas served by City of Bellevue for all future planning scenarios were interpolated using demand forecasts from City of Bellevue's most recent master plan update. The updated total existing (2023) demand for BOV, including Bellevue demands, was 3,336 gpm.

For the Rose Hill – Well Service Area (RH-WSA), the City's demand database includes nodes only in the Redmond portion of the service area, whereas the RH-WSA model itself includes other areas served by the City of Kirkland.

The updated demand assignment for the Existing 2023 demand alternative for the RH-WSA model was performed separately for three geographical regions:

1. West of I-405. The RH-WSA model does not need to include the Kirkland infrastructure west of I-405. In the Kirkland model, junctions west of I-405 have an ADD of 2,095 gpm.

This demand is met by pipes that cross I-405 at 60th Street, 85th Street, and 116th Street. The ADD was applied in three equal demands of 698 gpm at the model nodes on the west side of these three crossings. These demands were assumed to be the same for planning year 2019 and were increased with the same factor as used for the Redmond City area for the existing, 10-year and 20-year modeling scenarios.

2. East of I-405 and west of Redmond service area. This area is served by the City of Kirkland, but the infrastructure affects the supply to the City of Redmond. Therefore, this area was included in the RH-WSA model. In the Kirkland model, the junctions in this area had an ADD of 612 gpm. These demands were assumed to be the same for planning year 2019 and were increased with the same factor as used for the Redmond City area for the existing, 10-year and 20-year modeling scenarios.
3. Inside Redmond service area. The RH-WSA junctions inside the Redmond service area were assigned demands as part of the demand allocation task. These junction demands were updated in the WaterGEMS model for the Existing 2023 ADD demand alternative. The ADD for these nodes was 3,810 gpm.

The total ADD assigned to the RH-WSA model for Existing 2023 conditions, including Kirkland demands, was 7,006 gpm.

Future Modeling Scenario Demands

Existing system demands were increased to 10-year (2033) and 20-year (2043) scenarios based on the demands forecasted. The total demands for 10-year and 20-year future modeling scenarios for the Redmond City Service area nodes in the three models are shown in Table 10-14.

Table 10-14. Future Demands from Demand Allocation

Model		RH-WSA			BOV			NVH
Service Area		Redmond	Kirkland	Total	Redmond	Bellevue	Total	Redmond
Planning Year	Scenario	ADD (gpm)	ADD (gpm)	ADD (gpm)	ADD (gpm)	ADD (gpm)	ADD (gpm)	ADD (gpm)
10 – year 2033	ADD	4,490	3,770	8,260	1,410	2,790	4,200	520
20 – year 2043	ADD	5,180	4,340	9,520	1,620	3,610	5,230	520

For RH-WSA, the demand database includes nodes only in the Redmond portion of the service area. The increase in demands in the Kirkland area for the future modeling scenarios was assumed to be consistent with Redmond City Area.

For BOV, the City's demand database includes nodes only in the Redmond portion of the service area. Bellevue's demands (i.e., those outside the Redmond portion of the service area) were adjusted based on demand forecasts given in the City's most recent master plan. The updated total demand for 20-year planning scenario, including Bellevue demands, was 14,928 gpm.

For NVH, demands were allocated throughout the entire service area. NVH service area is considered built out and the demands allocated for each planning scenario are representative of that.

Maximum Day and Peak Hour Demands

Modeling scenarios were created to evaluate conditions during MDD and PHD conditions. Demand scenarios for these conditions were created in the hydraulic model by using peaking factors to increase the values of ADD that had been assigned to each node using the procedure described in the above sections for existing and future modeling scenarios. The peaking factor is 2.3 for ADD to MDD for all the models. The peak hour demand factors were calculated using equation 3-1 from the 2020 Water System Design Manual. The equation calculates a peaking factor based on the number of ERUs in each service area. The peak hour demand factors for each service area are calculated as given below:

Table 10-15. Peak Hour Demand* Factors per Planning Year

Planning Year	RH-WSA	BOV	NVH
2019	4.08	4.12	4.55
2023	4.08	4.12	4.55
2033	4.11	4.14	4.55
2043	4.10	4.14	4.55

*PHD = $(ERU_{MDD}/1440)*[(C)(N)+F]+18$, where N is the number of ERUs in the study area, and C and F are coefficients based on the value of N, described in Table 3-1 of the 2020 Water System Design Manual.

Modeling Scenarios

Redmond has an extensive and interconnected distribution system. The system analysis looks for areas of low pressure and deficient fire flows where the existing system cannot provide adequate service during existing and future PHD conditions. The models were used to identify improvements that would increase the distribution system capacity to meet the required level of service for static pressures and fire flows at peak hour during maximum day conditions.

A minimum pressure of 40 psi must be maintained at all customer connections under peak hour demand conditions with operational and equalizing storage depleted in the reservoirs. A minimum of 20 psi must be maintained for fire flows under PHD conditions with operational, equalizing, and fire suppression storage depleted. Additionally, pipeline limiting velocity of 10 fps was used during fire flow conditions. If these criteria could not be met, improvements were identified and through an iterative trial-and-error process, implemented until pressure criteria could be satisfied with a minimum of total pipe and facility additions.

A number of steady state hydraulic analyses were completed for each service area for existing (2023), 10-year and 20-year future demand conditions. These considered pressures and fire flow availability during instantaneous PHD conditions. Table 10-16 describes the modeling scenarios conducted, and the sequence within which they were performed.

Table 10-16. Modeling Scenarios

Description	Demand	Purpose
Existing Peak Hour	2023 Peak Hour Demand	Evaluate system deficiencies
Existing Peak hour and Fire Flow	2023 Peak Hour Demand plus Fire Flow	Evaluate system deficiencies
10 – Year Peak Hour	10 – Year Peak Hour Demand	Evaluate system deficiencies
10 – Year Fire Flow	10 – Year Peak Hour Demand plus Fire Flow	Evaluate deficiencies
20 – Year Peak Hour	20 – Year Peak Hour Demand	Evaluate system and develop CIP for 20-year PHD demand conditions
20 – Year Fire Flow	20 – Year Peak Hour Demand plus Fire Flow	Evaluate system and develop CIP for 20-year PHD conditions during fire flow

10.4.2. Distribution System Evaluation

The hydraulic models were used to evaluate the distribution system under existing and future flows. The four service areas (Well, Rose Hill, Bellevue-Overlake-Viewpoint, and Novelty Hill) are represented in three separate hydraulic model files. For the summary below, the results have been combined to simplify the presentation of results across the City's entire service area.

Peak Hour Demand Results

Figure 10-1 depicts static pressures throughout the Well, Rose Hill, and Bellevue-Overlake-Viewpoint Service Areas under existing peak hour demand conditions. Figure 10-2 and Figure 10-3 present pressures for these same areas under 10-year demand and 20-year demand modeling scenarios The Novelty Hill service area is considered built out and the demands remain constant across all planning scenarios. Figure 10-4, presents static pressures throughout for the Novelty Hill Service Area for existing, 10-year and 20-year demand scenarios.

Existing System Results

Pressures throughout the water system are generally maintained above the 40-psi criterion. There are some exceptions that include the area along NE 104th Street near the Education Hill Reservoirs, where pressures are controlled largely by the water level in these tanks. Based on the ground elevation of approximately 395 feet along 104th Street, the peak hour pressure is between 25 and 30 psi. This low pressure is due to existing topography and is not caused by excessive head loss in the distribution system. During most operational conditions the City is able to maintain the level in the Education Hill tank between 460 and 470, thereby providing pressures of at least 30 psi to customers in this area. This includes a looped pipeline along the Redmond High School. The existing topography along 171st Ave NE (higher elevations) has resulted in lower pressures along the 16-inch line connecting to Redmond Reservoir Park. Another area of deficiency includes pipes located on local high points (for example, NE 88TH

place and model junctions that are located just downstream of a PRV at 154th Ave NE and NE 51st Ave). These factors were taken into consideration while proposing improvements and PRV settings were adjusted. Recommended improvements are noted in section 10.4.3.

10-year Peak Hour Demands

Pressure results throughout the water system for this future scenario are similar to those in the existing system scenario. Additionally, the deficiencies include areas on a 20-inch water main along 132nd Ave NE. This location observes a deficiency as it is just downstream of the Rose Hill tank.

20-year Peak Hour Demands

Pressure results throughout the water system for this future scenario are similar to those in the existing system and 10-year peak hour demand scenario. Additionally, low pressures were observed in the 176th and 177th Ave NE region on the 8-inch looped pipeline in proximity to the Education Hill Reservoirs.

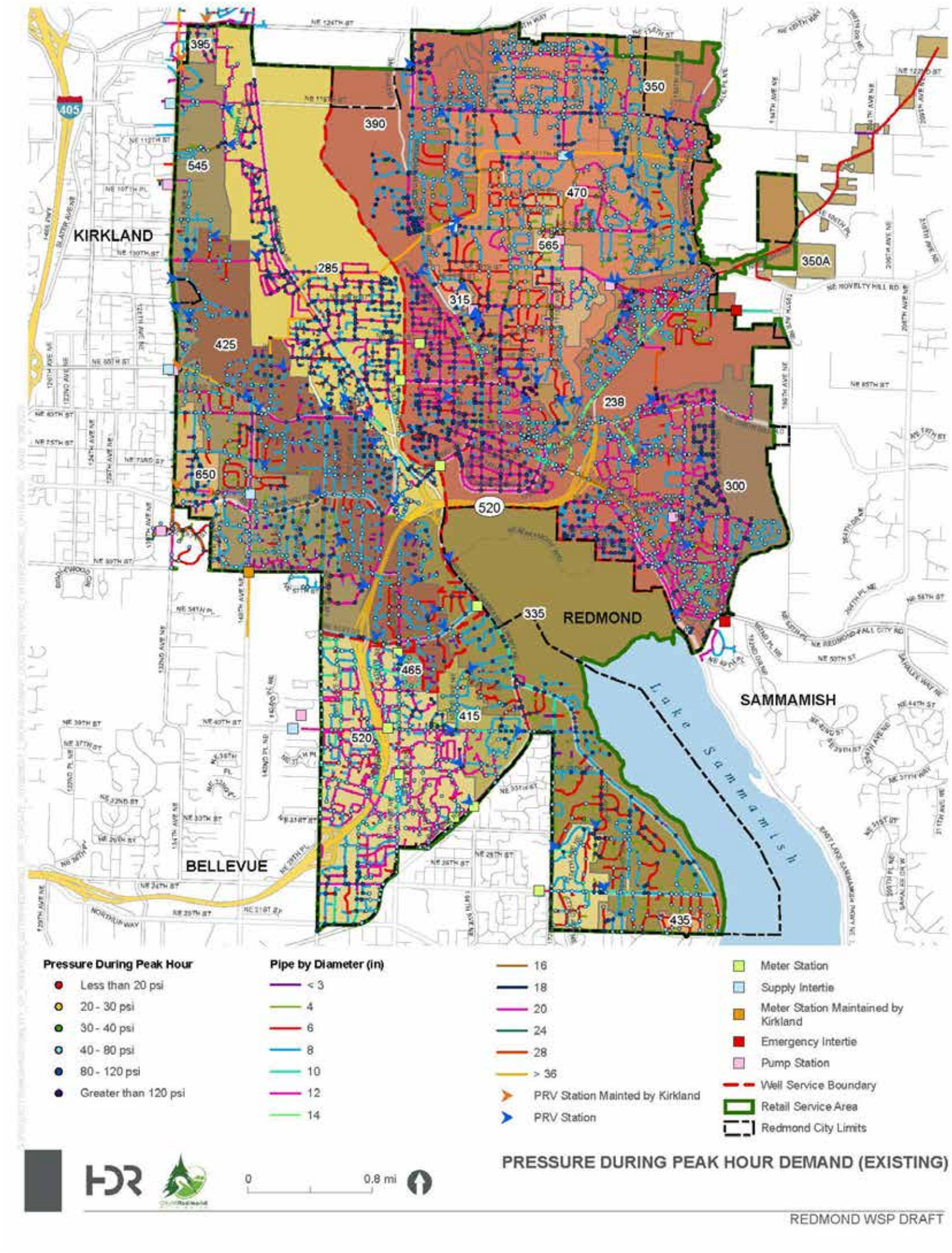


Figure 10-1. Pressure During Peak Hour Demand (Existing)

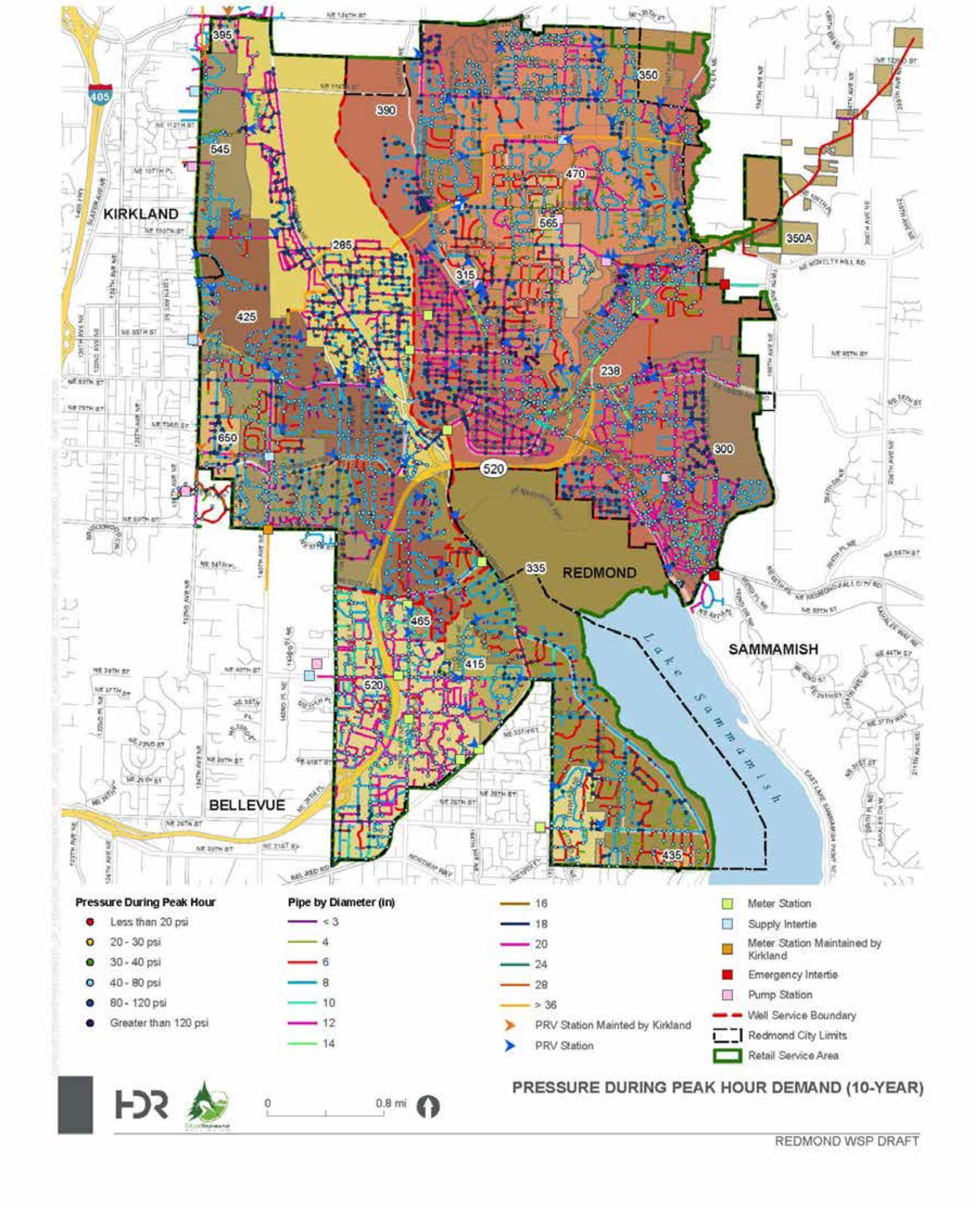


Figure 10-2. Pressure During Peak Hour Demand (10-Year)

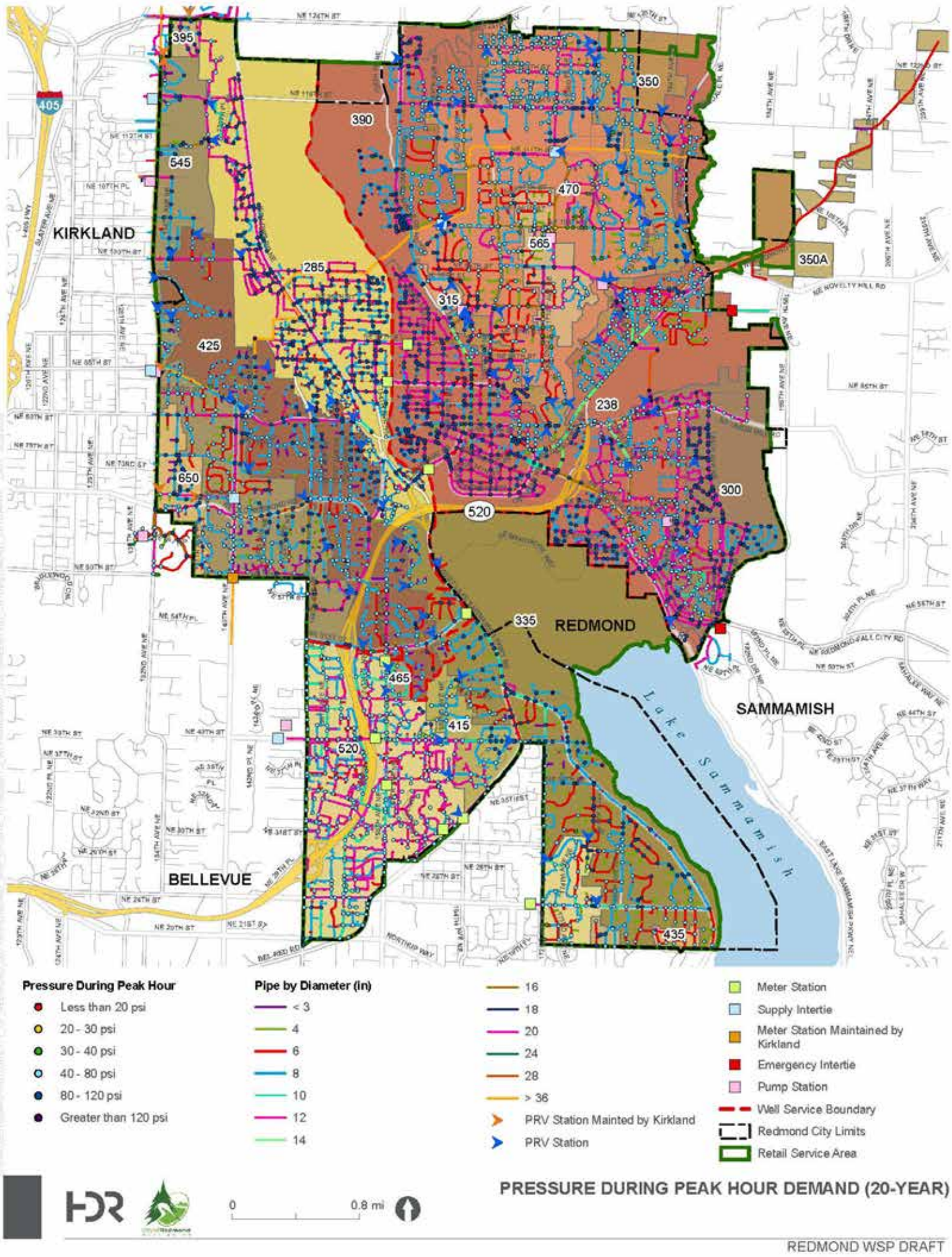


Figure 10-3. Pressure During Peak Hour Demand (20-Year)

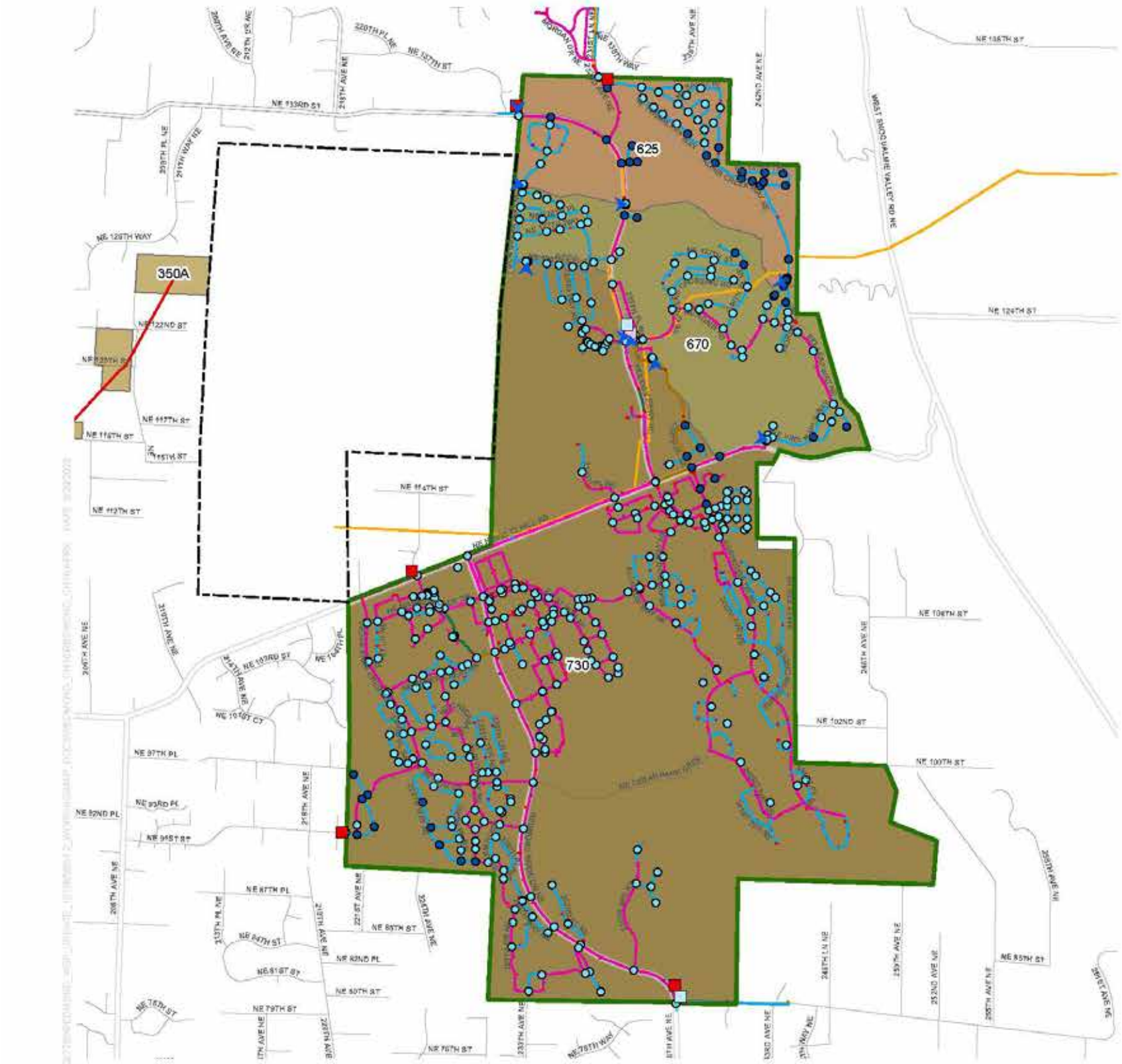


Figure 10-4. Novelty Hill Pressure During Peak Hour Demand

Fire Flow Results

Figure 10-5 depicts available fire flows throughout the Well, Rose Hill, and Bellevue-Overlake-Viewpoint Service Areas under existing peak hour demand conditions.

Figure 10-6 and Figure 10-7 present fire flows for these same areas under 10-year and 20-year future demand conditions. Figure 10-8 presents available fire flows throughout the Novelty Hill Service Area under existing peak hour demand conditions. As the NVH service area is considered built out the available fire flows under 10-year peak hour and 20-year peak hour demand conditions do not change with respective to the existing.

Available fire flows throughout the water system generally exceed required thresholds (i.e., typically 1,500 gpm for residential areas, and 3,500 gpm for nonresidential areas)

Existing System Available Fire Flow Results

There are a few neighborhoods that were developed in the 1970s and earlier that have fire flow availability less than what would be required by the Fire Department if the homes were to be constructed today. Model areas not meeting minimum pressure or maximum velocity criteria and their available fire flows are summarized in Appendix N for the existing system. These neighborhoods still have the fire flow availability that existed at the time the neighborhood was constructed. The infrastructure in these neighborhoods is 40 years old and aging. Pipes in these parts of the system will eventually be replaced as part of Redmond's water system replacement program. Increased fire flow availability will be a design requirement of those future projects. These neighborhoods with low fire flow availability may be given priority in the pipe replacement program. See Chapter 12, project D-1 for more detail on the City's pipeline replacement program. Junctions not meeting fire flow criteria are listed in Table 1 in Appendix N.

10-year Available Fire Flow Results

As demands increase, the fire flow results show increasing numbers of deficiencies. The available fire flows are presented in Figure 10-6 and hydrant nodes that do not meet criteria are summarized in Table 2 of Appendix N.

20-year Available Fire Flow Results

As demands increase, the fire flow results show increasing numbers of deficiencies. The available fire flows are presented in Figure 10-7 and hydrant nodes that do not meet criteria are summarized in Table 3 of Appendix N. The 20-year peak hour and fire flow demand condition using both pressure and velocity constraints was considered as the worst-case scenario on the existing system. Additional analyses were done to distinguish between the two criteria. Figure 10-9 depicts the deficiencies for this scenario and indicates if the deficiency is caused due to the maximum 10 fps velocity constraint or the 20-psi minimum pressure constraint. Improvements were identified to resolve all hydrant nodes that fail criteria for the 20-year peak hour demands and fire flow conditions.

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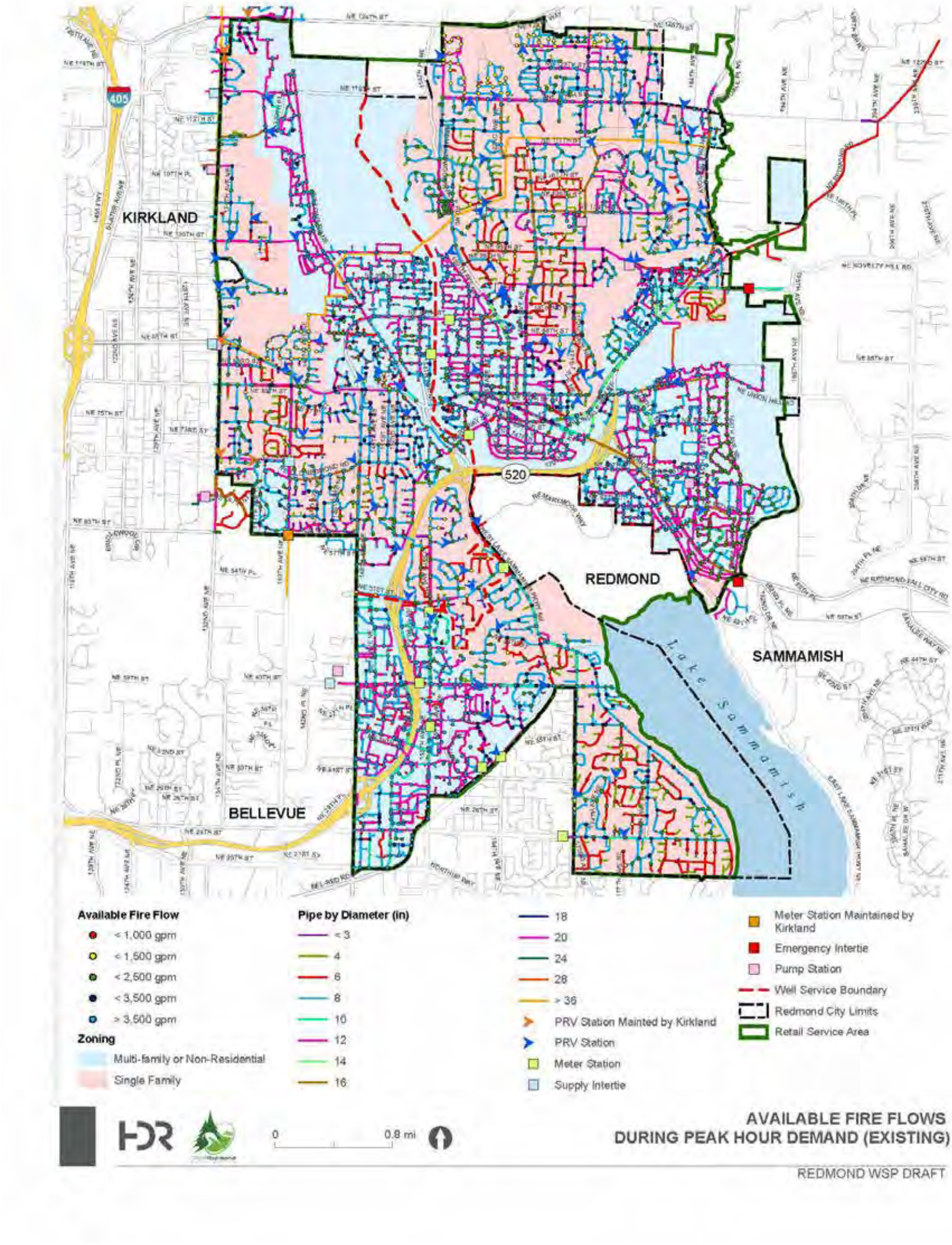


Figure 10-5. Available Fire Flows During Peak Hour Demand (Existing)

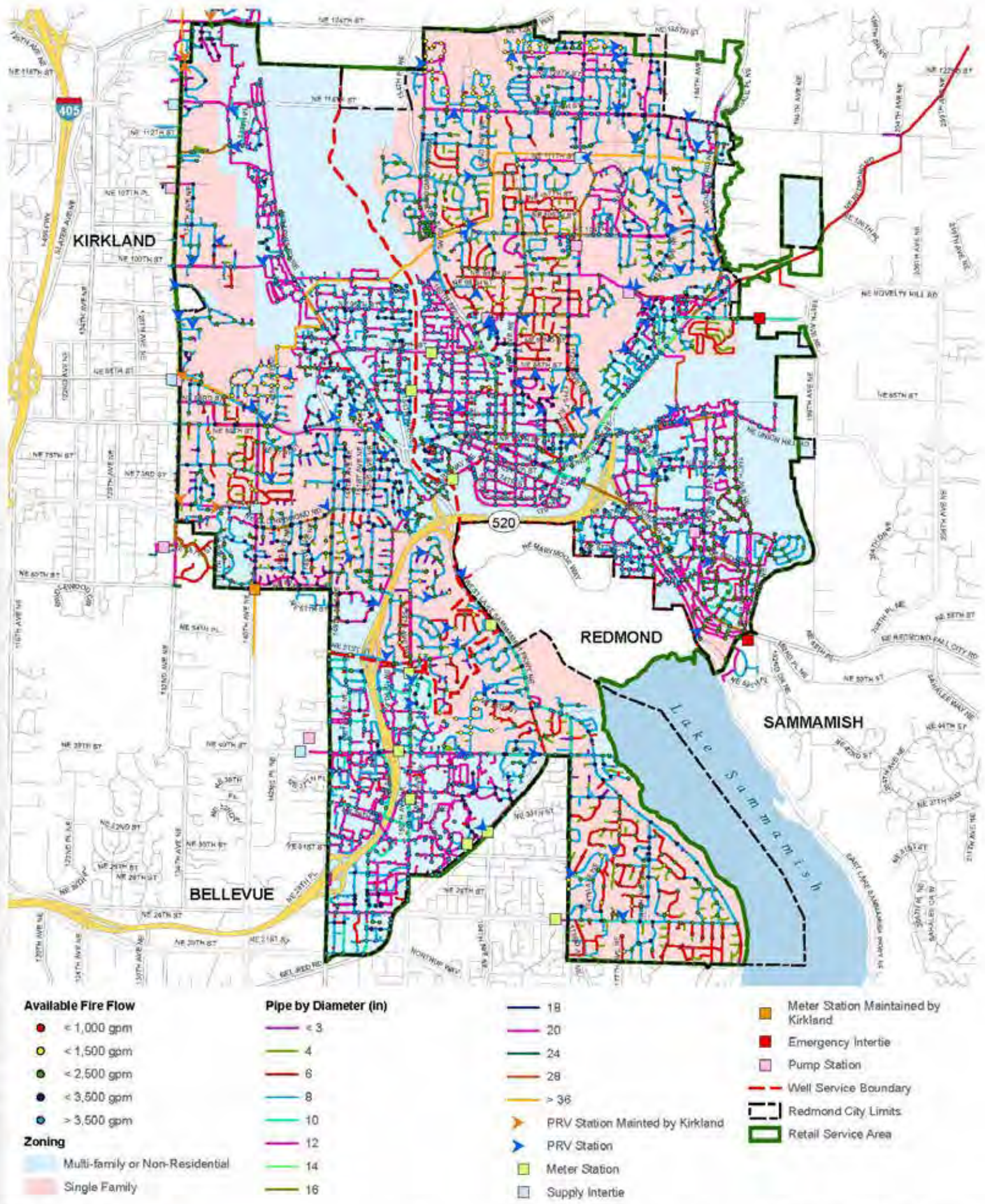


Figure 10-6. Available Fire Flows During Peak Hour Demand (10-Year)

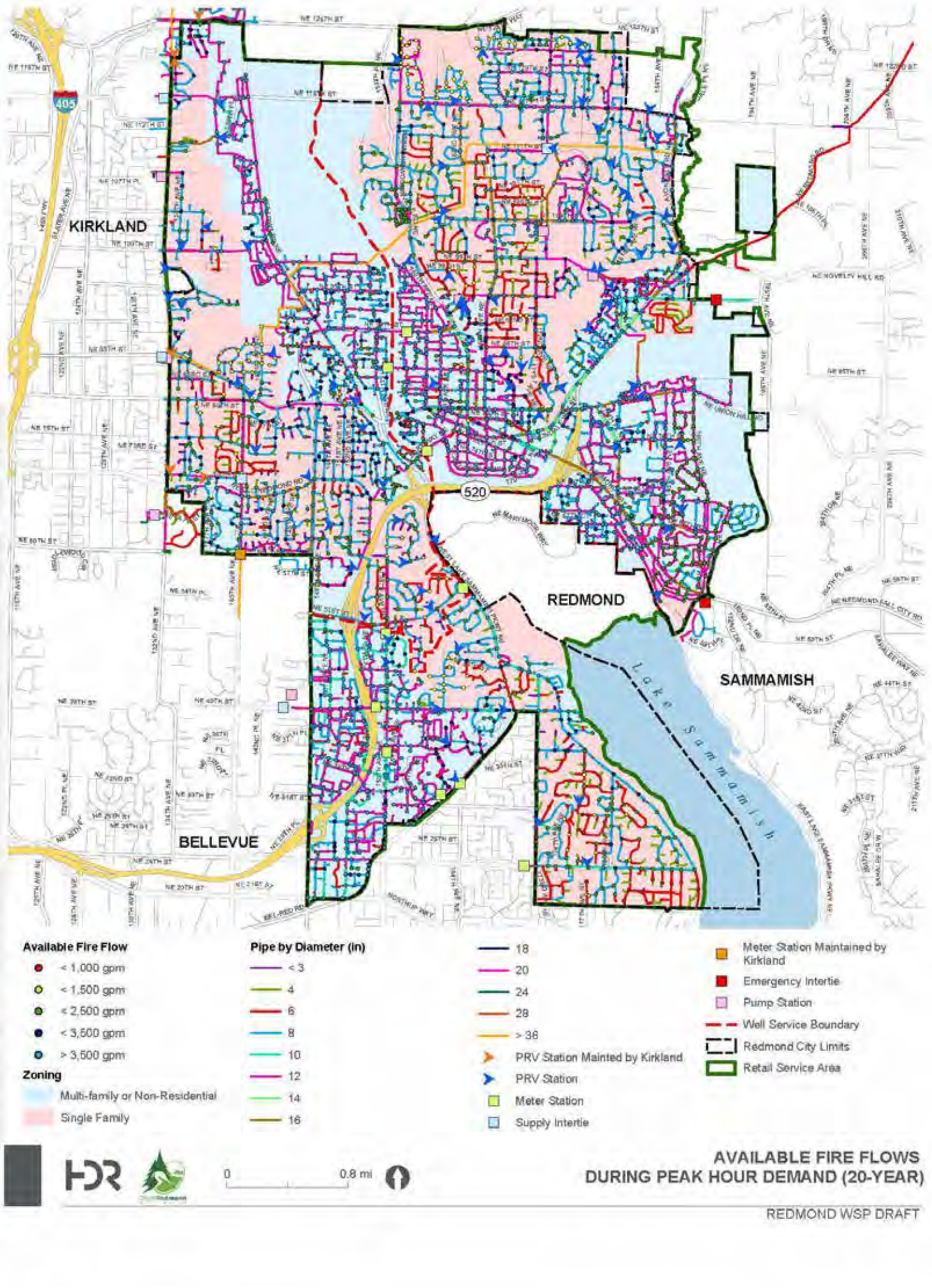
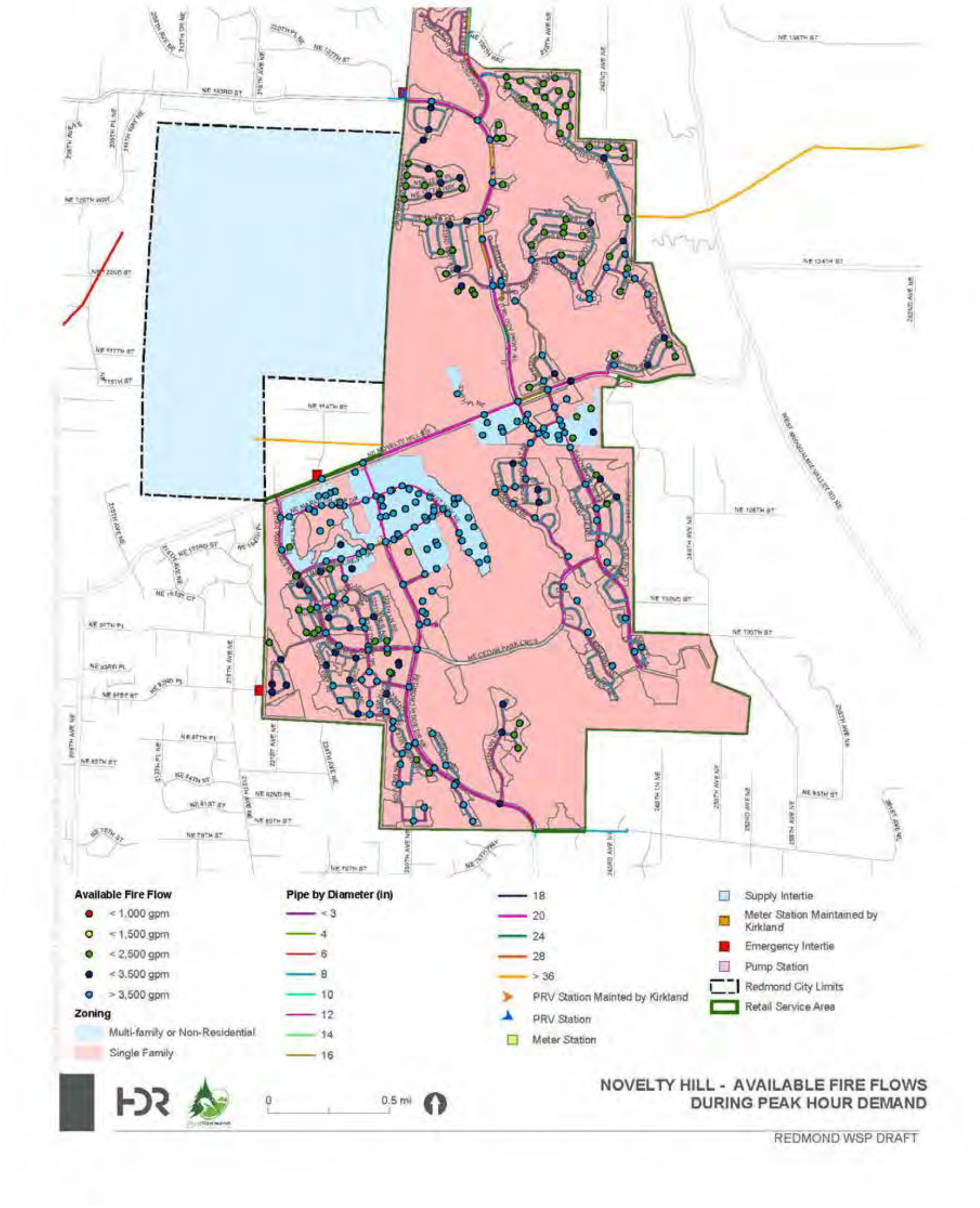


Figure 10-7. Available Fire Flows During Peak Hour Demand (20-Year)


NE 133RD ST
NE 132ND ST
NE 138TH ST
NE 124TH ST
NE 111TH ST
NE 114TH ST
NE 108TH ST
NE 100TH ST
NE 85TH ST
NE 80TH ST
NE 70TH ST
NE 65TH PL
NE 83RD PL
NE 87TH PL
NE 62ND PL
NE 60TH ST
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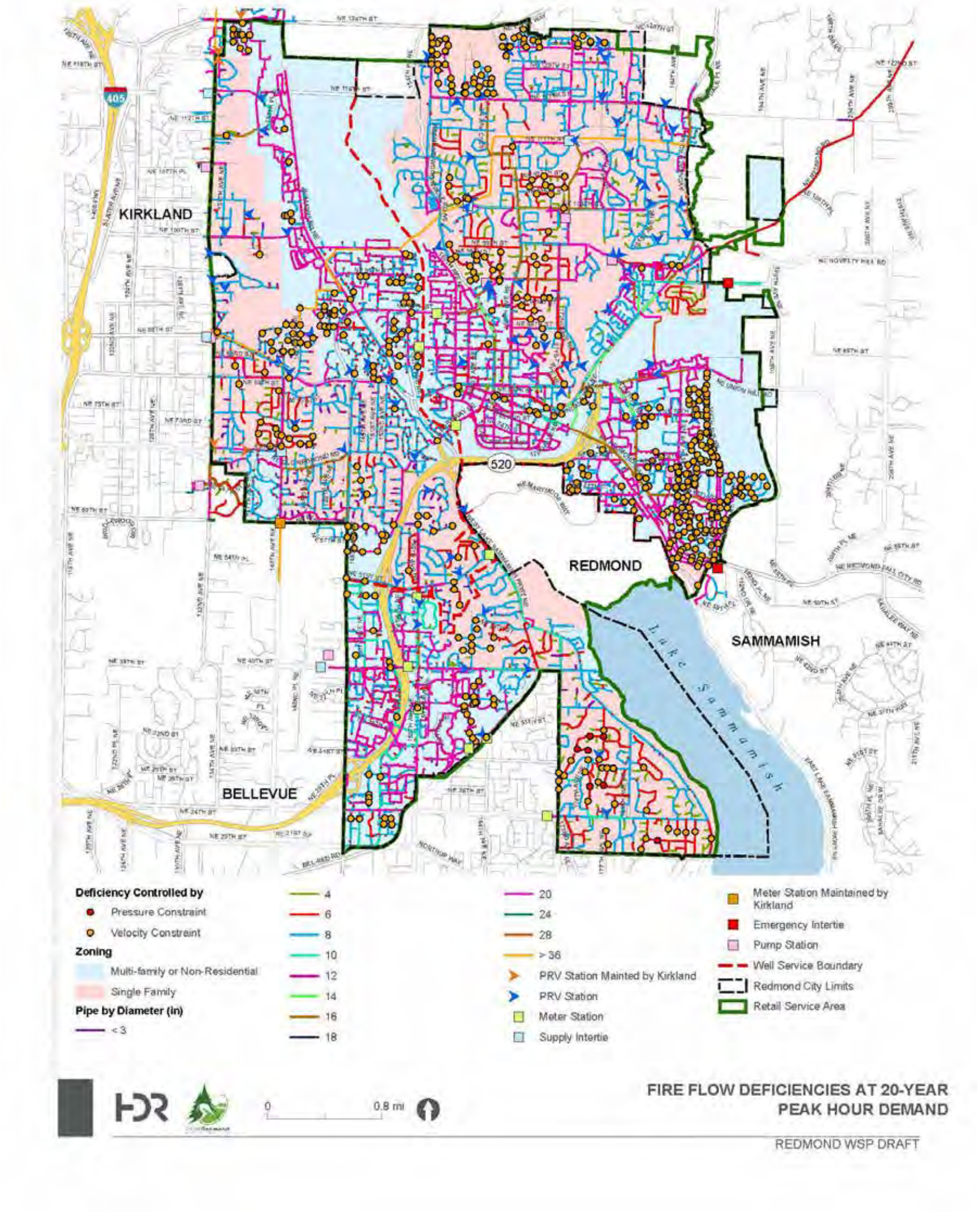


Figure 10-9. Fire Flow Deficiencies at 20-Year Peak Demand

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10.4.3. Distribution System Proposed Improvements

The existing system models were analyzed under 20-year PHD plus fire flow conditions (worst case) for the Well, Rose Hill, and Bellevue-Overlake-Viewpoint Service Areas. Based on the model results, improvements were developed to address areas of the system failing the evaluation criteria. Proposed improvements include upsizing pipes, updating PRV settings, and evaluating boundary conditions that will need to change to supply additional flow in the future. To propose improvements, fire flow analysis was conducted on all model nodes that represent hydrants excluding nodes around pumps stations, tanks and PRVs. Along with these distribution pipes were excluded from velocity criterion. Model improvements suggested for corresponding hydrant deficiencies have been listed in the Table 4 of Appendix N and shown in Figure 10-10.

The proposed pipeline improvements (upsizing) shown in Table 4 of Appendix N are organized according to priority, as follows:

- Priority Level 1 (High) - Project resolves at least one node having a pressure deficiency (i.e., less than 20 psi) under fire flow conditions.
- Priority Level 2 (Medium) - Project resolves at least one node deficiency where the velocity constraint creates a deficiency greater than 70% of fire flow requirement.
- Priority Level 3 (Low) - Project resolves at least one node deficiency where the velocity constraint creates a deficiency between 30 to 70% of fire flow requirement.
- Priority Level 4 (Very Low) - Project resolves at least one node deficiency where the velocity constraint creates a deficiency less than 30% of fire flow requirement.

The intent of this prioritization is to inform how the City identifies and prioritizes piping upgrades in its broader pipeline replacement program. See Project D-1 in Chapter 12 for more detail.

Improvements categorized as high priority (i.e., level 1) mainly lie in the southeast region of the BOV service area. This region also experiences high pipe velocities, triggering improvements in other priority levels as well. Increasing pipe sizes to resolve velocity criteria helps the system with pressure issues too. Thus, it is important to note that while high priority pipe improvements will improve pressures in the region significantly, they may not be the only ones that will be needed to fully resolve pressure issues.

The Well, Rose Hill model area pipeline improvements are summarized in Table 4 of Appendix N. The majority of the deficiencies in this service area are due to velocity criteria (maximum pipe velocities of 10 fps during peak hour demand and fire flow conditions) or a combination of velocity and pressure criteria. To resolve these issues, appropriate upsizing for the pipes was identified to lower distribution system velocities and headloss. Additionally, to address deficiencies due to residual pressure or low zone pressure, PRV settings were adjusted in some instances. For example, to resolve a pressure criteria deficiency downstream of PRV-6a and PRV-6b which connect zone 470 to 315 along NE 98th street, PRV HGL settings were increased to 314 ft to account for general system headloss. In addition, for PRV 66a and PRV-6b, located at NE 92ND Way, PRV HGL settings were increased to 417 ft to increase head in the 425 zone. These changes to the PRV HGL settings did not create any high pressure issues during low demand periods.

Additionally, fire flow analysis depicted deficiencies at non-hydrant junctions located at higher elevations. These are areas where the system will experience low pressures due to the

topography. The City plans for fire flow to be provided at such locations, where there are hydrants present, through the use of a pumper truck or mobile fire engine.

In the Bellevue-Overlake-Viewpoint Service Area, extremely low pressures due to supply to the 520 zone were observed. This zone is shared with the neighboring Bellevue system, part of which is included in the City's hydraulic model (BOV). A possible solution is to increase supply from the Holt aqueduct at the location where the current North 40th Street Pump Station connects to the 520 zone. Model analysis estimated about 15 million gallons per day of flow would be required through this connection to solve basic pressure problems for the Redmond 525 zone. Most of the deficiencies in this area are due to local velocity issues, but additional supply is needed to address overall pressures in the system.

Novelty Hill Area does not experience any system deficiencies for 20-year peak hour demand conditions and available fire flows throughout its service areas.

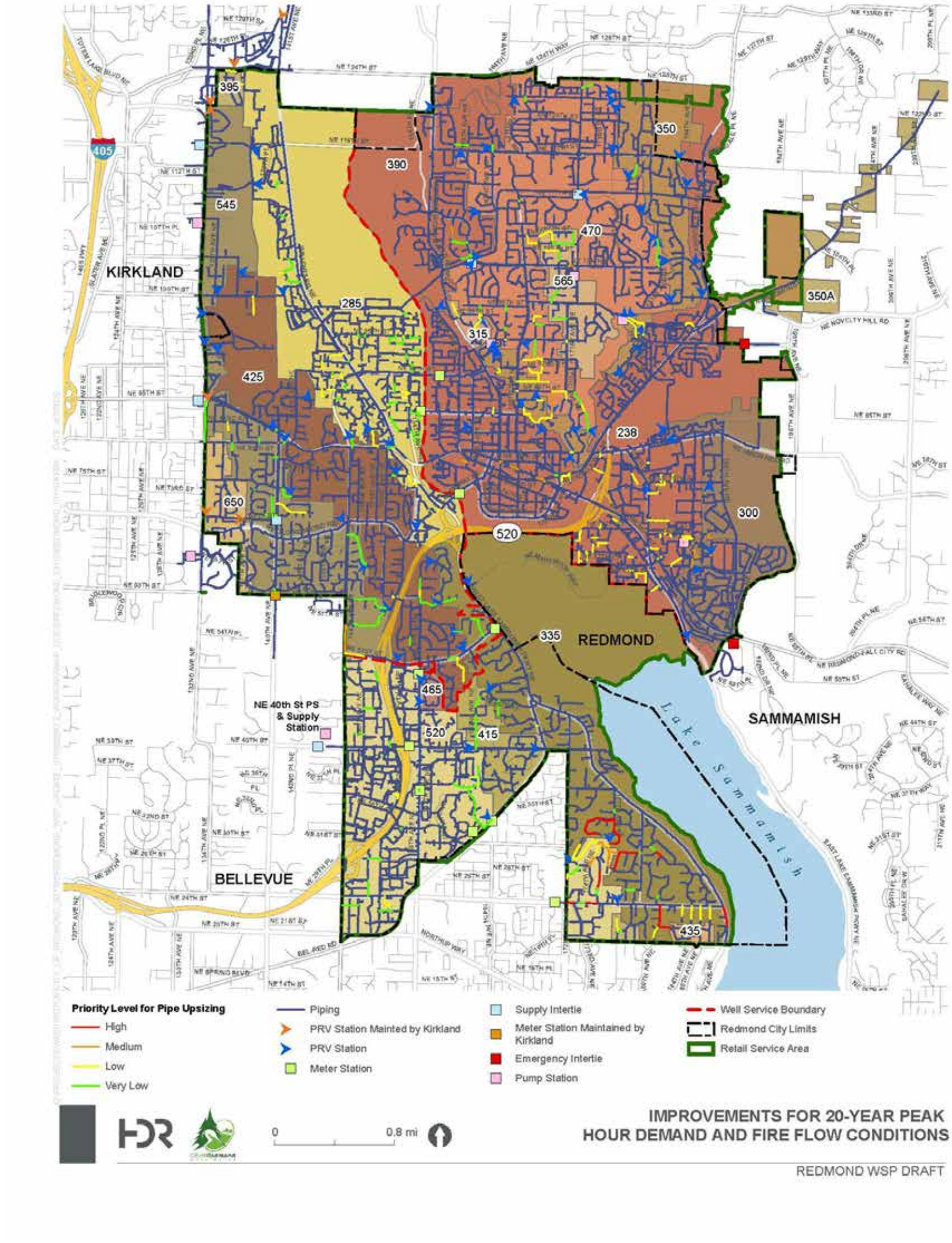


Figure 10-10. Improvements Proposed for 20-year Peak Hour Demand conditions and Available Fire Flows

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10.5. ERU Capacity Summary

The analyses presented in this chapter provide the limiting factors for the system's capacity. Table 10-17 displays the ERU capacity summary for the In-City Service Area and Table 10-18 displays the same information for the Novelty Hill service area. In both service areas, standby storage is the limiting factor for system capacity.

Table 10-17. ERU Capacity Summary – In-City Service Area

Service Classification	Total MDD for the classification, gpd [1]	Total # Connections in the classification [2]	ERUs [3]
Single-Family	5,217,288	12,331	12,542
Multi-Family	4,718,354	1,316	11,342
Non-Residential	2,579,854	1,255	6,202
Irrigation	2,324,095	579	5,587
Fire	589	570	1
Exempt	406,234	N/A	977
Non-revenue	576,135	N/A	1,385
Total existing ERUs = 38,036			
Physical Capacity as ERUs			
Water System Component (Facility)	**Calculated Capacity in ERUs for each component**		
Source(s)	138,320 [4]		
Treatment	NA [5]		
Equalizing Storage	102,977 [6]		
Standby Storage	41,942 [7]		
Transmission	N/A [4]		
Water Rights	N/A [8]		
Water System Physical Capacity (ERUs) = 41,942 [9] (based on the limiting water system component shown above)			

[1] Based on year 2021 demands from billing data.

[2] Based on number of connections in year 2021 (Table 4-4).

[3] Calculated using the MDD ERU factor for the City service area (416 gpd). The number of single family connections does not match the number of ERUs because the ERU factors is the average from 2019 - 2021, and therefore does not correspond exactly to the ERU value in 2021.

[4] Based on total capacity of wells and interties (approximately 57.9 mgd).

[5] This category does not apply; water treatment occurs at the wells at the rate of source production or is treated by SPU before it arrives at the interties.

[6] Based on the maximum ERUs that can be served at 40 psi, as described in the storage analyses.

[7] Based on the maximum ERUs that can be served from pumped standby storage, as described in the storage analyses.

[8] The City purchases water from Cascade Water Alliance, independent of the City's water rights, to supplement the groundwater sources. Therefore, water rights are not a limiting factor.

[9] Standby storage is the current limiting factor. This table indicates that 2021 demands were within the physical capacity limitations of the system. Per the information in Table 10-10, the standby storage capacity is forecast to be insufficient by 2023. This deficiency is based on the City's standby storage standard of 400 gpd/ERU rather than DOH's planning standard of 200 gpd/ERU. Using the DOH standard, no deficiencies are forecast in the 20-year planning horizon.

Table 10-18. ERU Capacity Summary - Novelty Hill Service Area

Service Classification	Total MDD for the classification, gpd [1]	Total # Connections in the classification [2]	ERUs [3]
Single-Family	1,251,470	3,296	3,297
Multi-Family	227,887	80	600
Non-Residential	102,417	73	270
Irrigation	177,635	64	468
Fire	3	4	0
Exempt	48,162	N/A	127
Non-revenue	43,635	N/A	115
Total existing ERUs = 4,877			
Physical Capacity as ERUs			
Water System Component (Facility)	**Calculated Capacity in ERUs for each component**		
Source(s)	24,974 [4]		
Treatment	NA [5]		
Equalizing Storage	19,284 [6]		
Standby Storage	7,618 [7]		
Transmission	N/A [4]		
Water Rights	N/A [8]		
Water System Physical Capacity (ERUs) = 7,618 [9] **(based on the limiting water system component shown above)**			

[1] Based on year 2021 demands from billing data.

[2] Based on number of connections in year 2021 (Table 4-4).

[3] Calculated using the MDD ERU factor for the Novelty Hill service area (380 gpd). The number of single family connections does not match the number of ERUs because the ERU factors is the average from 2019 - 2021, and therefore does not correspond exactly to the ERU value in 2021.

[4] Based on total capacity of wells and interties (approximately 11.4 mgd).

[5] This category does not apply; water treatment occurs at the wells at the rate of source production or is treated by SPU before it arrives at the interties.

[6] Based on the maximum ERUs that can be served at 40 psi, as described in the storage analyses.

[7] Based on the maximum ERUs that can be served from standby storage at 20 psi.

[8] The City serves this system exclusively with purchases from Cascade Water Alliance. Therefore, water rights are not a limiting factor.

[9] Standby storage is the current limiting factor.

Chapter 11: Operation and Maintenance Program

City of Redmond 2024 Water System Plan

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11. Operation and Maintenance Program

The City has developed many specific plans and programs to operate and maintain its water system. These plans and programs are referenced in this section and critical elements are attached as appendices. This section includes a brief summary of the overall operation and maintenance of the water system and those specific plans and programs.

11.1. Water System Management and Personnel

The City's water system is administered according to Redmond Municipal Code Title 13 and is under the direction of the Public Works Director. Management of the water utility is separated into multiple divisions within the Public Works Department, with most oversight and management provided by staff in the Utilities Engineering and Environmental Programs and Compliance Divisions and the Maintenance and Operations Division. Figure 11-1 shows the organizational structure of the City's Public Works Department.

Utilities Engineering and Environmental Programs and Compliance Divisions are managed by the Public Works Deputy Director. The Utilities Engineering Group is responsible for the planning and design of water system improvements. The Utilities Engineering Group consists of a utility engineering manager, civil engineers, and planners. The group also has support from engineering technicians, and administrative coordinators in other work groups.

The Construction Group, also within Public Works, primarily provides construction management for City projects and inspection services for public projects undergoing construction.

The Development Services Engineering Division, within the Planning Department, oversees the review of new private development projects, and coordinates with the EUSD engineers to ensure that utility infrastructure in new developments is appropriately designed and will be adequately served by the City's water system.

The Maintenance and Operations Division is managed by the Deputy Public Works Deputy Director, Maintenance and Operations. This division supports five maintenance groups in the Public Works Department, including the Water Maintenance Group. The Water Maintenance Group operates and maintains the City's water facilities. The group currently includes two supervisors (Operations and Water Quality), a water quality analyst, a cross-connection specialist, two utility system technicians, and 12 maintenance technicians for a total of 18 full-time employees.

The responsibilities of the Water Maintenance Group and support staff include inspection, treatment, testing, installation, and repair of system facilities; routine operation and preventive maintenance; meter reading; record keeping; administrative tasks; general clerical work; and corrective or breakdown maintenance as required in response to emergencies.

11.1.1. Personnel Responsibilities

Members of the water system staff have been assigned specific areas of responsibility dependent on their skill. The key responsibilities of the water system staff are summarized below.

Planning

- **Development Services Engineering Manager –** Oversees review of all proposed private development projects within the City.

Public Works

- **Director –** Directs and oversees the activities of all divisions of the Public Works Department.

Utilities and Environmental Programs

- **Deputy Director, Utilities and Environment –** Directs and oversees the activities of Utilities Engineering, Environmental Programs and Compliance and Utilities Operation.
- **Utilities Engineering Manager –** Plans, manages, and directs the City's water, stormwater and wastewater projects. Also serves as a liaison to Cascade Water Alliance, and coordinates many of the business functions of the utility.

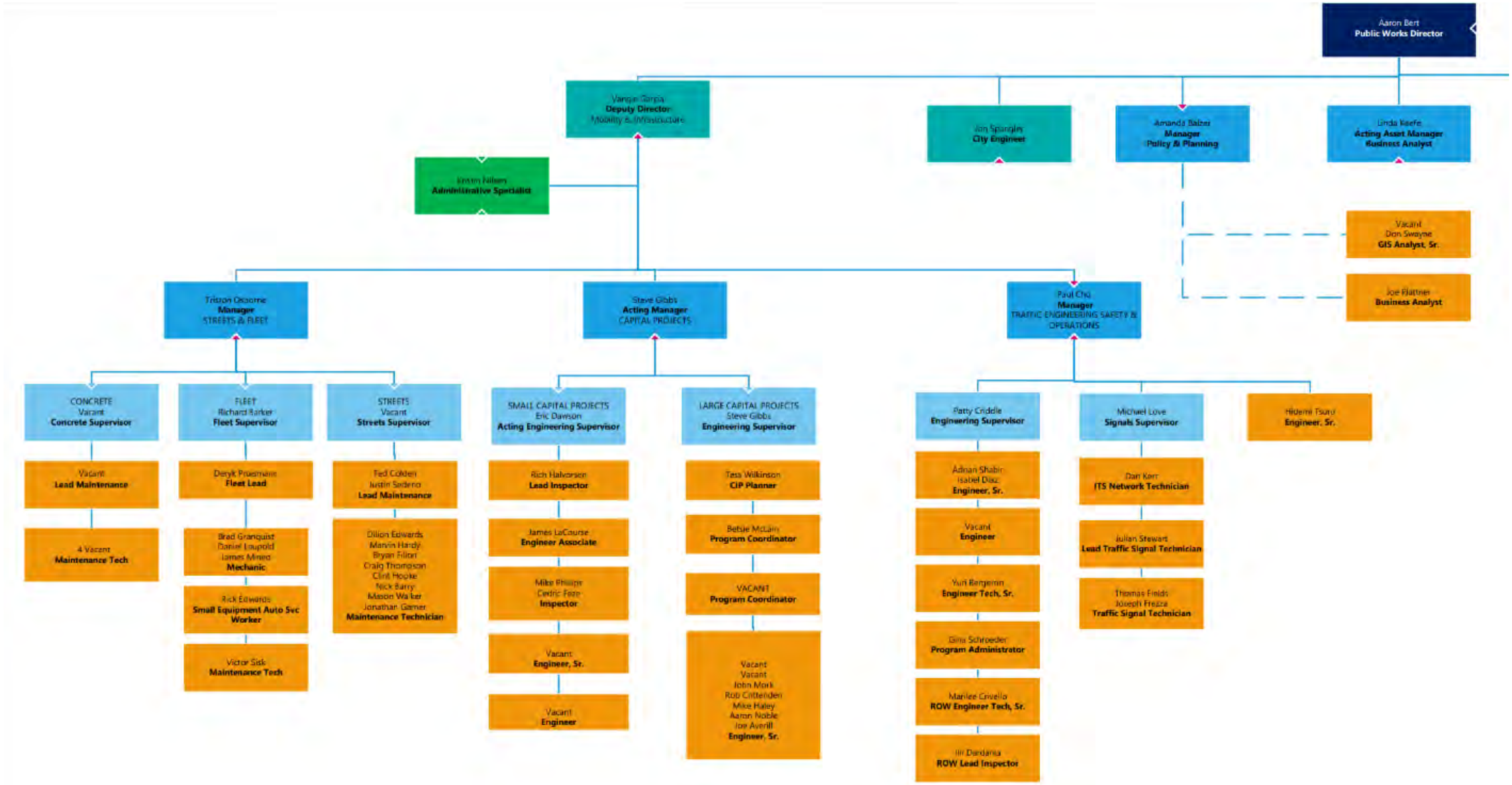
Operations Division

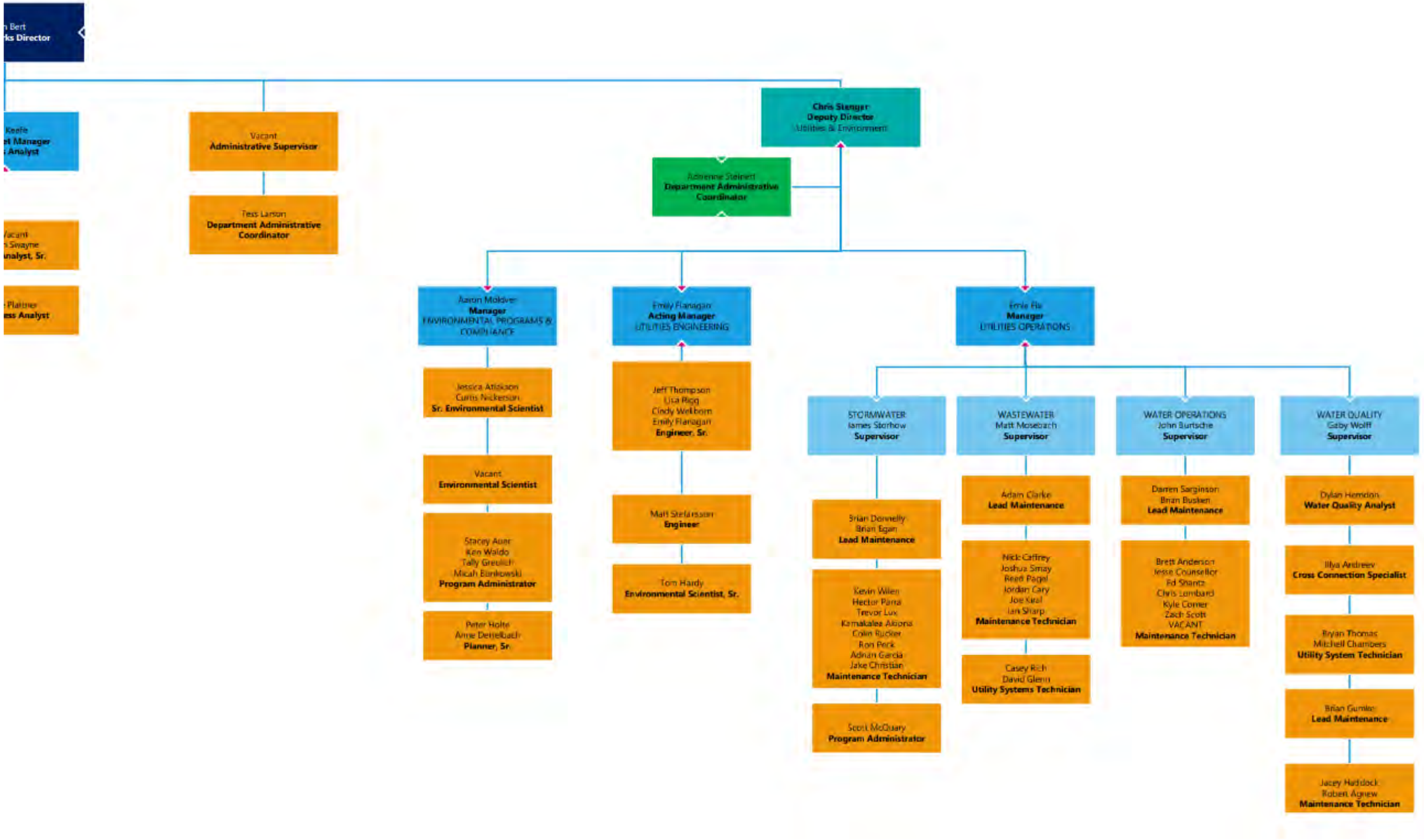
- **Deputy Director, Operations** – Directs and oversees maintenance and operations activities of the wastewater, stormwater, water, streets, and fleet maintenance groups.
- **Utilities Operations Manager** – Plans, manages, and directs the City's maintenance and operations of water, wastewater and stormwater systems.
- **Water Maintenance Group**
  - **Supervisor, Operations –** Coordinates and supervises maintenance crews responsible for the repair, installation, and operation of the City water system.
  - **Supervisor, Water Quality –** Coordinates and supervises maintenance staff responsible for water quality and treatment, including City wells and reservoirs.
  - **Lead Water Quality Technician –** Coordinates, schedules, and reviews work in the Water Quality Section. Assists EUSD as needed on capital projects.
  - **Utility System Technician -** Operates, maintains, repairs, and monitors the pumps, telemetry system, and chemicals used in water treatment.
  - **Water Quality Technician –** Inspects, tests, and monitors backflow prevention devices as part of the cross-connection control program. Serves as authorized plumbing inspector for cross-connection inspection and enforcement. Conducts coliform monitoring, and operates, maintains, and repairs telemetry system, as needed.
  - **Lead Maintenance Technician –** Assigns and directs the work of individuals and crews in manual work and operation of equipment used in the maintenance of the water system. Performs more complex maintenance and equipment operations.

- **Maintenance Technician –** Operates heavy and specialized equipment and performs maintenance, repair, and installation required for the effective operation of the City's water system. Assists in training and directing other employees in equipment operations and maintenance activities.

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Figure 11-1. City of Redmond Public Works Organization Chart




Vacant
Administrative Supervisor
Tess Larson
Department Administrative Coordinator
Chris Stanger
Deputy Director
Utilities & Environment
Adrienne Steinert
Department Administrative Coordinator
Aaron Moldver
Manager
ENVIRONMENTAL PROGRAMS & COMPLIANCE
Jessica Atkisson
Curtis Nickerson
Sr. Environmental Scientist
Vacant
Environmental Scientist
Stacey Aune
Ken Waldo
Tally Greulich
Micah Bankowski
Program Administrator
Peter Holte
Anne Dettelbach
Planner, Sr.
Emily Flanagan
Acting Manager
UTILITIES ENGINEERING
Jeff Thompson
Lisa Rigg
Cindy Welborn
Emily Flanagan
Engineer, Sr.
Matt Stefansson
Engineer
Tom Hardy
Environmental Scientist, Sr.
Ernie Ilo
Manager
UTILITIES OPERATIONS
STORMWATER
James Storhow
Supervisor
WASTEWATER
Matt Mosebach
Supervisor
WATER OPERATIONS
John Burtschie
Supervisor
WATER QUALITY
Gaby Wolff
Supervisor
Brian Donnelly
Brian Egan
Lead Maintenance
Kevin Wilen
Hector Parra
Trevor Lux
Kamakalea Akiona
Colin Rucker
Ron Peck
Adrian Garcia
Jake Christian
Maintenance Technician
Scott McQuary
Program Administrator
Adam Clarke
Lead Maintenance
Nick Caffrey
Joshua Sinay
Reed Pagel
Jordan Cary
Joe Kral
Ian Sharp
Maintenance Technician
Casey Rich
David Glenn
Utility Systems Technician
Darren Sarginson
Brian Busken
Lead Maintenance
Brett Anderson
Jesse Counsellor
Ed Shantz
Chris Lombard
Kyle Comer
Zach Scott
VACANT
Maintenance Technician
Dylan Herndon
Water Quality Analyst
Illya Andreev
Cross Connection Specialist
Bryan Thomas
Mitchell Chambers
Utility System Technician
Brian Gumke
Lead Maintenance
Jacey Haddock
Robert Agnew
Maintenance Technician

11.1.2. Operator Certification

In accordance with Chapter 70.120 RCW, a certified operator is required for Group A public water systems. Under Chapter 70.120.030, certified operators shall be in charge of the technical direction of a water system's operation, or an operating shift of such a system, or a major segment of a system necessary for monitoring or improving the quality of water. Chapter 246-292 WAC provides the requirements for water works operator certification. City personnel designated as operators are required to be certified upon hiring, or to complete certification within one year of their start of employment with the City. The City supports and encourages in-house training and external training opportunities for operators, for continuing education.

Table 11-1 shows certification information for the water utility maintenance staff.

Table 11-1. Operations Division Water Utility Personnel Certification

Position	Name	Certification
Supervisor, Operations	John Burtsche	Water Distribution Manager 4, Cross-Connection Specialist
Supervisor, Water Quality	Gaby Wolff	Water Distribution Manager 4, Water Treatment Operator IT 2, Cross-Connection Specialist
Water Quality Analyst	Dylan Herndon	Water Distribution Manager 3, Water Treatment Operator 3, Cross-Connection Specialist
Cross Connection Specialist	Iliya Andreev	Water Distribution Manager 2, Cross-Connection Specialist
Lead Maintenance Technician	Darren Sarginson	Water Distribution Manager 1, Cross-Connection Specialist
Lead Maintenance Technician	Brian Busken	Water Distribution Manager 1, Cross-Connection Specialist
Lead Water Quality Technician	Brian Gumke	Water Distribution Manager 3, Cross-Connection Specialist
Utility System Technician	Bryan Thomas	Water Distribution Manager 2, Cross-Connection Specialist
Utility System Technician	Mitchell Chambers	Water Distribution Manager 2, Cross-Connection Specialist
Maintenance Technician	Brett Anderson	Water Distribution Manager 2
Maintenance Technician	Jesse Counsellor	Water Distribution Manager 1
Maintenance Technician	Jordan Van Hoorn	Water Distribution Manager 1
Maintenance Technician	Ed Shantz	Water Distribution Manager 1, Cross Connection Specialist
Maintenance Technician	Eddie Sitaru	
Maintenance Technician	Zach Scott	
Maintenance Technician	Kyle Comer	
Maintenance Technician	Robert Agnew	Water Distribution Manager 1, Cross Connection Specialist
Maintenance Technician	Jacey Haddock	Water Distribution Manager 1

Position	Name	Certification
Maintenance Technician	Mark Brown	

Maintenance duties have been divided among four lead individuals, with each lead individual responsible for assigning crew activities in accordance with specific areas of expertise. Table 11-2 provides a breakdown of work responsibility by lead.

Table 11-2. Operations Division / Water Maintenance Group Lead Staff Responsibilities

Water Quality Analyst Dylan Herndon	Lead Maintenance Technicians Darren Sarginson & Brian Busken	Lead Water Quality Technician Brian Gumke
Water Quality Compliance with SDWA Bacteria Inorganics VOCs pH Fluoride Chlorine Consumer Confidence Reports **Telemetry** Repair Monitoring Control **Wells** Inspection Cleaning Operation Chemical additions **Miscellaneous** Cross-connection control	**Mains** Flushing Repairs Extensions Valves Locates **Hydrants** Records Inspection Repair Painting **Services** Repairs Installs Modifications **Valves** Inspection Operation PRVs Altitude **Plat & Capital** Shutdowns Inspection Specifications Standards **Miscellaneous** Pressure information Lucity work orders Blow-offs Air-Vacs Asphalt repair Novelty Hill Operations	**Meters** Installation Replacement Testing and calibration Reading Leaks Turn on/Shut off Door hangers Final bills Compound meters AR99 reading software Reading hardware Service disconnects **Wells** Control Valves Motors Pumps **Reservoir** Levels Cleaning

11.2. Major System Components and Routine System Operation

Major system components of the City's water system are inventoried in Section 2. Routine system operations include checking system facilities, daily monitoring of the telemetry system at the Maintenance and Operations Center (MOC), and responding to customer inquiries and complaints. Monitoring and operation of major system components, including reservoirs, wells, pump stations, and supply stations, are accomplished in part through telemetry and a centralized control system located at the MOC.

Each major system component has a hardcopy operation and maintenance manual that describes standard and alternative modes of operating the facility. In addition, the City's goal is to have all operations information available electronically in a similar format for each facility. That process has begun, and the City has electronic manuals for several of its facilities, including the Novelty Hill area system components. All CIP projects are required to provide an electronic file folder that contains all project information, project drawings, and any data about new or renovated facilities.

The City also implemented a significant upgrade to its water and wastewater SCADA system in 2008 consisting of conversion to a Wonderware software and installation of new hardware components. The result of the project was a more sophisticated system allowing staff a greater level of control and information management regarding the system's many components. Additional upgrades occurred in 2016 to improve backup communication abilities at the MOC and Lift Station 17.

11.3. Preventative Maintenance Program

The City has a preventative maintenance program that has kept the water system operating with very few breakdowns or emergencies. Capital improvement programs (CIP) continue to concentrate on specific system improvements that eliminate old piping and improve system operation.

Preventative maintenance consists of regularly servicing pumps and motors, pressure reducing stations, and hydrants; inspecting valves; mapping locations of facilities; testing meters for accuracy; cleaning and painting reservoirs and exposed equipment; and flushing dead-end pipelines. Table 11-3 provides a summary of routine and preventative work activities for the water maintenance staff.

Table 11-3. Preventative Maintenance Work Schedule

Asset/Equipment	Daily	Weekly	Monthly	Annually	As Required
Wells	Inspected & maintained				
Booster stations		Inspected & maintained			
Reservoirs		Inspected		Inspected annually; Cleaned every 6-8 years	Painting, typically every 15 years
Telemetry	Monitoring & recording	Recording	Recording	Recording	
Mains					Replaced or repaired as part of CIP Program
Valves				Operated during flushing program, 8 year inspection cycle	Repaired or installed, inspected and recorded as schedule permits
Services					Repaired or installed
Meters			Residential routes read Bi-monthly, Commercial read monthly	Commercial meters (3" and larger) tested annually	Repaired or installed
Pressure-reducing, altitude, pump-control, & pressure relief valves				Inspected, adjusted, or repaired 20 PRV full rebuilds per year on 5-year cycle	Repaired
Hydrants				1,400 Hydrants Inspected per year on 3-year schedule	Repaired or installed
Flushing				All service areas and wells	Water Quality complaints
Cross-connection			Notifications for testing		Inspected and recorded

11.4. Equipment, Supplies, and Chemical Listing

The Maintenance and Operations Division maintains a detailed inventory of equipment, supplies, and chemicals, including required Safety Data Sheets (SDS).

11.5. Comprehensive Water Quality Monitoring Plan

To ensure that the City's drinking water is kept safe and that adequate public health protection is maintained, the City has a water quality monitoring program. This program includes testing at sites across the City including the wells, and specific locations in the distribution system. The monitoring program meets Washington State Department of Health (DOH) requirements defined in Washington Administrative Code (WAC) 246-290-300, which includes requirements for sampling and testing of a minimum of 100 bacteriological samples per calendar month for a daytime population served of approximately 125,000.

The City of Redmond conducts water quality monitoring for physical and chemical parameters in accordance with the schedule provided in Table 11-4. Monitoring is conducted at these locations using the chemical/physical criteria and frequency shown in the table. Chlorine residual, fluoride, hardness, temperature, and pH are all tested in-house by City staff. The City adheres to the Coliform Monitoring Plan for bacteriological monitoring and follow-up requirements (Appendix J). For all other water quality tests, City staff collects the necessary samples and sends them to a certified laboratory, which are listed in Section 8.7. Water quality test results from 2011 – 2022 are summarized in Chapter 8.

Seattle Public Utilities conducts water quality monitoring for the surface water supplies delivered to the City of Redmond through the regional transmission system.

Table 11-4. Water Quality Monitoring Schedule

Location	Daily		Weekly			Annually	Quarterly	3 Years				6 Years			9 Years			Other[1]		
	Cl_2	NaF	Bacteria	pH	Temp	Nitrate	TTHM/HAA5	Pb & Cu	PFAS	SOCs	VOCs	Radionuclides	SOCs	VOCs	Asbestos	IOCs	SOCs	Hardness	Manganese	Arsenic
Wells 1 & 2	X	X		X	X	X			X			X		X		X	X	X		X
Well No. 3	X	X		X	X	X			X			X		X		X	X	X		X
Well No. 4	X	X		X	X	X			X	X	X	X				X	X	X	X	X
Well No. 5	X	X		X	X	X			X		X	X				X		X		X
Random	X	X		X	X													X		
Stands[2] (26)	X		X																	
Ends[3] (8)[4] D/DBPI							X													
Tier 1 Homes[5] (50+)								X												
AC pipe[6]															X					

[1] Other tests are performed, but not on a regular schedule. The City communicates with DOH regarding waivers and monitoring frequency. Arsenic testing must be increased if detections are recorded above the MCL.
[2] Specific system sampling stands.
[3] At ends of distribution system.
[4] 4 ends are within Redmond's service area and 1 end is on the Seattle side.
[5] Tier 1 homes built 1983–1986.
[6] System area with known AC pipe.

11.6. Emergency Response Program

Emergencies that could impede the supply of water on a short-term basis include such occurrences as pipe breakage, hydrant damage, and short-term power outages. These emergencies are normally anticipated and handled by the water utility staff without significant difficulty.

Less frequently, water utilities must deal with natural and man-made disasters of greater magnitude. These include earthquakes, volcanoes, hazardous material spills, aquifer contamination, vandalism, extended periods of freezing weather, extended droughts, flooding, major power outages, and windstorms. Less extensive emergencies include chlorine leaks, landslides, water system staff strikes, and large mechanical failures.

11.6.1. Vulnerability Evaluation

The City conducted a vulnerability analysis that estimates the degree to which the City's water system might be adversely affected in various emergency situations. This information has been used in the City's emergency preparedness program.

11.6.2. America's Water Infrastructure Act (AWIA)

AWIA requires that all community water systems serving populations greater than 3,300 persons conduct a Risk and Resilience Assessment (RRA) of the risks to, and resilience of, their system, and update their ERP accordingly. The RRA is required to include the following elements:

- Risk to the system from malevolent acts and natural hazards
- Resilience of the infrastructure, including supervisory control and data acquisition (SCADA)/cyber resilience
- Monitoring practices of the system
- Financial infrastructure of the system
- Use, storage, or handling of various chemicals by the system
- Operation and maintenance of the system

Per the AWIA requirements, the City prepared an RRA in 2020 that provides a review of the vulnerability of the City's critical assets, which incorporates risks caused by both natural hazards and human-caused threats, effectively updating the City's 2004 vulnerability assessment. This RRA summary report documents the process and results of the RRA, providing the City with an understanding of which assets in the system are most critical, along with potential mitigation measures that can be considered to address the identified risk in the water system. The City certified its RRA to the administrator of the U.S. Environmental Protection Agency (EPA) by the deadline (March 31, 2020).

The RRA must be reviewed at least every five years to determine if revisions are required because of changes to the water system. Upon review, the water system must recertify the RRA if there are no revisions or certify a revision to the RRA.

The City was also required to update its ERP within 6 months of the RRA certification so that the revised ERP includes information from the latest RRA. The ERP update must also be certified to the EPA. The City updated it's ERP according to the findings of the RRA and certified the document with EPA by the deadline (September 30, 2020). The ERP will be reviewed on the same five-year timeline required of the RRA and updated as necessary. The ERP referenced other related emergency planning efforts and documents prepared by the City, including the City's *Water Supply Contingency and Spill Response Plan* (1997) and the *City of Redmond Risk and Resiliency Analysis* (2020).

11.6.3. Emergency Call-Up

Individual emergencies that are called in by customers are addressed by emergency standby personnel from the Public Works Department. Each of the City's four public works divisions (water, wastewater, stormwater, and transportation) has an employee designated as the emergency standby person. They are all on-call 24 hours a day, seven days a week. Of the four individuals, one is the primary emergency contact person. The primary contact person receives all emergency calls and then notifies the appropriate person to handle the emergency.

Large-scale emergencies that affect the entire City are handled by the Emergency Operations Center (EOC) team. The team is comprised of upper-level management from within the City's staff. The head of the team, the Emergency Preparedness Manager, will typically be the first person contacted in the event of an emergency. Decisions about what actions to take and implementation of those steps are overseen by the EOC team.

11.6.4. Notification Procedures

All emergency situations are reported by calling 911, the City of Redmond Police Department, or the City of Redmond Fire Department. The police/fire dispatcher or 911 operator calls or pages the Public Works standby or "on-call" person.

A line of communication has been established by the City in the event of an emergency where the public, local agencies, or state agencies must be notified of an event affecting the City's water supply. After the initial notification to the EOC team and/or the Public Works emergency standby person, the following individuals will be notified: Lead Water Quality Technician, Operations Supervisor, Operations Manager, Deputy Public Works Director, Public Works Director, Mayor, and the Public Information Officer.

Detailed lists of notification contacts are provided in Appendix A of the ERP.

11.6.5. Response Actions to Specific Events and WAWARN

In the event of an emergency, the City would follow detailed procedures that were first outlined in the *Water Supply Contingency and Spill Response Plan,* and which have subsequently been revised and updated in the 2020 ERP. The City developed incident action checklists for numerous potential emergency events which outline specific emergency response actions for anticipated events. The checklists, as well as core emergency procedures, are in Appendix B of the ERP.

Emergency response to events jeopardizing the supply system could result in a reduction or complete loss of supply quantity and pressure or water not suitable for potable use. Events of

this magnitude may require shutdown of the supply stations and notifying water customers and DOH. The system would require adjustment of system controls as necessary to provide supply from storage facilities if not contaminated. Alternative water sources have also been identified, primarily consisting of emergency interties, which can be relied upon in the event primary sources are unavailable.

The City also is a member of the Washington Water/Wastewater Agency Response Network (WAWARN), an organization that allows water and wastewater systems to receive rapid mutual aid and assistance from other systems during an emergency. Being a member of WAWARN increases Redmond's emergency preparedness and coordination and provides the City a single agreement to access resources statewide.

11.7. Safety Procedures

The City has safety procedures in place related to traffic control, chemical handling, and equipment operation. There are also a number of training classes offered that are related to safety. Safety training includes working within confined spaces, first aid, traffic control, and CPR. Monthly safety meetings are held to review safety procedures, training, and related issues.

11.8. Cross-Connection Control (CCC) Program

The City has an established cross-connection control program described in RMC Chapter 13.10. The program document is provided in Appendix M.

Where a cross-connection or other nuisance currently exists, the customer shall be required to correct the problem within 30 days. In the event that the nuisance is not abated within the prescribed time, or if the nuisance poses an immediate threat of contamination to the public water supply, service from the City water supply system to the premises may be discontinued or terminated. In addition, any person found guilty of any violation defined within the provisions of RMC Section 13.10 shall be guilty of a misdemeanor and subject to penalties defined in RMC Section 1.01.110.

The City currently employs ten certified cross-connection control specialists (see Table 11-1 above). Backflow assemblies are required by the City to be inspected and tested by a Backflow Assembly Tester upon installation. All backflow devices registered with the City are inspected and tested annually by a DOH certified Backflow Assembly Tester.

The City maintains a database of all high hazard premises that are required to have backflow assemblies. As of the writing of this WSP, the database contains information regarding 825 assemblies, including their locations/addresses, make/model of assembly, type of hazard addressed, and testing history. Assemblies are installed in a wide range of situations, ranging from restaurants (where ice makers and soft drink systems are present) to medical/dental facilities and commercial buildings with boilers. As of the writing of this WSP, approximately 85% of all assemblies were noted as being in compliance with respect to testing requirements.

11.9. Customer Inquiries

Customer inquiries are handled as described in Section 2.5.5. Similar inquiries that are received on a regular basis are seen as indications of areas in need of potential operations or

maintenance attention. Recurring inquiries in an area may include pressure or water quality problems. Customer inquiries are addressed directly by the operations staff, who document them as they are received.

11.10. Record Keeping and Reporting

Maintenance and operations records are maintained on a regular basis using Lucity software. Lucity is an asset management program that reords work order initiation and project completion. Lucity is also used to actively manage all Water assets based on condition assessments, maintenance needs and criticality of system components.

The Water Maintenance Group's record-keeping procedures are identified below.

- Detailed records of customer requests and complaints are initially logged in through the Customer Service Desk using the City's Q-Alert software. The information is transmitted to Water Operations for resolution. Data includes customer name and address, date, nature of the call, and final disposition.
- Records of maintenance activities performed on hydrants, valves, meters, air-vacuum valves, pumps, PRV stations, and other system assets are maintained electronically in Lucity. Technicians in the field use tablets to connect to Lucity for record keeping and reporting.
- All hydrant, main, and valve locations are maintained in bound volumes in each service truck, as well as the MOC.
- Tank levels, water system consumption, key system pressures, and a log of each well are continuously maintained by an automated telemetry system at the MOC.
- All water quality information required by the SDWA is recorded by the MOC. Water quality records include bacteria sampling, pH monitoring, fluoride and chlorine levels, and other data. Bacteriological, physical, and chemical test results are kept on file at the MOC for a minimum of 10 years. Other data is retained for the minimum period prescribed by WAC 246-290-480.
- During routine maintenance or construction activities resulting in excavation of a service line, maintenance staff will classify the material and size of the public and private side of the service line on their work orders. This information is compiled in a working inventory that is reviewed and updated by the Water Quality Analyst or Water Quality Supervisor.

11.11. Asset Management Program

As of the writing of this WSP, the City has current initiatives to operationalize asset management within the organization. The Public Works Department has an existing asset management program roadmap that includes the following elements: management of asset lifecycle, risk management, financial, and program development. Public Works has also initiated prioritization framework development by identifying consequence of failure factors for wastewater and rmwater pipes. Starting with a portion of its water and wastewater system, a strategic asset management plan (SAMP) is currently under development for the Novelty Hill area. The SAMP will facilitate improved service, reliability, and cross-function cost planning for the Novelty Hill portion of the Retail Service Area. The Novelty Hill Water and Wastewater SAMP development will focus on strategic operations and maintenance (O&M) improvements

and tactical planning of rehabilitation and replacement (R&R) projects for tanks, pump stations, lift stations, and water and wastewater conveyance infrastructure in the service area. Redmond plans to use the Novelty Hill SAMP process to inform development of the asset management strategy for the remainder of its service area and establish an asset management foundation that incorporates stormwater assets as well.

Additionally, Redmond is currently performing an enterprise systems study to weigh its options for system consolidation, configuration, or new system implementation. Public Works currently uses Lucity as its Enterprise Asset Management System (EAM) for water, wastewater and stormwater facilities, a system for asset registry and work order management. GIS is the system of record for linear and vertical water, wastewater and stormwater assets.

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Chapter 12: Capital Improvement Program

City of Redmond 2024 Water System Plan

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12. Capital Improvement Program

12.1. Development of Capital Improvement Program

The capital improvement program (CIP) is prepared by first identifying projects that address water system needs or deficiencies, as documented in earlier chapters of this plan. In addition, recurring or annual capital projects related to system maintenance have also been included in the list of improvements.

An implementation schedule of the projects was then developed. Generally, projects of higher priority (i.e., those that address current system needs) were scheduled for implementation within the ten-year planning horizon (2023-2032). Projects that serve anticipated future needs associated with system growth, or are less critical to system operation, were scheduled for implementation beyond 2032. Detailed scheduling of the near-term projects was based primarily upon the City's existing forecast of project implementation timelines. Where applicable, the timing of water system projects has been coordinated with sewer and street improvements planned for the same locations.

Planning-level costs for projects identified by the City prior to this WSP update were estimated using the City's cost estimating tool, which provides budgetary-level cost estimates. Generally, each project cost includes the following components:

- **Base construction cost.** Includes all labor and material costs needed to construct a project.
- **Sales tax.** Calculated as 10.1 percent of the base construction cost.
- **Construction contingency.** Takes into account the uncertainties associated with estimating project costs at this planning level. Typically calculated as 30 percent of the total of base construction plus sales tax.
- **Design engineering/geotechnical/surveying/permitting/construction administration engineering.** Includes City and consultant design costs, and other related cost items, such as permitting and construction administration. For most projects, this is calculated as 25 percent of the base construction cost. However, a higher percentage of the base construction cost is used for projects with more complex design or permitting needs.

These elements are summed to determine the total project-level cost estimate for a project, as expressed in 2023 dollars.

Where applicable, design costs are scheduled one year in advance of construction costs, to reflect the phasing typically used for larger projects.

12.2. Planned Projects and Costs

Table 12-1 presents the City's schedule of CIP projects planned for implementation between 2023 and 2032, as well as those slated for implementation beyond 2032. The City reevaluates

the CIP every year for costs through the forthcoming six-year period and updates its CIP accordingly. In total, the City's 10-year CIP includes approximately $71 million in improvements.

Figure 12-1 provides the locations for the major planned improvements. Descriptions of each project follow. Additional maps that display future capital projects are included in Appendix O. The maps include additional detail of the general alignment of piping that developers will be required to install, at their cost, as new development is constructed within the City's service area. These projects are not identified in the CIP and will be completed by developers as needed to provide the infrastructure to serve the associated new growth.

If a development project requires completion of a project listed on the CIP to provide adequate service, the developer will need to complete the improvement at their cost to serve the associated new growth to the adopted standards. This includes replacing undersized pipe or pipe that is at the end of its useful life.

Table 12-1. Capital Improvement Program Table (In 2023 dollars)

CIP No.	Description	Total Project Cost (dollars)	Schedule and Costs (dollars)										Long-term
			2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	
Supply													
S-1	Well No. 4 Rehabilitation or Replacement	100,000	50,000	50,000									
S-2	Groundwater Aquifer Monitoring Network Improvements	294,822			61,655	233,167							
S-3	Groundwater Protection Infiltration Retrofit Program	2,183,567	1,078,663		10,450	364,818	364,818	364,818					
S-4	Well Equipment Upgrades	100,000											100,000
Storage and Pumping													
ST-1	Additional Storage Facilities - Education Hill (7.4 MG)	24,000,000											24,000,000
ST-2	Reservoir Painting	24,000,000								12,00,000			12,000,000
Distribution System													
D-1	Pipe Replacement Program	6,500,000	100,000	1,200,000	100,000	1,200,000	100,000	1,200,000	100,000	1,200,000	100,000	1,200,000	6,500,000
D-2	PRV and Meter Vault Projects #2 and #3	8,785,037	5,964,522				1,348,942	1,471,573					
D-3	Pressure Reducing Valve Replacement (NE 51st Street Crossing of State Route 520)	25,000	25,000										
D-4	Booster Pump Station Replacements (Education Hill, SE Redmond, Perrigo)	4,073,343						962,709					3,110,634
D-5	Country Route Upgrade (368 ft, 12-in pipe; 11,430 ft, 8-in pipe)	5,730,000											5,730,000
D-6	Willows Road Watermain Extension	2,107,242		90,762	272,287	972,592	771,601						
D-7	51st Street Watermain Replacement	1,057,892					439,231	618,661					
D-8	Overlake Access Ramp Watermain	15,000	15,000										
D-9a	AC Watermain Replacement Phase 1 - Viewpoint North	5,551,825			431,047	690,346	637,793	2,500,578					1,292,061
D-9b	AC Watermain Replacement Phase 2 - 2400 179th Avenue	274,358				65,599	127,725	81,034					
D-9c	AC Watermain Replacement Phase 3 - Viewpoint South	5,003,917					171,955	619,448					4,212,514
Kirkland Joint Use Projects													
JU-1	Kirkland South Reservoir Tank Painting and Seismic Retrofit	2,869,236		2,141,078	728,158								
JU-2	Kirkland Supply Station 3 Replacement	400,000											400,000
JU-3	Kirkland North Pump Station Replacement	800,000											800,000
Bellevue Joint Use Projects													
JU-4	Bellevue 40th Street Meter Replacement	143,525					43,296	100,229					
Maintenance and Operations Center													
MOC-1	Maintenance and Operations Center (MOC) - Campus Design	976,545			509,502	467,043							
MOC-2	Maintenance and Operations Center (MOC) - Campus Construction Phase 1	6,000,000					3,000,000	3,000,000					
MOC-3	Maintenance and Operations Center (MOC) - Campus Construction Phase 2	250,000						250,000					
MOC-4	Maintenance and Operations Center (MOC) - Trinity Building Generator	56,737	15,839	40,898									
MOC-5	Maintenance and Operations Center (MOC) - Fuel Storage Tank Replacement	176,366			35,273	141,093							
MOC-6	Maintenance and Operations Center (MOC) - Security Improvements	83,580	18,753	64,827									

CIP No.	Description	Total Project Cost (dollars)	Schedule and Costs (dollars)										Long-term
			2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	
Other													
O-1	Portable Generators Replacement	200,000											200,000
O-2	Control System and Telemetry Upgrade, Phases 2 and 3	4,234,343	1,500,000	2,100,000	634,343								
O-3	Control System and Telemetry Upgrade Phase 4	3,481,308			409,976	975,140	2,096,192						
O-4	Software Upgrades (Utility Billing, GIS, Asset Mgmt)	50,000	5,000	5,000	5,000	5,000	5,000	5,000	5,000	5,000	5,000	5,000	50,000
O-5	Asset Management Program Development	100,000	10,000	10,000	10,000	10,000	10,000	10,000	10,000	10,000	10,000	10,000	100,000
O-6	Novelty Hill AMI	1,712,649	158,421	341,153	909,806	303,269							
O-7	Pavement Management - Avondale Road (NE 90th Street to Novelty Hill Road)	3,642,508		204,895	409,790	409,790	938,747	1,679,286					
O-8	Pavement Management - NE 24th Street (West Lake Sammamish Parkway to 172nd Avenue NE)	7,306,203	697,743	761,175	761,175	2,288,413	2,797,697						
	Annual Totals		9,803,003	7,009,788	5,288,462	8,126,270	12,852,997	12,863,336	115,000	13,215,000	115,000	1,215,000	58,395,209

TBD = Cost to be determined when project definition is sufficient to support development of such estimates.

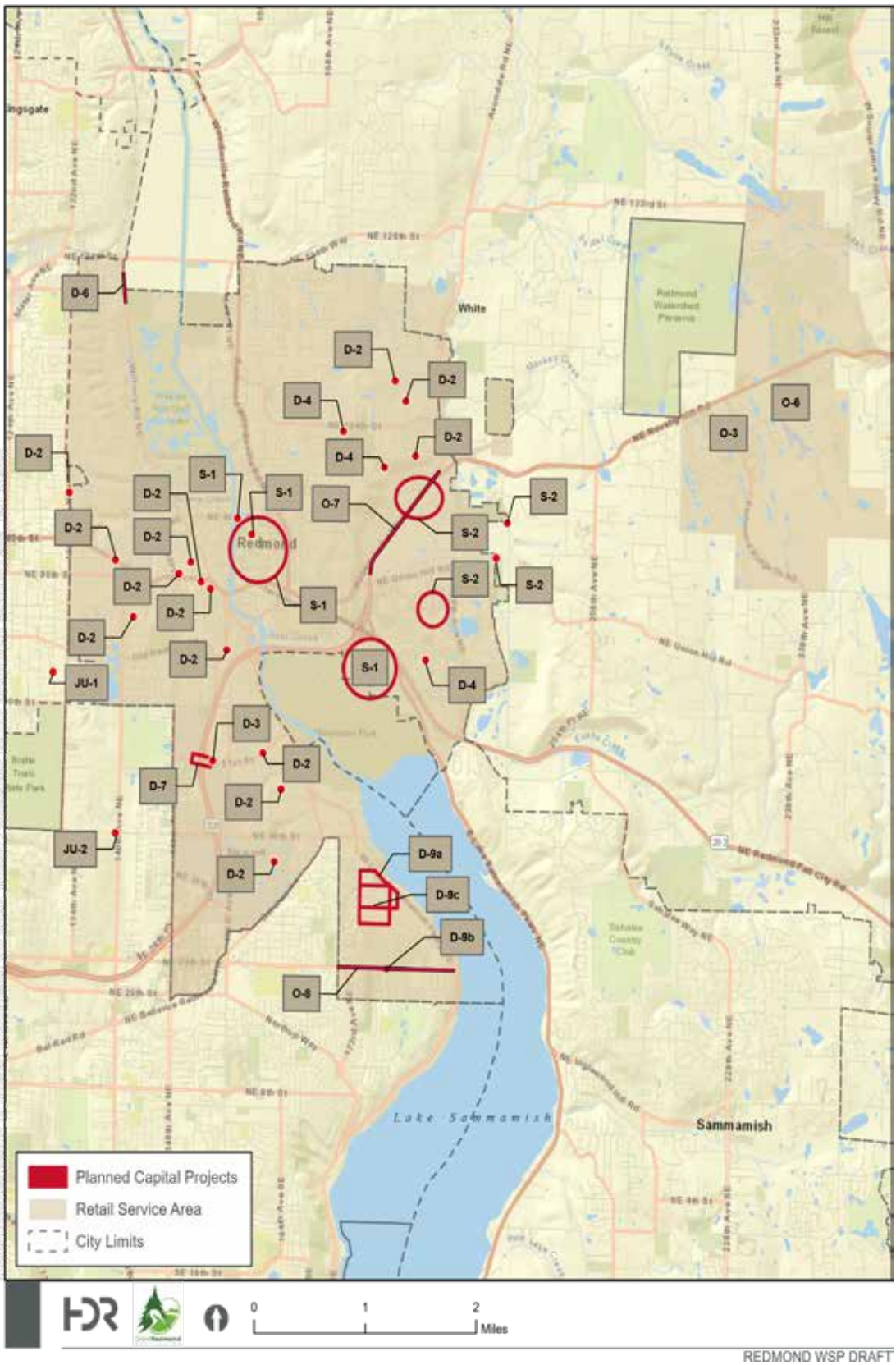


Figure 12-1. Capital Improvement Program Projects Map

12.2.1. Water Supply Projects

The following projects include improvements related to enhancing or protecting existing sources of supply.

- **S-1: Well No. 4 Rehabilitation or Replacement.** This project involves addressing the continued decline in production at Well No. 4. Options to be further evaluated include well rehabilitation, potential drilling of a replacement well, and water rights changes to allow for other wells to be considered as points of withdrawal under the Well No. 4 rights. Funds are budgeted within the 10-year planning horizon for continued study of the issue and identification of a project.
- **S-2: Groundwater Aquifer Monitoring Network Improvements.** Install five to eight new groundwater monitoring wells to monitor the drinking water aquifer. Decommission up to five existing groundwater monitoring wells that have reached the end of their useful lives.
- **S-3: Groundwater Protection Infiltration Retrofit Program.** The City works with private entities to retrofit private stormwater infiltration systems to reduce risk to the drinking water aquifer. This has been an ongoing program and is anticipated to be completed within the next six years.
- **S-4: Well Equipment Upgrades.** Several of the wells will require some level of equipment replacements and upgrades due to the age of the existing equipment.

12.2.2. Water Storage and Pumping Projects

The following projects include improvements related to maintaining existing pumping/storage facilities and construction of new facilities to address future storage volume deficiencies.

- **ST-1: Additional Storage Facilities – Education Hill (7.4 MG).** At the 20-year demand forecast horizon, the City projects a system-wide standby storage deficiency of approximately 7.4 MG in the Well, Rose Hill, and Bellevue-Overlake-Viewpoint Service Areas. Additional storage constructed at the Education Hill tank site can serve to fully address this deficiency. The City has property available at this site for additional facilities, which will likely take the form of two approximately 3.75 MG reservoirs constructed in a phased manner. The timing of reservoir construction will be based upon the rate of demand growth. The City will monitor demand growth and periodically reassess the adequacy of existing standby storage volumes to determine the appropriate schedule for design and construction of new storage facilities. Alternative sites for some of the storage needs will also be analyzed. The 565 zone (also on Education Hill) currently has a single feed and would benefit from an additional storage source and feed.
- **ST-2: Reservoir Painting.** The City's reservoirs should be painted roughly every 15 years. The City will develop a detailed schedule informed by the results of its ongoing strategic asset management program work. At this time, the approximate costs for interior and exterior recoating of the Novelty Hill Tanks are budgeted within the 10-year CIP, with additional recoating costs for two or three additional reservoirs included beyond the 10-year horizon.

12.2.3. Water Distribution System Projects

The following projects include distribution system improvements, primarily related to piping and valving, that serve to increase fire flow availability in targeted areas, increase overall reliability in the transmission/distribution system, and provide for ongoing maintenance of pipeline facilities.

- **D-1: Pipe Replacement Program.** This ongoing program addresses the replacement of aging, undersized, and/or asbestos cement (AC) water distribution pipes to improve fire flows, minimize emergencies, and prevent catastrophic failures.

Redmond has roughly 53 miles of AC pipe. Figure 12-2 displays the City's current extent of AC pipe. While the pipe remains functional, it is at higher risk of failure due to age and material. Specific segments of AC pipe are targeted for replacement in areas where the City has planned overlay projects, or where there is a known high rate of failure. To proactively address replacement, the City is developing an asset management program that will quantify the appropriate schedule to accelerate work in areas where pipe replacement is the highest priority. Pipe replacement will be prioritized based on age, capacity and risk and impact of failure. Funding for individual pipe replacement projects that have already been identified is included in the City's 10-year CIP. Once an assessment of the system is complete, the schedule for replacement of additional AC pipe sections will be established based on need and availability of funds.

The hydraulic modeling results described in Section 10.4 are used to help prioritize which pipe segments are replaced and the replacement timeline. Figure 10-10 displays pipes that the hydraulic model identified as priorities for replacement or upsizing based on fire flow and velocity criteria. Discrete piping improvement projects are listed in Appendix N.

Furthermore, there are pipes in the system that are undersized based on the zoning for the area the pipe serves. Per Chapter 4 of the City's Water and Wastewater System Design Requirements, water mains serving single family residential zones must be at least 8-inches in diameter, and mains serving multifamily and non-residential zones must be at least 12-inches in diameter. These are not explicitly shown on the CIP table, as selection of which pipe replacement projects occur in certain years is driven by additional factors, including alignment with other City priorities. Figure 12-3 displays AC pipes that are also undersized based on the zoning category of the area they serve and deficient based on hydraulic modeling. These pipes are considered high priority for the pipeline replacement program because they satisfy three key criteria for replacement.

The City budgets an annual amount to support this effort, with project prioritization and selection revisited frequently. The City will focus on prioritizing projects where redevelopment is not likely to occur. Detailed maps displaying the various criteria of pipes identified for future improvements, as well as anticipated developer extensions, are in Appendix O.

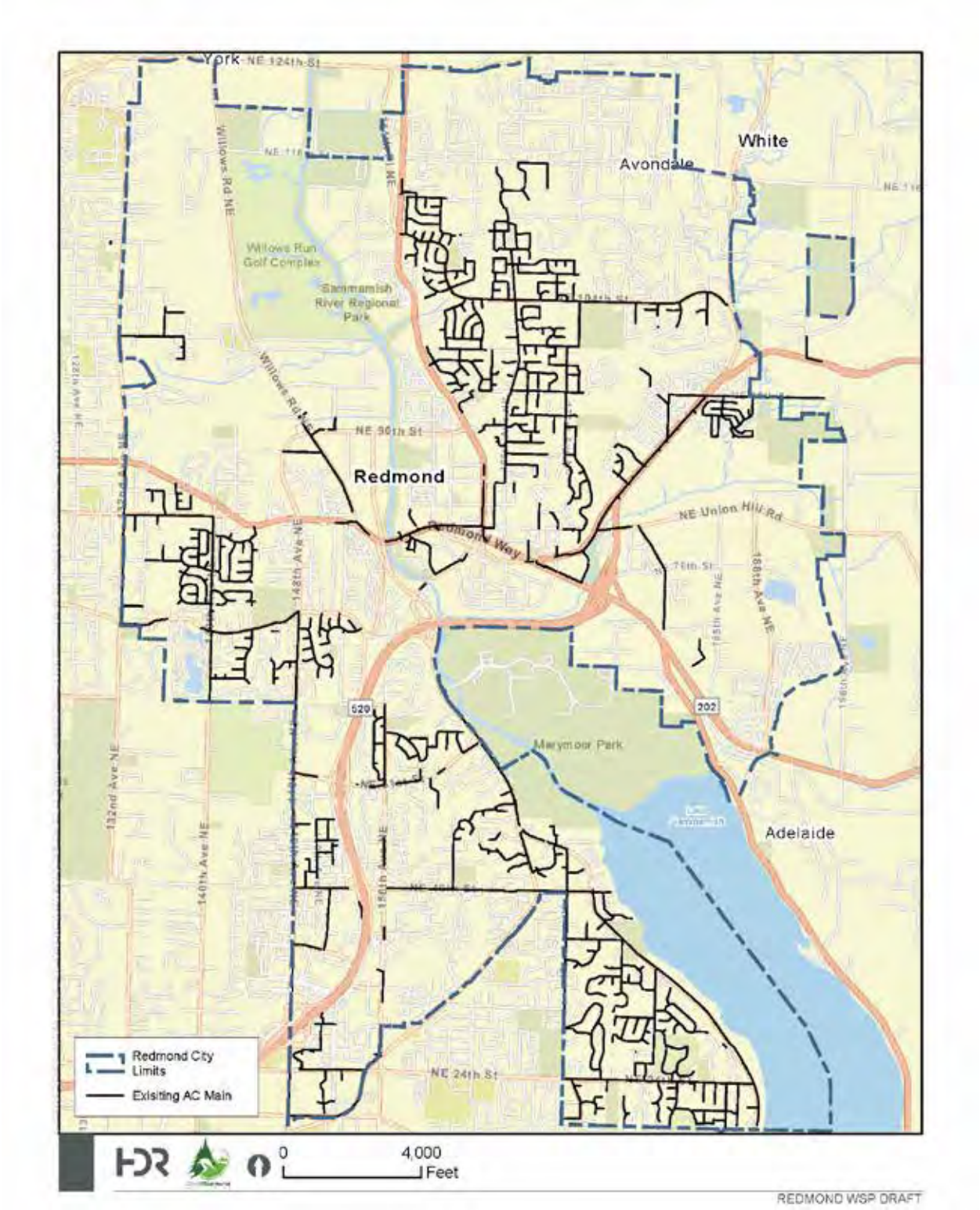


Figure 12-2. AC Watermains in the City's Water System

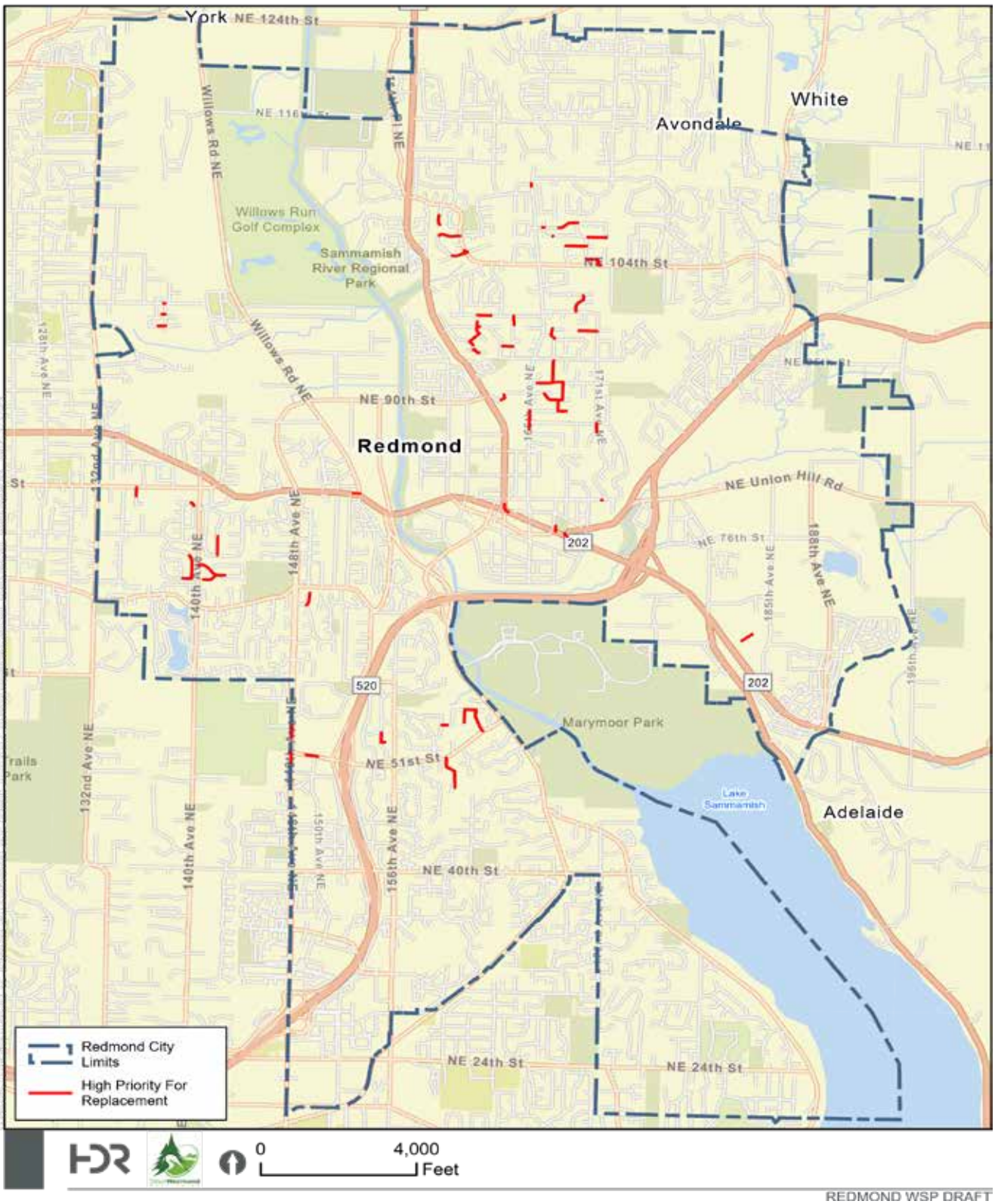


Figure 12-3. High-Priority Deficient Water Mains

- **D-2: PRV and Meter Vault Projects #2 and #3.** This ongoing program involves the replacement of aging and undersized pressure reducing valves (PRVs) and large meters and associated vaults. These replacements significantly reduce the risk of PRV failure which could have a significant impact on customers. Fourteen total PRV replacements are planned.
- **D-3: PRV Replacement – NE 51st Street Crossing of State Route 520.** Replacement of PRV 54 station at 51st east of SR 520.
- **D-4: Booster Pump Station Replacements: Education Hill, SE Redmond, and Perrigo.** Perform a comprehensive system and condition assessment of the City's three booster pump stations. Plan replacements for equipment and facilities identified in the assessment.
- **D-5: Country Route Upgrades.** This project involves upsizing an existing 1920's-era 6-inch dead-end cast iron pipe that extends east along NE Redmond Road toward the Redmond Watershed. The City is planning to work with neighboring purveyors to provide at a minimum one or more additional feeds to the pipe. Ultimately the entire pipe run will need to be replaced due to its age. How that is done may differ from the phases listed below, based on coordination with Woodinville Water and Union Hill Water Association.
    - Phase 1. Replace 368 feet with 12-inch pipe, west of Avondale Road. In addition, replace 3,450 feet with 8-inch pipe, terminating near Farrel McWhirter Park.
    - Phase 2. When needed, replace 4,620 feet with 8-inch, from the end of Phase 1 to the end of NE Redmond Road at 116th.
    - Phase 3. When needed, replace 3,360 feet with 8-inch, from the end of Phase 2 to the terminus of the existing line.
- **D-6: Willows Road Watermain Extension.** Extend the watermain under Willows Road by 1,300 feet to complete the water system for the area and associated frontage improvements. This project supports growth, improves redundancy of the system, and improves fire protection.
- **D-7: 51st Street Watermain Replacement.** Replace the 8" waterline that runs under SR520 with a 12" waterline that runs under the NE 51st Street overpass.
- **D-8: Overlake Access Ramp Watermain.** Replace 8" AC watermain with 12" DI watermain in Shen Street and Hopper Street associated with WSDOT construction of access ramp improvements.
- **D-9: AC Pipe Replacement Projects.** The City has planned three AC pipe replacement projects within the 10-year planning horizon.
    - **D-9a – Viewpoint North.** Remove 3,100 feet of AC watermain that is at the end of its lifecycle and replace it with DI pipe and new services in a portion of the Viewpoint neighborhood. This is the first phase of the Viewpoint AC pipe replacement project. This project will reduce risk of property damage, temporary loss of water service, and fire protection due to watermain breaks.
    - **D-9b – 2400 179th Ave.** Replace 960 feet of aging 6-inch AC watermain with 8-inch DI watermain. King County will construct this project as part of the Lake Hills Project. This project will increase the size of watermain to meet current

standards, reduce risk of property damage and temporary loss of water service, and ensure adequate fire protection by reducing watermain breaks.

- **D-9c – Viewpoint South.** Remove 3,100 feet of AC watermain that is at the end of its lifecycle and replace it with DI pipe and new services in a portion of the Viewpoint neighborhood. This is the second phase of the Viewpoint AC pipe replacement project. This project will reduce risk of property damage, temporary loss of water service, and fire protection due to watermain breaks.

12.2.4. Joint Use Projects

The following represent improvement projects associated with facilities that are shared with either the City of Kirkland or the City of Bellevue. Redmond will continue to coordinate with Kirkland and Bellevue to identify other joint use projects. As of the writing of this WSP, these are the specific projects that are either planned for implementation in the near-term or that address deficiencies identified in previous chapters of the WSP. Costs shown in Table 12-1 reflect only Redmond's share of total project costs, unless noted otherwise.

- **JU-1: Kirkland South Reservoir Tank Painting and Seismic Retrofit.** (Denoted as CIP J5 in Kirkland 2014 WSP.) In lieu of painting and retrofitting the existing reservoir (which was the original plan), Kirkland will replace the jointly owned and operated water tank with a larger concrete reservoir that will provide additional storage volume (roughly 15 MG). Redmond will provide a portion of funds for the project, based on the available storage allotted. Tank design is moving forward and will include additional storage for Kirkland if Bellevue and Redmond maintain the existing storage volumes, or additional storage for all three municipalities if Redmond and Bellevue are willing to pay for additional storage.
- **JU-2:** Kirkland Supply Station 3 Replacement. (Denoted as CIP J1 in Kirkland 2014 WSP.) Replace the existing station with a new below-grade station that resolves deficiencies that are detailed in Kirkland's 2014 WSP. Costs shown in Table 12-1 are total project costs..
- **JU-3:** Kirkland North Pump Station Replacement. (Denoted as CIP J2 in Kirkland 2014 WSP.) Replace the existing station with a new station that resolves deficiencies that are detailed in Kirkland's 2014 WSP and provides a capacity of 5,000 gpm. In addition to transferring water between reservoirs, the proposed pump station will be capable of maintaining adequate pressures during high demand periods or when SPU provides supply at or near the minimum contract head levels. Costs shown in Table 12-1 are total project costs.
- **JU-4: Bellevue 40th Street Meter Replacement.** The City of Bellevue is making safety and equipment improvements to one water meter which Redmond jointly owns with Bellevue. Redmond will provide a portion of funds for the project.

12.2.5. Maintenance and Operations Center

The City has identified six improvements to its Maintenance and Operations Center (MOC) that will be funded through the water CIP through the 2028 CIP planning horizon:

- Campus design
- Campus construction (phases 1 and 2)

- Trinity Building Generator
- Fuel Storage Tank Replacement
- Security Improvements

12.2.6. Other Projects

The following are miscellaneous projects that support ongoing and reliable water system operation.

- **O-1: Portable Generator Replacement.** Purchase of replacement generators to provide emergency power at various sites. Key sites are the Education Hill Pump Station and Reservoir Park.
- **O-2: Control System and Telemetry Upgrade, Phases 2 and 3.** Replace control panels and telemetry communication systems at several in-City water utility facilities. Control panels will be upgraded to current industry standard technology and telemetry communications will be more reliable.
- **O-3: Control System and Telemetry Upgrade Phase 4.** Replace control panels and telemetry communications systems at all Novelty Hill water and wastewater facilities. Control panels will be upgraded to current industry standard technology and telemetry communications will be more reliable.
- **O-4: Software Upgrades.** This refers to periodic upgrades associated with software used for utility billing, GIS, asset management, etc. Estimated annual costs are depicted in Table 12-1; however, costs may be incurred at different frequencies (e.g., every five years).
- **O-5: Asset Management Program Development.** This refers to various programmatic activities the City anticipates undertaking within and beyond the 10-year planning horizon to support its asset management program. Estimated annual costs are depicted in Table 12-1; however, costs may be incurred at different frequencies and may change if costs are shared with other utilities or departments within the City.
- **O-6: Novelty Hill Advanced Metering Infrastructure.** Replace water meters in the Novelty Hill service area with Advanced Metering Infrastructure (AMI) meters to improve remote tracking of water usage by customers and the City. AMI facilitates improve customer service, water use efficiency, and operational efficiency.
- **O-7: Pavement Management.** Replace approximately 2,500 l.f. AC watermain (mostly 16”) in Avondale Road from NE 90th Street to Novelty Hill Road in preparation for future overlay work.
- **O-8: Pavement Management.** Replace approximately 6,300 l.f. AC watermain (8” and 12”) in NE 24th Street from W. Lake Sammamish Parkway to 172nd Avenue NE in preparation for future overlay work.

Chapter 13: FINANCIAL ANALYSIS

City of Redmond 2024 Water System Plan

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(Not applicable)

13. Financial Analysis

13.1. Introduction

The financial analysis examines the City's water utility's capacity to maintain financial stability over the planning period. The assessment considers past performance and expected future requirements. Additionally, it reviews the affordability of the City's current water rates and assesses whether any rate adjustments are necessary to sustain operations and fund planned capital investment projects.

For transparency and accountability, the financials for the In-City service area and the Novelty Hill service area are kept separate for planning, rate setting and financial reporting purposes. Separate analysis is provided for each service area. While water and wastewater financials are combined in the city's overall financial statements, they have been separated for the purpose of water-only analysis.

13.2. In-City Service Area Financial History

This sub-section provides a condensed overview of the financial performance of the water utility's In-City service area from 2013 to 2022, based on the city's financial statements (Statement of Revenues, Expenses, and Changes in Fund Net Position). Key insights drawn from this analysis include:

- Service charges increase by 12.5% between 2013 and 2022, primarily attributed to the expansion of the city's customer base of 12.68% and the implementation of water rate increases during this period. Since 2007, the city has adhered to a policy of adjusting rates in line with inflation, resulting in annual incremental increases. However, during the 2021-2022 rate setting process the city chose to leave water rates unchanged due to the economic pressures on rate payors by caused by the Covid-19 pandemic. Table 13-1 and Table 13-2 show the rate adjustment history over the last decade for each customer class.

Table 13-1. In-City Residential Water Rates

Residential Bi-Monthly Water Rates								
Effective	Flat Rates				Commodity Rates			
	.75 Inch	1 Inch	1.5 Inch	2 Inch	0-800	801-2000	2001-4000	4001+
1/1/2013	26.26	33.40	40.40	60.00	1.60	3.20	4.80	6.40
1/1/2014	26.80	34.00	41.20	61.20	1.65	3.30	4.95	6.60
1/1/2015	27.60	35.10	42.50	63.10	1.70	3.40	5.10	6.80
1/1/2016	28.05	36.20	43.80	65.00	1.75	3.50	5.25	7.00
1/1/2017	29.10	36.90	44.70	66.30	1.79	3.57	5.36	7.14
1/1/2018	29.70	37.70	45.60	67.60	1.82	3.64	5.46	7.28
1/1/2019	30.00	38.00	46.06	68.28	1.84	3.68	5.51	7.35
1/1/2020	30.30	38.46	46.52	68.96	1.86	3.71	5.57	7.43
1/1/2021	30.30	38.46	46.52	68.96	1.86	3.71	5.57	7.43
1/1/2022	30.30	38.46	46.52	68.96	1.86	3.71	5.57	7.43

Table 13-2. In-City Multi-Family and Commercial Water Rates

Multi-Family and Commercial Monthly Water Rates											
Effective	Flat Rates								Commodity Rates		
	.75 Inch	1 Inch	1.5 Inch	2 Inch	3 Inch	4 Inch	6 Inch	8 Inch	Winter	Summer	Irrigation
1/1/2013	17.25	30.75	53.25	80.20	125.00	234.00	458.00	729.00	2.10	3.60	5.80
1/1/2014	17.60	31.35	54.30	81.80	155.00	238.00	467.00	743.00	2.15	3.70	5.90
1/1/2015	18.15	32.30	55.95	84.25	160.00	245.00	481.00	765.00	2.22	3.81	6.10
1/1/2016	18.70	33.30	57.65	86.80	165.00	253.00	496.00	788.00	2.29	3.93	6.30
1/1/2017	19.10	34.00	58.80	88.55	168.00	258.00	506.00	804.00	2.34	4.01	6.43
1/1/2018	19.50	34.70	60.00	90.30	172.00	263.00	516.00	820.00	2.39	4.09	6.56
1/1/2019	20.33	36.17	62.55	94.14	179.31	274.18	537.93	854.85	2.49	4.26	6.56
1/1/2020	21.19	37.71	65.21	98.14	186.93	285.83	560.79	891.18	2.60	4.45	6.56
1/1/2021	21.19	37.71	65.21	98.14	186.93	285.83	560.79	891.18	2.60	4.45	6.56
1/1/2022	21.19	37.71	65.21	98.14	186.93	285.83	560.79	891.18	2.60	4.45	6.56

- Operating expenses (excluding depreciation) increased by 12.14% from 2013 – 2022. Due mostly to the rising inflationary, salary and benefit increases, and rate increases from Cascade Water Alliance. This excludes the annual remittance of Regional Capital Facilities Charges to Cascade Water Alliance. The amount of this expense is offset by the collection of charges due and varies depending on the level of development activity in the city.

- The operating ratio serves as a tool to assess the water utility's self-sustainability as a business entity, gauging the capacity of yearly operating revenues to offset annual operating expenses. By incorporating depreciation costs into this assessment, it offers clarity on whether the city is charging customers adequately to finance asset replacement alongside daily operational expenditures. As depicted in Table 13-3, the water utility covered operating costs throughout the ten-year duration apart from 2018 and 2022 when long-term liabilities for Regional Capital Facilities Charges to Cascade Water Alliance where due and payment was offset by revenue recognized in previous years.

- The current ratio serves as a gauge of short-term liquidity, reflecting the water utility's capability to settle its immediate bills. The current ratio is computed by dividing unrestricted current assets (excluding inventories and prepaid items) by current liabilities. A ratio of 1.0 signifies adequate funds to cover bills; higher ratios are favorable, indicating readiness to handle significant or unexpected expenses. Over the past decade, the water utility has maintained current ratios ranging from 11.30 to 61.90 in typical years, signifying robust capacity to fulfill short-term financial commitments. In 2019 the current ratio is significantly above the normal range at 193.63 due to the decrease in current liabilities caused by payments made to Cascade Water Alliance for Regional Capital Facility Charges. The current liabilities for 2019 were $250,873, the annual average is above $1M.

- Days of cash on hand serves as a gauge of financial stability, measuring how long the water utility could sustain its daily operating and maintenance costs without any additional revenue. It is determined by dividing unrestricted cash by the average daily operational expenses (excluding depreciation). While there isn't a fixed minimum requirement for this metric, bond rating agencies have recently indicated a preference for utilities aiming for the highest bond ratings to maintain a minimum of 180 days of cash on hand. As shown in Table 13-3 the water utility has consistently sustained between 215 and 687 days of cash on hand over the past decade, surpassing this standard comfortably.

- The water utility has no outstanding debt. The city issued $11.7M in revenue bonds in 2008 to fund the rehabilitation of drinking water wells and complete construction of a new water treatment facility. The bonds were callable in 2018 and redeemed through available cash on hand, five years prior to the final maturity date. The water utility maintained a debt service coverage ratio of 14.36 – 17.65 on the revenue bonds when required, exceeding the 1.20 ratio required by bond covenants.

- The Debt-to-Asset Ratio serves as a measure of indebtedness, commonly used to assess whether a utility is excessively leveraged. Values surpassing 60% typically raise concerns about over indebtedness. High levels of debt can be perceived unfavorably within a fiscal health assessment, as debt incurs additional costs like interest and entails obligations such as coverage and reserves, potentially constraining a utility's financial

flexibility. The water utility's ratio has declined from 6.0% in 2013 to 0% in 2018, indicating the settlement of existing revenue bond obligations.

Table 13-3. In-City Service Area – Historical Financial Operating Results

In-City Service Area - Historical Operating Results (Years Ended December 31, $000s)										
Description	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**	**2019**	**2020**	**2021**	**2022**
Operating Revenues:										
Charges for Services	$ 15,916	$ 15,548	$ 16,784	$ 16,646	$ 18,474	$ 17,326	$ 16,492	$ 16,591	$ 18,147	$ 18,190
Total Operating Revenues	$ 15,916	$ 15,548	$ 16,784	$ 16,646	$ 18,474	$ 17,326	$ 16,492	$ 16,591	$ 18,147	$ 18,190
Operating expenses:										
Administrative and General [1]	$ 1,954	$ 2,044	$ 1,758	$ 1,975	$ 2,168	$ 2,367	$ 2,192	$ 2,090	$ 2,199	$ 2,278
Purchased Water	6,485	6,933	6,769	7,509	6,017	8,194	5,005	6,779	6,417	9,173
Maintenance and Operations [1]	1,774	1,961	3,033	3,139	2,945	3,350	3,198	3,627	3,722	3,897
Taxes	1,470	574	608	609	627	668	650	644	675	705
Depreciation and Amortization	2,924	2,955	2,999	3,022	3,049	3,105	2,865	2,813 [2] [1]	2,836 [2] [1]	2,911
Total Operating Expenses	$ 14,606	$ 14,465	15,166	16,254	14,806	17,685	13,909	15,952	15,851	18,963
Operating Income (Loss)	$ 1,310	$ 1,083	1,618	392	3,667	(359)	2,582	638	2,296	(773)
Non-Operating Revenues (Expenses):										
Interest and Investment Revenue	$ 44	$ 40	$ 49	$ 52	$ 55	$ 92	$ 39	$ 43	$ 35	$ 88
Net Change in fair value of the Investments	(31)	(7)	(16)	(10)	(16)	37	24	40	(54)	(189)
Grants	65	101	52	71	91	93	106	124	124	146
Interest Expense	(413)	(380)	(353)	(323)	(286)	(109)	(0)	-	-	-
Miscellaneous	83	129	164	96	105	381	187	300	185	215
Total Non-Operating Revenues (Expenses)	$ (252)	$ (118)	$ (104)	$ (113)	$ (51)	$ 494	$ 356	$ 507	$ 291	$ 260
Income (loss) before contributions and transfers	$ (14,842)	$ (14,567)	$ (15,253)	$ (16,351)	$ (14,839)	$ (17,174)	$ (13,537)	$ (15,428)	$ (15,542)	$ (18,685)
Capital Contributions	$ 1,235	$ 1,250	$ 1,081	$ 1,113	$ 605	$ 1,656	$ 1,167	$ 917	$ 1,105	$ 1,483
Transfers In	-	-	-	-	-	-	-	-	-	-
Transfers Out	(2,049)	(2,301)	(2,377)	(2,440)	(2,330)	(2,553)	(3,232)	(3,329)	(2,993)	(3,059)
Change in Net Position	$ (15,656)	$ (15,618)	$ (16,549)	$ (17,678)	$ (16,564)	$ (18,071)	$ (15,603)	$ (17,841)	$ (17,429)	$ (20,261)
Operating Ratio (Excluding Depreciation)	734.00	740.33	724.89	794.89	636.41	841.48	669.71	792.00	717.18	882.49
Operating Ratio (Including Depreciation)	917.71	930.35	903.58	976.43	801.48	1020.70	843.41	961.53	873.47	1042.51
Current Ratio	12.64	16.34	16.60	17.40	11.30	34.75	193.63	31.40	61.90	48.95
Days Cash on Hand	215	235	335	351	386	386	659	595	687	592
Outstanding Debt Principal at Year-End	$ 8,919,149	$ 8,195,033	$ 7,445,917	$ 6,666,801	$ 5,852,685	N/A	N/A	N/A	N/A	N/A
Outstanding Principal as % of Capital Assets	6.0%	5.6%	5.1%	4.4%	3.8%	N/A	N/A	N/A	N/A	N/A

[1] To Exclude GASB 68 (pension) & GASB 87 (lease) entries

[2] To Exclude GASB 83 entries (ARO)

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13.3. Novelty Hill Service Area Financial History

This sub-section offers a concise summary of the financial performance of the water utility's Novelty Hill service area from 2013 to 2022, based on the city's financial statements (Statement of Revenues, Expenses, and Changes in Fund Net Position). Key observations from this examination include:

- Charges for services increased by 9.91% between 2013 and 2022, with factors such as the customer base expansion and water rate increases contributing to this stability. Since 2007, the city has followed a policy of adjusting rates to match inflation, resulting in annual incremental increases. However, during the 2021-2022 rate setting process, the city opted to maintain water rates due to economic pressures from the Covid-19 pandemic on rate payers. Table 13-4 and Table 13-5 show the rate adjustment history over the last decade for each customer class.

Table 13-4. Novelty Hill Residential Water Rates

Residential Bi-Monthly Water Rates								
Effective	Flat Rates				Commodity Rates			
	.75 Inch	1 Inch	1.5 Inch	2 Inch	0-800	801-2000	2001-4000	4001+
1/1/2013	33.30	43.80	54.30	83.30	2.75	5.50	8.25	11.00
1/1/2014	34.00	44.70	55.40	85.00	2.80	5.60	8.40	11.20
1/1/2015	35.10	46.10	57.10	87.60	2.90	5.80	8.70	11.60
1/1/2016	36.20	47.50	58.80	90.20	3.00	6.00	9.00	12.00
1/1/2017	39.10	51.30	63.50	97.40	3.24	6.48	9.72	12.96
1/1/2018	42.30	49.80	68.60	105.20	3.50	7.00	10.50	14.00
1/1/2019	43.56	51.30	70.66	108.36	3.61	7.21	10.82	14.42
1/1/2020	44.88	52.84	72.78	111.60	3.71	7.43	11.14	14.85
1/1/2021	44.88	52.84	72.78	111.60	3.71	7.43	11.14	14.85
1/1/2022	44.88	52.84	72.78	111.60	3.71	7.43	11.14	14.85

Table 13-5. Novelty Hill Multi-Family and Commercial Water Rates

Multi-Family and Commercial Monthly Water Rates											
Effective	Flat Rates								Commodity Rates		
	.75 Inch	1 Inch	1.5 Inch	2 Inch	3 Inch	4 Inch	6 Inch	8 Inch	Winter	Summer	Irrigation
1/1/2013	20.50	40.20	73.10	113.00	218.00	337.00	665.00	1060.00	2.60	3.75	10.25
1/1/2014	20.90	41.00	74.55	115.00	223.00	343.00	678.00	1081.00	2.65	3.85	10.45
1/1/2015	21.55	42.25	76.80	118.45	230.00	354.00	699.00	1114.00	2.73	3.97	10.76
1/1/2016	22.20	43.55	79.10	122.00	237.00	365.00	720.00	1148.00	2.82	4.09	11.10
1/1/2017	24.00	47.05	85.45	132.00	256.00	394.00	778.00	1240.00	3.05	4.42	11.99
1/1/2018	25.95	50.80	92.30	143.00	276.00	426.00	840.00	1340.00	3.30	4.77	12.95
1/1/2019	26.73	52.32	95.07	147.29	284.28	438.78	865.20	1380.20	3.40	4.91	13.34
1/1/2020	27.53	53.89	97.92	151.71	292.81	451.94	891.16	1421.61	3.50	5.06	13.74
1/1/2021	27.53	53.89	97.92	151.71	292.81	451.94	891.16	1421.61	3.50	5.06	13.74
1/1/2022	27.53	53.89	97.92	151.71	292.81	451.94	891.16	1421.61	3.50	5.06	13.74

- Operating expenses (excluding depreciation) increased by 8.24% from 2013 to 2022, primarily driven by inflationary pressure, salary and benefit cost increases, and rate adjustments from Cascade Water Alliance.

- The operating ratio functions as a measure of the water utility's self-sustainability as a business entity, evaluating the capacity of yearly operating revenues to cover annual operating expenses. By factoring in depreciation costs, it offers insight into whether the city is sufficiently charging customers to finance asset replacement alongside daily operational costs. As depicted in Table 13-6, the water utility managed to cover operating costs throughout the ten-year period and maintained a desirable operating ratio above .60 throughout.

- The current ratio assesses short-term liquidity, indicating the water utility's ability to meet immediate financial obligations. It's calculated by dividing unrestricted current assets (excluding inventories and prepaid items) by current liabilities. A ratio of 1.0 signifies adequate funds to cover bills, with higher ratios indicating readiness to handle unexpected expenses. Over the past decade, the water utility maintained current ratios ranging from 48.25 to 306.98, reflecting a robust capacity to meet short-term commitments.

- Days of cash on hand measures financial stability, indicating how long the water utility could sustain daily operating and maintenance costs without additional revenue. Although there isn't a fixed minimum requirement, bond rating agencies prefer utilities aiming for high bond ratings to maintain a minimum of 180 days of cash on hand. As demonstrated in Table 13-6, the water utility consistently sustained between 823 and 1,731 days of cash on hand over the past decade, comfortably surpassing this standard.

- The water utility has not issued debt for the Novelty Hill service area and therefore the Debt-to-Asset Ratio is 0%. The ratio assesses indebtedness and is commonly used to determine if a utility is excessively leveraged. Values above 60% typically raise concerns about over indebtedness. High debt levels can negatively impact fiscal health, incurring additional costs like interest and obligations such as coverage and reserves, potentially limiting financial flexibility.

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Table 13-6. Novelty Hill Service Area – Historical Financial Operating Results

Novelty Hill Service Area - Historical Operating Results
(Years Ended December 31, $000s)

Description	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
Operating Revenues:										
Charges for Services	$ 3,266	$ 3,316	$ 3,286	$ 2,758	$ 3,457	$ 4,140	$ 3,431	$ 3,589	$ 3,858	$ 3,625
Total Operating Revenues	$ 3,266	$ 3,316	$ 3,286	$ 2,758	$ 3,457	$ 4,140	$ 3,431	$ 3,589	$ 3,858	$ 3,625
Operating expenses:										
Administrative and General [1]	$ 278	$ 272	$ 172	$ 182	$ 252	$ 268	$ 356	$ 365	$ 259	$ 306
Purchased Water	1,641	1,554	1,207	1,104	1,238	1,731	1,304	1,453	1,388	1,384
Maintenance and Operations [1]	296	319	449	494	575	604	685	502	637	706
Taxes	112	117	120	109	129	142	138	142	151	140
Depreciation and Amortization	632	638	652	660	668	670	673	688	689	688
Total Operating Expenses	$ 2,959	$ 2,899	$ 2,600	$ 2,549	$ 2,862	$ 3,414	$ 3,156	$ 3,150	$ 3,124	$ 3,224
Operating Income (Loss)	$ 307	$ 416	$ 686	$ 209	$ 595	$ 726	$ 275	$ 439	$ 735	$ 401
Non-Operating Revenues (Expenses):										
Interest and Investment Revenue	$ 14	$ 13	$ 18	$ 22	$ 32	$ 51	$ 41	$ 27	$ 22	$ 48
Net Change in fair value of the Investments	(11)	(3)	(6)	(4)	(10)	16	17	25	(33)	(97)
Grants	-	-	-	-	-	-	-	-	-	-
Interest Expense	-	-	-	-	-	-	-	-	-	--
Miscellaneous	68	68	73	79	83	80	95	104	91	80
Total Non-Operating Revenues (Expenses)	$ 72	$ 79	$ 84	$ 97	$ 105	$ 147	$ 152	$ 157	$ 80	$ 30
Income (loss) before contributions and transfers	$ 378	$ 495	$ 771	$ 306	$ 700	$ 873	$ 427	$ 596	$ 814	$ 431
Capital Contributions	$ 51	$ 44	$ 0	$	$ 0	$ 35	$ 0	$ -	$ -	$ 96
Transfers In	-	-	-	-	-	-	-	-	-	-
Transfers Out	(550)	(598)	(670)	(690)	(679)	(692)	(708)	(730)	(681)	(685)
Change in Net Position	$ (121)	$ (58)	$ 100	$ (384)	$ 21	$ 216	$ (281)	$ (134)	$ 133	$ (158)
Operating Ratio (Excluding Depreciation)	0.71	0.68	0.59	0.68	0.63	0.66	0.72	0.69	0.63	0.70
Operating Ratio (Including Depreciation)	0.91	0.87	0.79	0.92	0.83	0.82	0.92	0.88	0.81	0.89
Current Ratio	48.25	54.92	183.87	306.98	73.92	94.70	274.61	116.48	152.22	154.28
Days Cash on Hand	823	988	1,162	1,312	1,317	1,184	1,385	1,728	1,701	1,731
Outstanding Debt Principal at Year-End	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Outstanding Principal as % of Capital Assets	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

[1] To Exclude GASB 68 (pension) & GASB 87 (lease) entries

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13.4. Capital Funding Resources

13.4.1. Government Programs

Federal and state grant programs have in the past served as vital sources of capital funding assistance for local utilities. However, these programs have experienced significant reductions in scope and funding, or they have been replaced by low-interest loan programs. The remaining grant programs are extremely competitive due to decrease available funding over the years and increased interest but worthwhile to apply. Funding programs for which the city may be eligible include:

Public Works Board (PWB) Loan Program

The PWB extends loans to cities, counties, special purpose districts, public utility districts, and quasi-municipal governments. Eligible projects cover the repair, replacement, and construction of infrastructure related to domestic water, sanitary wastewater, stormwater, solid waste, road, and bridge projects. These projects aim to enhance public health and safety, address environmental concerns, stimulate economic development, or improve system efficiency. For details on the application process, funding status, as well as rates and terms, interested parties can refer to the PWB website at http://www.commerce.wa.gov/building-infrastructure/pwb-home-page.

Drinking Water State Revolving Fund (DWSRF) Loan Program

Historically, DWSRF funding has been directed towards safeguarding public health and ensuring compliance with drinking water regulations. Loan repayment periods typically range from 20 to 30 years, with some cases offering partial loan forgiveness. Applicants are required to have an approved water system plan (or plan amendment) incorporating the DWSRF project before submitting an application. All public water systems receiving a DWSRF loan must undergo environmental and cultural reviews, as well as an Investment-Grade Efficiency Audit (IGEA). The IGEA focuses on applying energy efficiency measures to water systems and may be financed as part of the DWSRF loan. For more details on the DWSRF Loan Program, interested parties can visit https://www.doh.wa.gov/CommunityandEnvironment/DrinkingWater/WaterSystemAssistance/.

Community Economic Revitalization Board (CERB) Grant and Loan Program

Established in 1982 as part of the Washington State Department of Commerce, CERB addresses local economic development challenges in Washington communities. CERB allocates funding to local governments and federally recognized tribes for public infrastructure projects, including water, wastewater, stormwater, public buildings, telecommunications, and port facilities, aimed at supporting private business growth. Priority is given to projects that generate or retain jobs for low and moderate-income residents. CERB typically offers funding through three main programs:

- Committed Private Partner Program: This initiative extends loans and grants to public agencies with private sector commitments to finance infrastructure construction vital for private business expansion. Applicants must provide evidence of private development's dependence on CERB funding and demonstrate the absence of other funding sources with comparable terms.

- Planning Grant Program: This program provides limited funding for studies evaluating high-priority economic development projects focused on job growth and long-term economic prosperity.

- Prospective Development Program: Rural communities can access loans and grants for public infrastructure that facilitates future business development. Applicants must submit an economic feasibility study indicating significant job creation and private capital investment resulting from the project. They must also demonstrate a need for CERB assistance and the unavailability of other funding sources with similar terms.

CERB offers a maximum of $2 million per project, with interest rates ranging from 1% to 3%. The Board convenes every two months to review projects and allocate funds. CERB is less favorable option compared to other funding sources, and eligibility for assistance under this program may vary for the city. For further details, visit http://www.commerce.wa.gov/building-infrastructure/community-economic-revitalization-board.

Infrastructure Assistance Coordination Council

The Infrastructure Assistance Coordinating Council comprises state and local agencies tasked with coordinating funding efforts for infrastructure repair and development. While it doesn't directly provide funding, it assists local governments in navigating funding avenues for infrastructure improvements. The Council serves as a valuable resource for identifying new funding opportunities, such as through its annual conference featuring sessions dedicated to educating attendees about available resources. For additional information, visit http://www.infrafunding.wa.gov/.

13.4.2. Bond Financing

Revenue bonds are commonly utilized to finance capital improvements that surpass a utility's financial capabilities, backed by the revenues generated by the issuing utility. Due to this limited assurance, revenue bonds may carry higher interest rates compared to other forms of debt and often necessitate additional security measures to safeguard bondholders against default risks. These measures may encompass maintaining dedicated reserves and meeting minimum financial performance criteria, such as bond debt service coverage.

In Washington State, there is no legal requirement for a public vote to issue revenue bonds. However, the terms associated with revenue bonds often impose practical constraints on a utility's level of indebtedness. Excessive debt levels can hinder the flexibility to implement gradual rate increases and can elevate the overall cost of capital investment due to associated interest payments. It's noteworthy that bond rating agencies also consider debt service coverage when assigning debt ratings. Higher debt levels may impede a utility's ability to meet the coverage ratios mandated by rating agencies for the highest ratings. In recent years, the coverage ratios necessary for top ratings have frequently exceeded the minimum legal standards specified in applicable bond covenants. Ratings hold significant financial importance as higher ratings typically grant access to lower interest rates.

13.4.3. Other Funding Sources

Under the authority granted by RCW 57.08.005 (11), the city mandates a Water Capital Facility Charge on development projects as a prerequisite for connecting to its water utility. This charge aims to recoup a fair portion of the utility infrastructure costs from growth, fostering equity

between new and established customers. Water capital facility charge revenues serve as a primary funding source for the water utility capital investment program.

The water CFC calculation defines equivalent units based on meter flow equivalents (MFEs), which quantify the maximum continuous flow capacity of each connection. Recognizing that irrigation and cooling tower meters impose disproportionately high peak demands on the system relative to other customers with comparably sized meters, the city's CFC methodology assigns three times the otherwise applicable number of MFEs to irrigation and cooling tower meters. It assigns two times the otherwise applicable number of MFEs to exempt irrigation and cooling tower meters in recognition of the fact that they are connected to a service connection that was already subject to CFCs.

The water CFCs are calculated by dividing the total cost of existing facilities and future capacity-expanding capital projects by the total number of equivalent units projected through 2026. Presently, the charge stands at $3,050 per equivalent residential unit (ERU), $2,040 net of credits provided for distribution and storage. The city is currently working with a rate consultant to update the charge to be effective 2025.

13.5. Financial Plan

The primary objective of the financial plan is to formulate a multi-year rate strategy that generates sufficient revenue to cover both the operational and capital costs of the city. The study is centered on determining the revenue required to fulfill the financial commitments of the system, encompassing:

- Operation and maintenance expenses
- Administrative and overhead costs
- Policy-driven necessities
- Capital Investment Program
- Current and prospective debt service obligations

Operated as a business enterprise, the city's water utility relies on revenue from rates rather than taxes or other external funding sources. The financial plan scrutinizes the utility's capacity to uphold affordable water rates while executing the adopted Capital Investment Program (CIP) and fulfilling ongoing financial obligations. It constitutes a thorough analysis encompassing both operational and capital aspects:

- The capital funding plan outlines a strategy for financing the CIP, considering rate revenues, existing reserves, capital facility charges (CFCs), debt financing, and other expected resources (e.g., grants, contributions from developers). This plan can influence the overall financial strategy through the utilization of debt financing (resulting in annual debt service) and capital funding integrated into rates.
- The revenue requirement analysis determines the revenue necessary to sustain the day-to-day operation, maintenance, and management of the utility annually. This analysis specifically addresses needs funded through operational revenues and incorporates a framework of fiscal policies aimed at fostering long-term financial stability and sustainability.

13.6. Financial Policies

The following overview outlines the key financial policies utilized in this analysis:

- **Utility Reserves**: Reserves serve as a crucial element in the utility's financial strategy, offering the flexibility to manage fluctuations in costs and revenues, thereby mitigating potential adverse impacts on ratepayers. In this analysis, resources are categorized into the following funds:

    - Operating Reserve: This reserve provides an unrestricted fund balance to accommodate short-term revenue and expense cycles, addressing unanticipated expenses or revenue shortfalls. The City's fiscal policies establish a 12% (55 days) of expenses as an operating reserve target. To calculate the target, the city excludes ending fund balance, one-time expenses, capital purchases, and the principal portion of current year debt service payments.

    - Rate Stabilization Reserve: This reserve intends to help the water utility avoid rate spikes in low-sales years. City policy sets the target balance at 15% of budgeted rate revenue.

    - Capital Reserve: Maintaining an appropriate segregation of operating and capital resources, this reserve includes funds explicitly designated for capital purposes such as CFCs, grants, debt proceeds, and capital funding generated through rates. City policy does not explicitly require a minimum balance for this reserve, assuming the utilities can issue debt and/or defer projects as needed.

    - Restricted Bond Reserve: Revenue bond covenants typically require a restricted reserve as a security measure for the bondholders. The water utility does not currently have outstanding revenue bonds that require a reserve.

- **System Reinvestment:** System reinvestment (depreciation) funding aims to uphold system integrity by securing sufficient capital for the replacement of aging system facilities. The related funding policies aim to generate a reasonable level of cash funding for capital investment rather than ensuring full cash funding at any given time. The city has been funding system reinvestment through utility rates based on annual depreciation expense net of annual debt principal payments.

- **Financial Sufficiency Standards:** The revenue requirement analysis uses sufficiency tests to determine the revenue needed annually to meet the water utility's financial obligations:

    - Cash Flow Test: This test determines whether annual revenues are sufficient to cover all known cash requirements for each year of the planning period. This test includes operations and maintenance expenses, debt service payments, system reinvestment funding, and reserve funding.

    - Net Income Test: Ensures operating revenues are sufficient to cover operating expenses, including depreciation. This test includes investment interest earnings as a revenue and debt interest payments as an expense.

- Coverage Test: The coverage test evaluates the utilities' ability to meet applicable bond coverage requirements, as specified by the City's bond covenants and internal debt policies. The City's bond covenants require that the utilities' net revenues are equal to 1.2 times annual revenue bond debt service as a legal minimum. The coverage test evaluates revenues and expenses somewhat differently than under the cash test. For the coverage test, obligations include operating expenses, revenue bond debt service, and the incremental debt service coverage policy. The annual revenue requirement encompasses meeting both tests, with potential cash flow deficits occurring as part of a strategy to implement rate increases gradually, while always adhering to applicable coverage standards.

13.7. Capital Funding Plan

The 2023-2032 Capital Investment Program identifies $$$ in project costs (2022 dollars). Adjusting for inflation at an assumed rate of approximately 5.0% per year in the early years and reducing to 3.0% beginning in 2026. The total projected ten-year expenditures for the In-City service area is $73.8M and the Novelty Hill service area totals $7.9M. Table 13-7 – Table 13-10 summarize the projected capital funding strategy and reflects a "pay-as-you-go" approach to fund the Capital Investment Program for each service area. This approach targets full cash funding for the projected capital expenditures through a combination of existing cash balances, Capital Facility Charges, system reinvestment (depreciation), grants, and investment interest earnings.

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Table 13-7. In-City Service Area – Capital Improvement Program ($000s)

In-City Service Area - Capital Improvement Program (2023 - 2032) ($000s)										
Description	**2023**	**2024**	**2025**	**2026**	**2027**	**2028**	**2029**	**2030**	**2031**	**2032**
Storage Improvements	$ 71	$ 2,605	$ 928	-	-	$ 963	$ 2,525	$ 586	-	-
Water Main Improvements	24	165	703	1,729	2,148	3,820	2,567	3,264	2,069	1,259
Supply Improvements	349	1,879	1,171	2,698	3,780	1,780	-	-	-	-
Facility Improvements	49	882	647	745	1,809	851	2,234	2,075	3,139	1,809
Pressure Zone Improvements	4,488	1,359	-	-	1,349	1,472	4,902	1,745	-	-
General Plant Improvements	1,162	2,761	634	-	-	-	-	-	-	-
Groundwater Aquifer Protection Improvements	32	66	62	233	-	-	-	-	-	-
Total (2022 Dollars)	**$ 6,175**	**$ 9,717**	**$ 4,146**	**$ 5,405**	**$ 9,086**	**$ 8,885**	**$ 12,228**	**$ 7,670**	**$ 5,208**	**$ 3,068**
Plus: Adjusted for Inflation	$ -	$ 486	$ 166	$ 162	$ 273	$ 267	$ 367	$ 230	$ 156	$ 92
Total Projected Expenditures	**$ 6,175**	**$ 10,203**	**$ 4,312**	**$ 5,567**	**$ 9,358**	**$ 9,151**	**$ 12,595**	**$ 7,900**	**$ 5,364**	**$ 3,160**

Table 13-8. In-City Service Area – Summary of Projected Capital Funding Strategy ($000s)

In-City Service Area - Summary of Projected Capital Funding Strategy (2023 - 2032) ($000s)										
Description	**2023**	**2024**	**2025**	**2026**	**2027**	**2028**	**2029**	**2030**	**2031**	**2032**
Beginning Capital Fund Balance	**$ 23,285**	**$ 26,266**	**$ 20,235**	**$ 20,281**	**$ 22,030**	**$ 17,494**	**$ 12,602**	**$ 6,793**	**$ 3,198**	**$ 2,178**
Plus: Rate-Funded System Investment	2,789	2,816	2,845	2,873	2,902	2,931	2,960	2,990	3,020	3,050
Plus : Transfer from Operating Fund	4,000	-	-	2,500	-	-	2,500	-	-	2,500
Plus: System Capital Facility Charge	1,395	1,056	1,088	1,120	1,154	1,189	1,224	1,261	1,299	1,338
Plus: Developer Contributions	-	-	101	257	188	-	-	-	-	-
Plus: Investment Interest	972	300	165	165	179	140	101	54	26	17
Plus: Federal Funding	-	-	160	400	400	-	-	-	-	-
Less: Projected Capital Expenditures	(6,175)	(10,203)	(4,312)	(5,567)	(9,358)	(9,151)	(12,595)	(7,900)	(5,364)	(3,160)
Ending Capital Fund Balance	**$ 26,266**	**$ 20,235**	**$ 20,281**	**$ 22,030**	**$ 17,494**	**$ 12,602**	**$ 6,793**	**$ 3,198**	**$ 2,178**	**$ 5,923**

Table 13-9. Novelty Hill Service Area – Capital Improvement Program ($000s)

Novelty Hill Service Area - Capital Improvement Program (2023 - 2032) ($000s)										
Description	**2023**	**2024**	**2025**	**2026**	**2027**	**2028**	**2029**	**2030**	**2031**	**2032**
Storage Improvements	-	-	-	-	-	-	-	-	-	-
Water Main Improvements	-	-	-	-	-	-	-	-	-	-
Supply Improvements	-	-	-	-	-	-	-	-	-	-
Facility Improvements	-	195	161	186	452	212	558	984	319	452
Pressure Zone Improvements	-	-	-	-	-	-	-	-	-	-
General Plant Improvements	13	1,151	1,114	790	1,048	-	-	-	-	-
Groundwater Aquifer Protection Improvements	-	-	-	-	-	-	-	-	-	-
Total (2022 Dollars)	**$ 13**	**$ 1,346**	**$ 1,275**	**$ 976**	**$ 1,500**	**$ 212**	**$ 558**	**$ 984**	**$ 319**	**$ 452**
Plus: Adjusted for Inflation	$ -	$ 67	$ 51	$ 29	$ 45	$ 6	$ 17	$ 30	$ 10	$ 14
Total Projected Expenditures	**$ 13**	**$ 1,413**	**$ 1,326**	**$ 1,005**	**$ 1,545**	**$ 218**	**$ 575**	**$ 1,014**	**$ 329**	**$ 466**

Table 13-10. Novelty Hill Service Area – Summary of Projected Capital Funding Strategy ($000s)

Novelty Hill Service Area - Summary of Projected Capital Funding Strategy (2023 - 2032) ($000s)										
Description	**2023**	**2024**	**2025**	**2026**	**2027**	**2028**	**2029**	**2030**	**2031**	**2032**
Beginning Capital Fund Balance	**$ 12,159**	**$ 15,821**	**$ 15,397**	**$ 14,885**	**$ 14,689**	**$ 13,954**	**$ 14,542**	**$ 14,777**	**$ 14,597**	**$ 15,100**
Plus: Rate-Funded System Investment	689	689	690	690	690	691	691	692	692	692
Plus : Transfer from Operating Fund	2,500	-	-	-	-	-	-	-	-	-
Plus: Investment Interest	486	300	124	120	120	115	119	141	140	144
Less: Projected Capital Expenditures	(13)	(1,413)	(1,326)	(1,005)	(1,545)	(218)	(575)	(1,014)	(329)	(466)
Ending Capital Fund Balance	**$ 15,821**	**$ 15,397**	**$ 14,885**	**$ 14,689**	**$ 13,954**	**$ 14,542**	**$ 14,777**	**$ 14,597**	**$ 15,100**	**$ 15,471**

13.8. Revenue Requirement

The revenue requirement analysis assesses the water utility's capability to meet its anticipated expenses based on its existing rate structure. Should any projected shortfalls arise, this analysis will form the foundation for recommending adjustments to the rates.

13.8.1. In-City Service Area Projected Financial Performance

The revenue requirement analysis was formulated utilizing data from the city's 2023-2024 Adopted Budget and supplemented by several key assumptions:

- Rate revenue projections are primarily based on estimates provided by city staff, incorporating adjustments for a growth rate of approximately 1.58% per year (equivalent to approximately 536 new ERUs annually). The growth assumption is deliberately conservative to ensure prudence in projecting future revenues and assessing financial viability, diverging from the higher growth forecasts typically used to estimate capacity requirements for the capital investment program.

- The city conducted a full update of all development related fees were last adjusted in 2023 and fees were reset effective February 2024. The fees will be increased annually by CPI until the next Development User Fee Study expected in 2027.

- Cascade Water Alliance Regional Connection Charges are estimated based on anticipated development activity and planned reconnections to the water system.

- Investment interest earnings are computed based on projected fund balances, assuming an interest rate of approximately 2.0% per year.

- Telecom Leases renew annually and are adjusted for CPI at an estimated rate of 5% through 2025 and then reducing to 3%.

- Other operating revenues are maintained at the budgeted 2023 levels.

- The forecast of operating expenses is based on the 2023 Budget, with future projections adjusted for inflation.

    - Most expenses are escalated for CPI inflation at a rate of 5% per year through 2025 and then reducing to 3%.

    - Recognizing that salary and benefit costs have outpaced general inflation, they are escalated by 7% and 7% per year through 2025 and then reduced to an escalation of 5%.

    - Variable operating costs are adjusted for growth and inflation, while taxes are computed based on projected revenues and prevailing tax rates (State excise tax: 5.029%, B&O tax: 1.5%).

    - Cascade Water Alliance purchased water rates increase by 2.2% in 2023 and 2024, rates are anticipated to increase by 3% thereafter.

- Given that the funding plan for the capital investment program does not contemplate any new debt issuance to fund projects, there continues to be no debt service expected for the utility in the next 10 years.

- System reinvestment is fully funded by rates and expected to increase by 1.7% annually based on expected additions to capital assets.

Table 13-11 summarizes the water utilities project financial performance for the In-City service area and rate revenue requirements based upon the above assumptions.

Table 13-11 demonstrates the necessity for water rate increases to accommodate rising operating costs and purchased water costs, sustain ongoing infrastructure maintenance programs and environmental programs outlined in the utility's operating budget, and to facilitate a level of funding for system reinvestment crucial for completing planned capital projects. The proposed rate strategy involves inflationary increases that keep pace with rising costs.

The City Council has initiated the implementation of the rate strategy detailed in Table 13-11 by adopting increases of 5% annually for 2023 and 2024 through the passage of City Ordinance No. 3108 in December 2022. Recognizing the potential for changes in economic conditions and customer behavior, the city plans to reassess rate requirements for its water utility before setting rates for 2025 and beyond.

Rate Affordability (In-City)

Regarding rate affordability, the Washington State Department of Health and the Public Works Board utilize an affordability index, considering a community's rates "affordable" if resulting bills are below 2% of the median household income (MHI) for the demographic area. Based on U.S. Census Bureau data indicating a Redmond MHI of $157,287 in 2022 dollars, Table 13-12 summarizes the affordability evaluation of the city's rates, indicating that they currently meet and will continue to meet the affordability threshold from 2023 to 2032.

Conclusion (In-City)

In conclusion, the findings presented in this chapter for the In-City service area emphasize the necessity for revenue increases to address projected O&M, purchased water, and capital investment costs over the ten-year planning period. While this financial plan is built on various assumptions subject to change over time, the city commits to periodic review of its utilities' financial needs through its biennial budgeting process and comprehensive rate studies. Table 13-11 offers current projections of near-term revenue adjustments, subject to periodic review and adjustment as necessary. Through prudent fiscal management, the water utility aims to sustain its operations on a financially sound basis.

Table 13-11. In-City Service Area – Projected Financial Performance and Revenue Requirements ($000s)

In-City Service Area - Projected Financial Performance & Revenue Requirements ($000s)										
Description	**2023**	**2024**	**2025**	**2026**	**2027**	**2028**	**2029**	**2030**	**2031**	**2032**
Revenues:										
Water Rate Revenue at 2022 Rates	$ 16,187	$ 16,477	$ 16,632	$ 16,865	$ 17,103	$ 17,342	$ 17,649	$ 17,910	$ 18,245	$ 18,568
Other Water Revenues	2,004	2,004	1,929	1,929	1,929	1,929	1,929	1,929	1,929	1,929
Total Operating Revenues	**$ 18,191**	**$ 18,481**	**$ 18,560**	**$ 18,794**	**$ 19,031**	**$ 19,270**	**$ 19,577**	**$ 19,838**	**$ 20,173**	**$ 20,497**
Expenses:										
Purchased Water	$ 8,762	$ 8,859	$ 9,124	$ 9,398	$ 9,680	$ 9,970	$ 10,270	$ 10,578	$ 10,895	$ 11,222
Other Cash-Funded Operating Expenses	7,255	7,512	7,921	8,741	9,078	9,713	10,393	11,120	11,899	12,732
Depreciation Expense	2,789	2,816	2,845	2,873	2,902	2,931	2,931	2,931	2,931	2,931
Total Operating Expenses	**$ 18,806**	**$ 19,187**	**$ 19,890**	**$ 21,013**	**$ 21,660**	**$ 22,614**	**$ 23,593**	**$ 24,629**	**$ 25,725**	**$ 26,885**
Net Operating Cash flow	**$ (615)**	**$ (706)**	**$ (1,330)**	**$ (2,219)**	**$ (2,629)**	**$ (3,344)**	**$ (4,016)**	**$ (4,790)**	**$ (5,552)**	**$ (6,388)**
Annual Water Rate Revenue Increase	**5.00%**	**5.00%**	**2.00%**	**2.00%**	**4.00%**	**4.00%**	**4.00%**	**3.00%**	**3.00%**	**3.00%**
Post-Adjustment Summary:										
Total Water Rate Revenue	$ 16,997	$ 18,166	$ 18,703	$ 19,345	$ 20,402	$ 21,515	$ 22,772	$ 23,801	$ 24,974	$ 26,179
Use of Rate Stabilization Reserve	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Net Income	$ 193	$ 327	$ 330	$ 220	$ 606	$ 668	$ 878	$ 837	$ 877	$ 892
Net Cash Flow	$ 449	$ 892	$ 575	$ 75	$ 441	$ 55	$ 293	$ 257	$ 300	$ 310
Coverage	(N/A)	(N/A)	(N/A)	(N/A)	(N/A)	(N/A)	(N/A)	(N/A)	(N/A)	(N/A)
Projected Ending Operating Reserve Balance	$ 10,483	$ 11,375	$ 11,950	$ 12,025	$ 12,466	$ 12,522	$ 12,815	$ 13,073	$ 13,373	$ 13,684
Minimum Ending Operating Reserve Balance	$ 1,386	$ 1,397	$ 1,436	$ 1,473	$ 1,510	$ 1,544	$ 1,584	$ 1,621	$ 1,659	$ 1,694

Table 13-12. In-City Service Area – Affordability Evaluation

In-City Service Area - Affordability Evaluation (2023-2032)										
Description	**2023**	**2024**	**2025**	**2026**	**2027**	**2028**	**2029**	**2030**	**2031**	**2032**
Monthly Single-Family Bill @ 6 ccf	$ 26.94	$ 28.29	$ 28.85	$ 29.43	$ 30.61	$ 31.83	$ 33.10	$ 34.10	$ 35.12	$ 36.17
Median Household Income	$ 158,287	$ 158,287	$ 158,287	$ 158,287	$ 158,287	$ 158,287	$ 158,287	$ 158,287	$ 158,287	$ 158,287
Annual SF Bill as a % of MHI	0.02%	0.02%	0.02%	0.02%	0.02%	0.02%	0.02%	0.02%	0.02%	0.02%

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13.8.2. Novelty Hill Service Area Projected Financial Performance

The revenue requirement analysis was formulated utilizing data from the city's 2023-2024 Adopted Budget and supplemented by several key assumptions:

- Rate revenue projections are primarily based on estimates provided by city staff, incorporating no adjustments for growth. The service area has been considered as built out since 2019 when the last planned multi-family development was completed. Although there have been periodic new connections to the system, they have had little impact on the growth of the customer base.

- The city conducted a full update of all development related fees were last adjusted in 2023 and fees were reset effective February 2024. The fees will be increased annually by CPI until the next Development User Fee Study expected in 2027. As the service area has been built out for many years there has been a significant decrease in development revenue received and expectations are kept very conservative for forecasting and budget purposes.

- Investment interest earnings are computed based on projected fund balances, assuming an interest rate of approximately 2.0% per year.

- Telecom Leases renew annually and are adjusted for CPI at an estimated rate of 5% through 2025 and then reducing to 3%.

- Other operating revenues are maintained at the budgeted 2023 levels.

- The forecast of operating expenses is based on the 2023 Budget, with future projections adjusted for inflation.

    - Most expenses are escalated for CPI inflation at a rate of 5% per year through 2025 and then reducing to 3%.

    - Recognizing that salary and benefit costs are escalated by 7% per year.

    - Excise Taxes are computed based on projected revenues and prevailing tax rates (State excise tax: 5.029%, B&O tax: 1.5%).

    - Cascade Water Alliance purchased water rates increase by 2.2% in 2023 and 2024, and by 3% for the following years.

- There is no expected issuance of debt for the utility within the next 10 years.

- System reinvestment is fully funded by rates and expected to increase annually by .85% based on expected additions to capital assets.

Table 13-13 summarizes the water utilities project financial performance for the Novelty Hill service area and rate revenue requirements based upon the above assumptions.

Table 13-13 underscores the imperative for water rate adjustments to accommodate escalating operating costs and purchased water expenses, maintain ongoing infrastructure maintenance programs, and support environmental initiatives outlined in the utility’s operating budget.

Furthermore, these adjustments are vital to secure funding for essential system reinvestment crucial for the completion of planned capital projects. The proposed rate strategy entails implementing inflationary increases aligned with the upward trajectory of costs.

Initiating the implementation of the rate strategy outlined in Table 13-13, the City Council has adopted annual increases of 8% for 2023 and 2024, through the passage of City Ordinance No. 3108 in December 2022. Recognizing the potential for fluctuations in economic conditions and customer behavior, the city plans to review rate requirements for its water utility before establishing rates for 2025 and beyond.

Rate Affordability (Novelty Hill)

In terms of rate affordability, the Washington State Department of Health and the Public Works Board utilize an affordability index, considering a community's rates as "affordable" if resulting bills amount to less than 2% of the median household income (MHI) for the demographic area. With U.S. Census Bureau data indicating a Redmond MHI of $157,287 in 2022 dollars, Table 13-14 outlines the affordability evaluation of the Novelty Hill service area rates, affirming their compliance with and sustained adherence to the affordability threshold from 2023 to 2032.

Conclusion (Novelty Hill)

The information presented for the Novelty Hill service area underscores the necessity for revenue adjustments over the 10-year planning period to address projected O&M, purchased water, and capital requirements. While this financial plan is based on assumptions that will evolve, the city is committed to periodically reviewing its utilities' financial needs through its biennial budgeting process and comprehensive rate studies. By exercising prudent fiscal management, the water utility strives to maintain its operations on a financially stable foundation.

Table 13-13. Novelty Hill Service Area – Projected Financial Performance and Revenue Requirements ($000s)

Novelty Hill Service Area - Projected Financial Performance & Revenue Requirements ($000s)										
Description	**2023**	**2024**	**2025**	**2026**	**2027**	**2028**	**2029**	**2030**	**2031**	**2032**
Operating Revenues:										
Water Rate Revenue	$ 3,525,857	$ 3,762,327	$ 3,669,327	$ 3,669,327	$ 3,669,327	$ 3,669,327	$ 3,674,327	$ 3,674,327	$ 3,674,327	$ 3,674,327
Other Water Revenues	143,500	143,500	151,000	151,000	153,000	153,000	160,000	160,000	162,000	162,000
Total Operating Revenues	**$ 3,669,357**	**$ 3,905,827**	**$ 3,820,327**	**$ 3,820,327**	**$ 3,822,327**	**$ 3,822,327**	**$ 3,834,327**	**$ 3,834,327**	**$ 3,836,327**	**$ 3,836,327**
Operating Expenses:										
Purchased Water	$ 1,455,838	$ 1,488,546	$ 1,691,558	$ 1,755,221	$ 1,821,429	$ 1,890,286	$ 1,943,995	$ 1,999,315	$ 2,056,294	$ 2,114,983
Other Cash-Funded Operating Expenses	1,688,861	1,742,532	1,847,084	1,957,909	2,036,225	2,138,037	2,237,028	2,315,324	2,396,360	2,480,233
Depreciation Expense	689,606	689,951	695,885	701,869	707,905	713,993	720,134	726,327	732,573	738,873
Total Operating Expenses	**$ 3,834,305**	**$ 3,921,029**	**$ 4,234,527**	**$ 4,414,999**	**$ 4,565,560**	**$ 4,742,316**	**$ 4,901,156**	**$ 5,040,965**	**$ 5,185,227**	**$ 5,334,089**
Net Operating Cash Flow	**$ (164,948)**	**$ (15,202)**	**$ (414,200)**	**$ (594,672)**	**$ (743,233)**	**$ (919,989)**	**$ (1,066,829)**	**$ (1,206,638)**	**$ (1,348,900)**	**$ (1,497,762)**
Annual Water Rate Revenue Increase	**8.00%**	**8.00%**	**1.00%**	**1.00%**	**4.00%**	**4.00%**	**3.00%**	**3.00%**	**3.00%**	**3.00%**
Post-Adjustment Summary:										
Total Water Rate Revenue	$ 3,807,926	$ 4,388,378	$ 4,322,702	$ 4,322,702	$ 4,495,610	$ 4,675,435	$ 4,822,260	$ 4,966,927	$ 5,115,935	$ 5,269,413
Use of Rate Stabilization Reserve	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Net Income	$ 599,879	$ 890,800	$ 342,038	$ 158,466	$ 173,416	$ 162,577	$ 155,859	$ 156,180	$ 154,820	$ 151,133
Net Cash Flow	$ 179,325	$ 661,450	$ 299,969	$ 131,415	$ 159,349	$ 166,038	$ 166,953	$ 178,015	$ 191,526	$ 203,138
Coverage	(N/A)	(N/A)	(N/A)	(N/A)	(N/A)	(N/A)	(N/A)	(N/A)	(N/A)	(N/A)
Projected Ending Operating Reserve Balance	$ 950,054	$ 1,611,503	$ 1,911,473	$ 2,042,888	$ 2,202,237	$ 2,368,276	$ 2,535,229	$ 2,713,244	$ 2,904,771	$ 3,107,909
Minimum Ending Operating Reserve Balance	$ 257,453	$ 260,705	$ 286,493	$ 294,851	$ 303,520	$ 311,660	$ 319,695	$ 327,077	$ 334,664	$ 341,527

Table 13-14. Novelty Hill Service Area – Affordability Evaluation

Novelty Hill Service Area - Affordability Evaluation (2023-2032)										
Description	**2023**	**2024**	**2025**	**2026**	**2027**	**2028**	**2029**	**2030**	**2031**	**2032**
Monthly Single-Family Bill @ 6 ccf	$ 47.83	$ 51.66	$ 52.17	$ 52.69	$ 54.80	$ 56.99	$ 58.70	$ 60.47	$ 62.28	$ 64.15
Median Household Income	$ 158,287	$ 158,287	$ 158,287	$ 158,287	$ 158,287	$ 158,287	$ 158,287	$ 158,287	$ 158,287	$ 158,287
Annual SF Bill as a % of MHI	0.03%	0.03%	0.03%	0.03%	0.03%	0.04%	0.04%	0.04%	0.04%	0.04%

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Appendix A
Approval/Adoption Documentation, Local Government Consistency, and Agency Comments with Responses

Docusign Envelope ID: 6EF1A1E9-8A3A-4645-844E-C3018692B817

Introduced: 11/19/24
Adopted: 11/19/24

NON-CODE

REDMOND CITY COUNCIL
ORDINANCE NO. 3183

AN ORDINANCE OF THE CITY OF REDMOND, WASHINGTON, REPEALING THE REDMOND WATER SYSTEM PLAN AND REPLACING IT WITH AN UPDATED PLAN AS PART OF A COMPREHENSIVE PLAN PERIODIC UPDATE, PROVIDING FOR SEVERABILITY, AND ESTABLISHING AN EFFECTIVE DATE

WHEREAS, Washington Administrative Code 246-290-100 requires development of a Water System Plan that demonstrates how a community public water system will address and fund present and future water needs for at least a 20-year planning period; and

WHEREAS, the Growth Management Act (GMA) requires that comprehensive plans and development regulations shall be subject to continuing evaluation and review; and

WHEREAS, the GMA requires that Redmond complete a periodic update of its comprehensive plan by December 31, 2024; and

Ordinance No. 3183
Ordinance No. 3181
Ordinance No. 3182
Ordinance No. 3184
Ordinance No. 3185
Ordinance No. 3186
Ordinance No. 3187
Ordinance No. 3188
Ordinance No. 3189
Ordinance No. 3190
Resolution No. 1597
AM No. 24-174

Docusign Envelope ID: 6EF1A1E9-8A3A-4645-844E-C3018692B817

WHEREAS, the Water System Plan is adopted by reference into the Redmond Comprehensive Plan to fulfill GMA planning requirements for capital facilities; and

WHEREAS, the City of Redmond last completed a periodic update on December 6, 2011, Ord. No. 2638; and

WHEREAS, the Redmond Comprehensive Plan has been amended several times through annual docket processes since 2011; and

WHEREAS, the City began the work of updating the Redmond Comprehensive Plan in late 2020 and refers to the update as Redmond 2050; and

WHEREAS, the purpose of updating the Comprehensive Plan is to extend the planning horizon from 2030 to 2050; to incorporate the themes of equity and inclusion, sustainability, and resilience; to reflect changes in the GMA, regional, and countywide planning documents since 2011; and to reflect City actions or studies since the 2011 Comprehensive Plan update; and

WHEREAS, on October 6, 2020, the City Council adopted Resolution No. 1538, which established the scope, timeline, and community involvement plan for Redmond 2050; and

Docusign Envelope ID: 6EF1A1E9-8A3A-4645-844E-C3018692B817

WHEREAS, throughout Redmond 2050 the City executed a multifaceted community involvement program to engage Redmond's diverse community, using methods such as a digital city hall lobby, online questionnaires, virtual workshops, in-person workshops, social media, videos, yard signs, utility bill inserts, newsletters, focus groups, contracting with community-based organizations, office hours, tabling at community events, pop-up engagement around the city, translating materials, a community advisory committee, a technical advisory committee, and attending board and commission meetings; and

WHEREAS, the City of Redmond issued a determination of non-significance for the Water System Plan on August 1, 2023, under the State Environmental Policy Act; and

WHEREAS, state agencies were sent 60-day notices of Redmond's proposed Water System Plan on September 11, 2024; and

WHEREAS, from September 13, 2023 to July 24, 2024, the Planning Commission conducted study sessions and held a public hearing for the Water System Plan and subsequently transmitted a recommendation to the City Council for consideration; and

Docusign Envelope ID: 6EF1A1E9-8A3A-4645-844E-C3018692B817

WHEREAS, from September 3, 2024, to September 24, 2024, the City Council received a staff report and held study sessions to study the Planning Commission's recommendation; and

WHEREAS, having considered the Planning Commission's recommendations and community input, the City Council desires to adopt the 2024 Water System Plan to encourage coordinated and efficient development, and to ensure that adequate facilities and services will be available as development occurs.

NOW, THEREFORE, THE CITY COUNCIL OF THE CITY OF REDMOND, WASHINGTON, DOES ORDAIN AS FOLLOWS:

Section 1. Classification. This is a non-code ordinance.

Section 2. Findings and Conclusions. The City Council hereby adopts the findings and conclusions contained in the associated Planning commission Report, including all related attachments and exhibits, City file no. LAND-2024-00118.

Section 3. Water System Plan Repealed. The Redmond Water System Plan, as adopted in Ord. No. 2643 on December 6, 2011, and as subsequently amended, is repealed.

Section 4. Water System Plan Adopted. The Redmond Water System Plan is adopted as shown in Exhibit 1, attached

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hereto and incorporated herein by this reference as if set forth in full.

Section 5. Preparation of Final Water System Plan Document. The Administration is directed to complete preparation of the final Water System Plan document, including updates to numbering; correction of any typographical errors; minor editorial revisions; inclusion of appropriate graphics and illustrations; and general formatting.

Section 6. Severability. If any section, sentence, clause, or phrase of this ordinance should be held to be invalid or unconstitutional by a court of competent jurisdiction, such invalidity or unconstitutionality shall not affect the validity of any other section, sentence, clause, or phrase of this ordinance.

Section 7. Effective date. This ordinance shall become effective five days after its publication, or publication of a summary thereof, in the City's official newspaper, or as otherwise provided by law.

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ADOPTED by the Redmond City Council this 19th day of November, 2024.

CITY OF REDMOND

ANGELA BIRNEY, MAYOR

ATTEST:

CHERYL XANTHOS, MMC, CITY CLERK (SEAL)

APPROVED AS TO FORM:

DocuSigned by:
Daniel Kenny
DDAD3355F1F2425...
DANIEL KENNY, CITY ATTORNEY

FILED WITH THE CITY CLERK:	November 5, 2024
PASSED BY THE CITY COUNCIL:	November 19, 2024
SIGNED BY THE MAYOR:	November 22, 2024
PUBLISHED:	November 25, 2024
EFFECTIVE DATE:	November 30, 2024

ORDINANCE NO. 3183

YES: ANDERSON, FORSYTHE, KRITZER, NUEVACAMINA, SALAHUDDIN, STUART

NO: NONE



City of Redmond
2024 Water System Plan

July 2024

AGENDA

REDMOND PLANNING COMMISSION MEETING
Wednesday, June 26, 2024 – 7:00 p.m.

How to Participate in the Hybrid Meeting

- **Planning Commission meetings offer in-person and remote attendance opportunities.**
- Join in-person at the Redmond City Hall Council Chambers. Staff will be on-hand to provide any assistance and help sign-up for public comment.
- **Meetings are wheelchair accessible** . Personal public-address system receivers are available upon request **one week** prior to the meeting. If you require other reasonable accommodations, please notify city staff at 425-556-2481 or at TDD 425-556-2909 **one week** prior to the meeting.
- **Watch live** at **redmond.gov/RCTV** , Comcast channel 21, Ziply channel 34, or at **facebook.com/ CityofRedmond** .
- **Listen live** by calling **510-335-7371.**
- **OnDemand viewing** (posted within 24 hours) at: **redmond.gov/RCTV .**

Public Comments

- **Written public comments can be submitted anytime** via email to **PlanningCommission@redmond.gov** . Staff will confirm receipt of your comment via email. All emails are subject to publication as part of the written public record.
- Verbal public comments can be provided:
    - In-person at City Hall, or
    - Live via phone, if you contact the Planning Commission liaison at **PlanningCommission@redmond.gov** ***no later than 5 p.m. on the meeting date*** , with your name, phone number, and agenda item/issue you'd like to speak on. Staff will **reply confirming receipt via email** and during the meeting, will call the number you provided to connect you to the Commission.

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1. Call to Order & Roll Call *7:00 pm*

2. Approval of the Agenda *2 min.*

3. Approval of Planning Commission Meeting Minutes and Summaries *3 min.*

- June 12, 2024 Meeting Summary

4. Items from the Audience *5 min.*

Opportunity for public comment on any item that is not the subject of a public hearing. *See instructions at top of agenda on how to arrange to speak at this hybrid meeting.*

Comments will be limited to 3 minutes per speaker; time may not be delegated to another speaker. The number of speakers on any one item, or the amount of time allocated for this agenda item, may be limited at the discretion of the Chair. Commissioners may choose to respond to public comments, but no action will be taken at this time.

5. Redmond Zoning Code Rewrite Phase 3 – Legislative Amendments (Report Approval) *5 min.*

The Planning Commission will review and approve its Report and Recommendation to the City Council on these amendments.

Attachments: Memo
Att. A: Planning Commission Recommendation and Report

Staff Contacts:		
	Kim Dietz, Principal Planner	425-556-2415
	Tim McHarg, Principal Planner	425-556-2414

6. Redmond 2050: Phase 2C Elements – Land Use; Community Development and Design; and Climate Resilience and Sustainability Elements (Report Approval) *5 min.*

The Planning Commission will review and approve its Report and Recommendation to the City Council on these amendments.

Attachments: Memo
Att. A: Planning Commission Recommendation and Report

Staff Contacts:		
	Lauren Alpert, Senior Planner	425-556-2460
	Beckye Frey, Principal Planner	425-556-2750
	Glenn Coil, Senior Planner	425-556-2742
	Ian Lefcourte, Senior Planner	425-556-2438

7. Water System Plan and General Wastewater Plan updates (Public Hearing, Study Session, and potential Recommendation) *60 min.*

The Commission will hold a public hearing on the updated Water System Plan, as well as an update, as part of Redmond 2050, of the City's General Wastewater Plan and the Redmond Zoning Code. This will be followed by a study session, and the Commission may make a recommendation to approve.

Attachments: Memo
Att. A: Presentation
Att. B: PC Issues Matrix

References: Technical Committee Report and Recommendation
a. Staff Compliance and Review
b. 2024 Water System Plan Update
c. General Wastewater Plan Update (May 2024)
d. Revisions to RZC 21.17.010

e. SEPA Threshold Determination (Water System Plan)

Staff Contacts:	Lisa Rigg, Senior Engineer	425-556-2295
	Anne Dettelbach, Senior Planner	425-556-2824
	Jeff Thompson, Senior Engineer	425-556-2884
	Peter Holte, Senior Planner	425-556-2822

8. Redmond Zoning Code Rewrite Phase 3 - Consolidation and Streamlining Package (Study Session) *40 min.*

The Commission will continue a study session on proposed amendments to the Redmond Zoning Code related to use tables, landscaping, and open space. A public hearing that includes these topics is planned for July.

Attachments:
Memo
Att. A: Issues Matrix
Att. B: Table of Changes

Resources:
All from May 29, 2024:
Att. A: Presentation
Att. B: RZC 21.04 General Provisions (draft)
Att. C: Land Use Table Changes
Att. D: RZC 21.32 Open Space (draft)
Att. E: RZC 21.36 Landscaping (draft)

Staff Contacts:	Kim Dietz, Principal Planner	425-556-2415
	Beckye Frey, Principal Planner	425-556-2750

9. Redmond 2050 Monthly Update (Briefing): *10 min.*

Staff will brief the Commission on Redmond 2050 activities.

Attachments: Memo

Staff Contacts:	Jeff Churchill, Planning Manager	425-556-2492

10. Staff & Commissioner Updates *5 min.*

Updates and discussion only. No action will be taken at this time.

Staff updates & scheduling:

- Discussion of topics and dates for upcoming meetings.

Commissioner report-outs, requests, news & resources:

- Commissioner updates or news.
- Requests for briefings or information from staff at future meetings.
- Commissioners share news and resources on planning topics.

11. Adjourn *9:15 p.m.*

Unless otherwise noted, the Redmond Planning Commission meetings begin at 7:00 p.m. in City Council Chambers 1st Floor, Redmond City Hall, 15670 NE 85th Street in Redmond. **Agendas and Minutes** are available on the City's website: **www.redmond.gov/PlanningCommission** .

The Planning Commission can be reached by email at PlanningCommission@redmond.gov, by phone via the message line at 425-556-2481, or by mail at:

City of Redmond Planning Commission
MS: 4SPL
P.O. Box 97010
Redmond, WA 98073-9710

For more information on agenda items, please contact the staff person(s) listed for each topic or the Planning Commission Liaison at 425-556-2481 or PlanningCommission@redmond.gov.

MEETING MINUTES

REDMOND PLANNING COMMISSION MEETING
Wednesday, June 26, 2024 – 7:00 p.m.

1. Call to Order & Roll Call – 7:01 p.m.

Commissioners Present:	Chair Susan Weston, Vice-Chair Jeannine Woodyear, Commissioners Adam Coleman, Bryan Copley (Virtual), Denice Gagner, Tara Van Niman (Virtual), and Aparna Varadharajan
Commissioners Excused:	
Staff Present:	Glenn Coil, Ann Dettelbach, Kim Dietz, Beckye Frey, Peter Holte, David Lee, Tim McHarg, Lisa Rigg, and Chris Wyatt
Recording Secretary:	Carolyn Garza, LLC

2. Approval of the Agenda

- *Motion to approve the Agenda by Vice-Chair Woodyear, seconded by Commissioner Aparna. The Motion passed.*

3. Approval of Planning Commission Meeting Minutes and Summaries

- *Motion to approve the June 12, 2024 Meeting Summary by Commissioner Aparna, seconded by Vice-Chair Woodyear. The Motion passed.*

4. Items from the Audience (General)

- David Morton, Redmond 98053, stated that the Toxic Substances Control Act (TSCA Inventory) lists 42,000 chemicals actively used in United States commerce and that Issaquah tests drinking water for only 99 contaminants as required by the Federal Safe Drinking Water Act and by State Regulations. Test methods are not designed to detect the majority of the other TSCA Inventory chemicals. More comprehensive testing can protect public health from unmonitored toxic substances as well as more regulation of certain land uses.

Senior Planner Coil stated that one more speaker had signed in, but the individual withdrew the request.

5. Redmond Zoning Code Re-Write Phase 3 – Legislative Amendments (Report Approval)

- *Motion to approve the Planning Commission Report for City Council on the Legislative Amendments for Redmond Zoning Code Re-Write Phase 3 by Commissioner Aparna, seconded by Vice-Chair Woodyear. There was no request for discussion and the Motion passed.*

6. Redmond 2050: Phase 2C Elements – Land Use, Community Development and Design, and Climate Resilience and Sustainability Elements (Report Approval)

- *Motion to approve the Planning Commission Report for City Council on the Land Use, Community Development and Design, and Climate Resilience and Sustainability Elements for Redmond 2050 by Vice-Chair Woodyear, seconded by Commissioner Coleman. There was no request for discussion and the Motion passed.*

7. Water System Plan and General Wastewater Plan Updates (Public Hearing, Study Session, and Potential Recommendation)

Senior Planner Holte and Senior Engineer Rigg gave the presentation.

Chair Weston opened the Public Hearing. Senior Planner Coil stated that one written comment had been received.

- David Morton, Redmond 98053, stated that overall, the Water System and General Wastewater Plans reflect a strong commitment to maintaining water quality, improving infrastructure, and ensuring sustainability. An area of concern is that the Plan could emphasize more community engagement and education, however. A potentially overlooked area is that the Plan might explore EPA drinking water treatment technologies that could offer enhanced removal of emerging contaminants.

Chair Weston closed the verbal portion of the Public Hearing while written testimony would remain open.

Senior Planner Coil presented the Issues Matrix from the September, 2023 meeting.

Senior Engineer Rigg began with the first item regarding climate vulnerability in the model. Cascade Water Alliance can be asked to provide a presentation separately, later in the year, on work done on behalf of the city. Commissioner Aparna stated that there would be valuable context to the Plan being discussed now, not material to the water supply plan but supplementary information to be added to the report going forward. Senior Planner Coil replied that an attempt can be made, but the deliberation process timeline is an issue. Chair Weston stated agreement with Commissioner Aparna regarding understanding points of hand-off. Vice-Chair Woodyear stated that policy is dependent upon Cascade Water Alliance, a

material impact, and that if the timeline requires decisions sooner without an opportunity to understand more, how adjustments to policies will be made if Cascade support is insufficient. Chair Weston stated understanding the timeline and asked what options are available. Senior Planner Coil replied that the Plan is not a policy document but a functional plan, the intention to ensure consistency with the Comprehensive Plan Utilities and Capital Facilities Elements; deliberation will not affect what is in the Plan but rather consistency with the Growth Management Act (GMA). Commissioner Aparna asked for clarification that the latest technical report from Cascade is what is referenced for calculations. Senior Engineer Rigg replied that calculations are based on the supply Cascade has committed to provide, which is less than what Cascade has the capacity to provide. Chair Weston asked what the vehicle for the commitment was and Senior Engineer Rigg replied that there is a binding agreement with Cascade and neighboring cities are integrated on the Cascade Board in decision making processes and commitments. Chair Weston asked if the Cascade Board produces an Annual Report as finding more information has been difficult. Senior Engineer Rigg replied that Cascade gave a presentation to Council in 2024 and a link to video and slides can be provided to Commissioners. Chair Weston stated that the link will be helpful and additional questions can be emailed to staff. Commissioner Aparna asked if there is a Technical Report from Cascade to understand basis of analysis that can be shared. Principal Planner Frey stated that according to Cascade Board meeting packets, there is a consultant currently conducting a climate impact study and a summary can be emailed to Commissioners. Commissioner Aparna stated that information from the Cascade side would be helpful. Commissioner Aparna stated that Issue one could be closed, but that Issue two should remain open.

Senior Engineer Rigg presented Issue three regarding pressure on water supply. Commissioner Aparna and Chair Weston stated that the Issue could be closed. Chair Weston stated that gray water and residential systems might be explored further in certain parts of the city.

Regarding Issue four, Tacoma Water, Commissioner Aparna asked that the response be formalized and stated that the Issue could be closed.

Regarding Issue five. Cascade Water Alliance system management, Commissioner Aparna asked that the response be formalized and stated that the Issue could be closed.

Regarding Issue six, Commissioner Van Niman stated that the Issue could be closed.

Regarding Issue seven, Vice-Chair Woodyear stated being satisfied with the response and follow-up actions, and that the Issue could be closed.

Regarding Issue eight, Chair Weston stated appreciating the response and that the Issue could be closed.

Regarding Issue nine, Chair Weston stated that the Issue was informational for a new Commissioner and could be closed.

Regarding Issue 10, Chair Weston stated that the Issue could be closed.

Regarding Issue 11, planning for anticipated pipe failure, Chair Weston stated that other Commissioners had been interested as well and asked if the answer is satisfactory. Commissioner Aparna asked how the city is aware of pipe failure sans visual evidence above

ground. Senior Planner Holte replied that water lines are pressurized and failure can be easily detected. Commissioner Coleman asked if there is an opportunity to replace pipes during exposure by other road projects and Senior Engineer Rigg replied yes, work is done ahead of time in anticipation of overlays. Senior Planner Holte described two current projects. Chair Weston stated that the Issue could be closed.

Regarding Issue 12, Senior Engineer Rigg asked to respond to a question via email or to include a response in the next packet for a thorough answer. Chair Weston replied that moving to the next packet was good and stated that email is not captured in the Public Record. Commissioner Aparna asked if the Public Hearing testimony by David Morton could be addressed. Senior Engineer Rigg replied that polyfluoroalkyl substances (PFAS) are being monitored and changing science and requirements are being observed. Vice-Chair Woodyear asked how quickly evolving science can be implemented, and Senior Engineer Rigg replied several years. Chair Weston asked if the Plan would need to be re-issued if there is a change in regulation and Senior Engineer Rigg replied no, that while Policies and codes constantly change the Plan is not required to be updated with a change, only every ten years. The Issue would remain open.

Regarding Issue 13. Commissioner Aparna stated that the Issue could be closed after formalizing the response.

Regarding Issue 14, Senior Engineer Rigg asked to respond via email. Commissioner Aparna stated concern regarding information provided by the city. Chair Weston stated an alternate opinion that the city is providing updates and status. Commissioner Aparna replied that information offered is current state but not projected and with no performance score card. Chair Weston stated that the information in question is not part of the Plan but is a reasonable request. Chair Weston stated that the Issue could be closed but with a note in the Issues Matrix that there is a request for more projections and not only current status. Principal Planner Frey stated that in the report, bullet points can be included with recommendations and Commissioner Aparna agreed.

Regarding Issue 15, Senior Engineer Rigg asked to follow up with a detailed email. Chair Weston asked that the follow up be brought to the next meeting as email is not captured in Public Record. Commissioner Van Niman stated hoping for scale of growth rate. Commissioner Copley asked if scope of water shortage shortfall is storage, and for clarification regarding a discussion note about *predicted water supply shortage*. Senior Engineer Rigg replied that the word *shortage* should be *storage*. Commissioner Aparna asked for clarification regarding projected growth percentages and Senior Engineer Rigg replied that there are Interlocal Agreements with Bellevue and Kirkland stating the percentage Redmond will receive to count in water system planning; Fire supply and not day-to-day demand is considered. Commissioner Aparna asked for clarification regarding changes to different Comprehensive Plans. Senior Engineer Rigg replied that changes will only occur if Interlocal Agreements are redone, agreed to by all municipalities engaged. Chair Weston stated that Issue 15 would remain open for additional information.

Issue 16 was closed.

Senior Engineer Rigg presented the response to Issue 17. Chair Weston asked if the issue is worth pursuing and Senior Planner Holte replied that pursuing would be expensive.

Commissioner Aparna stated that more data will be helpful in future rounds. Senior Planner Holte replied that an appendix in the Water Shortage Contingency Plan involves voluntary curtailment followed by cutting off unnecessary uses such as irrigation. There is authority by the city to ticket or shut off water meters if a shortage level becomes more critical. Commissioner Coleman asked if residences or businesses would be the focus. Commissioner Aparna stated that further data will bring more clarification. Senior Planner Holte replied that there is data on water consumption through commercial meters and uses in a shortage that will stop are irrigation and car washes, in example, and not businesses versus residences. Chair Weston stated that gathering data to support an argument is not necessary for the document before the Commission. Commissioner Aparna replied that data will help with future decisions. Chair Weston stated understanding that if Redmond reaches very low supply, that a plan should be in place to prioritize distribution. Commissioner Coleman asked if there is a plan that determines if businesses or residents receive water first and Senior Planner Holte replied no, that the majority of summer water consumption is general irrigation, filling pools and car washing. Commissioner Coleman asked for clarification that any restriction would be the same for both businesses and residences and Senior Engineer Rigg replied yes. Senior Planner Holte replied that Willows Run uses reclaimed water and may be exempted from an irrigation restriction. Irrigation of parks would be restricted. Commissioner Aparna asked again for further data. Senior Planner Holte asked if a solution could be that staff provide a total of irrigation water sold in the city during the last year data exists, and how much had come from commercial meters versus residential meters and Commissioner Aparna agreed. Principal Planner Frey recommended closing the Issue pending additional information but recognizing that the information will not change the plan or appendix in order to move forward with adoption of the plan. Commissioner Aparna agreed.

Regarding Issue 18, Commissioner Aparna asked that the response be formalized and stated that the Issue could be closed.

Regarding Issue 19, Commissioner Van Niman stated that the Issue could be closed.

Regarding Issue 20, Commissioner Aparna stated that the Issue could be closed but that the recommendation should be noted in the packet.

Chair Weston asked for any additional questions for the Issue Matrix, and there were none.

8. Redmond Zoning Code Rewrite Phase 3 – Consolidation and Streamlining Package (Study Session)

Principal Planner Frey presented the Package and the Issues Matrix.

Regarding Land Use Issue one, Chair Weston asked for clarification that Redmond code does not block pre-fabricated building materials that are important to affordable housing, although the definitions are helpful. Commissioner Aparna stated that container homes are being designed to fire codes and asked if certain manufacturers or specifications have already been approved. Principal Planner Frey recommended that the Issue remain open while a building official can be consulted for an answer. Chair Weston stated that Bellevue, Kirkland, and Seattle have addressed the issue in different ways.

Regarding Issue two, Commissioner Aparna had sent an email to staff asking to close.

Regarding Issue three, Commissioner Copley stated that the Issue could be closed.

Principal Planner Frey asked if any new issues should be added to Land Use and there were none.

Regarding Open Space Issue two, Chair Weston asked if spaces would be free or paid to access and Principal Planner Dietz replied depending on the programming aspect, a plaza with a concert could be free but a space for a class could incur a park fee. Chair Weston stated that a situation to avoid is Open Space sold as an amenity for a building with a membership fee to the public. Principal Planner Dietz replied that there should not be a membership fee but rather a possible fee specific to the actual programming within it, but the information can be confirmed. Principal Planner Frey stated that the Issue would be left open.

Regarding Issue three, Commissioner Aparna closed the item.

Regarding Issue four, Commissioner Copley stated that the issue could be closed.

Regarding Issue five, there is not a staff response yet and the issue would remain open. Coleman asked for clarification of the issue and Chair Weston explained. Commissioner Coleman stated that the formerly designated area for Saturday Market has light rail and town center planning is designed for a Saturday Market, higher usage, and Chair Weston agreed. Principal Planner Frey replied that staff with knowledge to answer have not been consulted yet.

Regarding Issue six, Commissioner Aparna closed the item.

Regarding Issue seven, Chair Weston stated that a map available on cell phones to the public would be valuable. Commissioner Aparna stated that Open Spaces and trails encourage connectivity. Principal Planner Frey replied that encouraging a network of Open Space opportunities will be clarified in the next package. Chair Weston stated that the Issue could be closed.

Regarding Issue eight, there is not yet a staff response. Principal Planner Frey explained the question.

Principal Planner Frey asked if there were further Issues for Open Space and there were none.

Commissioner Copley stated support for the comment of Chair Weston regarding communicating availability of Open Space.

Regarding Landscaping Issue one, Commissioner Copley stated that the Issue could be closed.

Regarding Issue two, there was no comment to close or leave open.

Regarding Issue three, Commissioner Copley stated that the issue could be closed. Commissioner Van Niman asked that there be more discussion in addition to the diagram provided in the response. Senior Planner Holte replied that mulch is 4 x 6 but structural soil is 8 x 12. Principal Planner Dietz replied that at the sidewalk looking down, mulch is seen, but underneath the sidewalk is the structural soil with more space for street tree roots. Commissioner Van Niman asked if space needed for trees has changed and Principal Planner Dietz replied that street trees are referenced in the Resiliency and Landscaping Plan; more appropriate trees are provided. Principal Planner Frey replied that the area for a street tree to grow is much larger than the grate or well seen at the surface. Commissioner Van Niman asked for further clarification that there is more room now and Principal Planner Frey replied yes.

Principal Planner Frey asked that Issue four be left open as an edit will be made.

Regarding Issue five, Commissioner Van Niman stated that two points did not seem consistent, *encouraged* and *required*. Principal Planner Frey left the issue open in order to research.

Regarding Issues six and seven, Commissioner Aparna emailed staff that the Issues could be closed.

Principal Planner Frey asked if there were any further new items for the Issues Matrix and there were none.

9. Redmond 2050 Monthly Update (Briefing)

Principal Planner Frey stated that the Downtown discussion was well attended at approximately 60 attendees, over half in person. The Power Point overview has been added to the website. A Q & A document is being created from questions received. Because of a power outage a recording was not available. New Downtown code is anticipated to be fully drafted by the end of July 2024 and additional community opportunities will occur.

Chair Weston asked where the Power Point presentation can be found, and Principal Planner Frey replied that there is a link at the top of the Redmond 2050 website.

Commissioner Coleman asked how feedback is being collected and assessed, and Principal Planner Frey replied that a document in a Q & A format is being created to track questions and feedback from the event that will be shared.

Principal Planner Frey stated that the next discussion will be held tomorrow, June 27, 2024, at Marymoor. Resources and materials are posted online.

10. Staff & Commissioner Updates

Senior Planner Coil stated that the next Planning Commission meeting will be July 10, 2024, a continued Study Session on the Water System Plan and the Comprehensive Plan Final Review in anticipation of the Public Hearing on July 24, 2024, important for quorum. The third July meeting will be July 31, 2024. Principal Planner Frey stated that a goal is to have no Planning Commission meetings in August, so a recommendation is hoped for by the end of July.

Commissioner Aparna asked if changes for the review will be redlined for efficiency and Senior Planner Coil replied that changes are being formatted now. Principal Planner Frey replied that there will be a table in the report and that changes are minor.

Commissioner Aparna asked about the status of a previous discussion regarding having youth represented on the Planning Commission and Principal Planner Frey replied that the idea will be worked on in Fall 2024 for potential implementation in 2025.

11. Adjourn

- *Motion to adjourn at 8:53 p.m. by Commissioner Copley, seconded by Vice-Chair Woodyear. The Motion passed.*

Minutes approved on: _____

Planning Commission Chair _____

Local Government Consistency Determination Form

Water System Name: City of Redmond Water System PWS ID: 71650B

Planning/Engineering Document Title: 2023 Water System Plan Plan Date: 2023

Local Government with Jurisdiction Conducting Review: City of Redmond Planning Department

Before the Department of Health (DOH) approves a planning or engineering submittal under Section 100 or Section 110, the local government must review the documentation the municipal water supplier provides to prove the submittal is consistent with **local comprehensive plans, land use plans and development regulations** (WAC 246-290-108). Submittals under Section 105 require a local consistency determination if the municipal water supplier requests a water right place-of-use expansion. The review must address the elements identified below as they relate to water service.

By signing this form, the local government reviewer confirms the document under review is consistent with applicable local plans and regulations. If the local government reviewer identifies an inconsistency, he or she should include the citation from the applicable comprehensive plan or development regulation and explain how to resolve the inconsistency, or confirm that the inconsistency is not applicable by marking N/A. See more instructions on reverse.

	For use by water system	For use by local government
Local Government Consistency Statement	**Identify the page(s) in submittal**	**Yes or Not Applicable**
a) The water system service area is consistent with the adopted land use and zoning within the service area.	Section 2.3.2; Figure 2-4; Figure 2-5; Section 2.4.2	Yes
b) The growth projection used to forecast water demand is consistent with the adopted city or county's population growth projections. If a different growth projection is used, provide an explanation of the alternative growth projection	Section 4.1; Table 4-1	Yes
c) For cities and towns that provide water service: All water service area policies of the city or town described in the plan conform to all relevant utility service extension ordinances.	Section 2.5.4	Yes
d) Service area policies for new service connections conform to the adopted local plans and adopted development regulations of all cities and counties with jurisdiction over the service area.	Section 2.5.3; Section 6.2; Section 6.3	Yes
e) Other relevant elements related to water supply are addressed in the water system plan, if applicable. This may include Coordinated Water System Plans, Regional Wastewater Plans, Reclaimed Water Plans, Groundwater Management Area Plans, and the Capital Facilities Element of local comprehensive plans.	Sections 2.3.2, 2.3.3, 2.3.4, 2.3.8	Yes

I certify that the above statements are true to the best of my knowledge and that these specific elements are consistent with adopted local plans and development regulations.

Signature 7/18/2023 Date

Glenn Coil, Sr. Planner, City of Redmond

Printed Name, Title, & Jurisdiction

Comment No.	Comment (and indication of comment source letter or email)	Response
King County	**December 6, 2024 email from Dan Cardwell (King County) to Jeff Hansen (HDR)**	
1	Your email nudged me to review the City's response to the King County UTRC's comments once again, specifically related to the timely/reasonable service appeal process. As I mentioned to Lisa this morning, I'm not sure how I overlooked the absence of the water system plan service policies referencing KCC 13.24.090, which provides the King County UTRC the authority to serve as the appeal body for timely and reasonable service appeals, after all local appeals have been exhausted. Lisa indicated that the City could complete a minor amendment to the Plan to incorporate language referencing this appeal process/opportunity. It may be appropriate for language referencing the UTRC as an appeal body in section 2.5.1.	Section 2.5.1 (next to last paragraph) has been edited per the comment, noting that the UTRC can serve as an appeal body.
Dept. of Ecology	**October 16, 2024 Comment Letter from Mike Shaljian (Ecology) to Lisa Rigg (City)**	
1	Section 7.2. Various comments related to the discussion of the Seidel Creek and Well 3 water rights, and how these rights are depicted in the Water Rights Self Assessment table.	The City has implemented the process of placing the Seidel Creek water rights (certificates 249 and 250) into Temporary Trust via Ecology's Trust Water Program. The application forms for the donation to temporary trust have been formally submitted with Ecology, as of May 12, 2025. Per the cover letter associated with those donation applications, it is the City's understanding that this action will allow Ecology to recognize a portion fo the allocation authorized under certificate 6675-A (Well 3) as additive, dependent upon the total annual quantity available under certificates 249, 250, 1313-A, and 3420-A. Based on this understanding, Section 7.2 of the WSP and the Water Right Self Assessment table (Table 7-2) have been revised to reflect this.
2	Populate the Self-Assessment table with current data and projected production estimates under each respective water right in Redmond's portfolio, along with cumulative totals independent of the water supplied from Cascade Water Alliance; separately include the current and projected quantities of purchased water from Cascade Water Alliance. As populated, it is impossible for Ecology to know how much water is being produced under Redmond's water rights versus what is purchased from Cascade Water Alliance.	Table 7-2 has been updated as requested, with current/projected production associated with each water right, along with amounts purchased from Cascade Water Alliance.
Dept. of Health	**December 11, 2024 email from Crystal Nuno (DOH) to Jeff Hansen (HDR), and December 6, 2024 email from Jeff Hansen to Crystal Nuno**	
1	Comment #1: Once received, please incorporate the approved King County ordinance into the water system plan and resubmit a final copy to DOH.	As of 5/22/25, the updated/finalized WSP has been submitted to King County. Once documentation of the County's approval has been received, that will be included in Appendix A and submitted to DOH.
2	Comment #2: Documentation showing Ecology satisfaction. An email will suffice.	As of 5/22/25, the updated/finalized WSP has been submitted to Ecology. Once documentation of Ecology's approval has been received, that will be included in Appendix A and submitted to DOH
3	Comment #19: Documentation of an informational consumer meeting, such as meeting minutes, and documentation showing that the City's governing body took action to approve the plan. It is okay if both are accomplished at the same meeting.	The Redmond City Council formally adopted the 2024 Water System Plan on November 19, 2024, per Ordinance 3183. A copy of this is included in Appendix A. As outlined in Ordinance 3183, the City provided multiple opportunities for consumer engagement during the WSP development process in 2023 and 2024. This culminated in a formal Planning Commission Public Hearing on July 26, 2024, where information was shared on the WSP and opportunity was provided for public comment. The agenda and minutes associated with this meeting are included in Appendix A.

Comment No.	Comment (and indication of comment source letter or email)	Response
4	Comment #3**:** Duty to serve has been added. How does the city define timely and reasonable? The utilities availability application form says response within 14 days. Is timely and reasonable 14 days? Where is the appeals language for customers who are denied service or disagree with the conditions of service? This section references RMC Title 13. Is the appeals found within this document? See DOH pub #331-444.	There is additional detail regarding the policies/procedures related to Water Permit applications in the Redmond Zoning Code (RZC). Water Permits are classified as Type 1 permits and follow the procedure outlined in RZC 21.76.050 (21.76.050 Permit Types and Procedures | Redmond Zoning Code). The text in Section 2.5.1 of the WSP has been revised to include discussion of this portion of the RZC, with an emphasis on the following points: - Timely. The established time frame for responding to an application for service is 14 days, which as you noted is stated on the utilities availability application form. This is the sole time frame established in code that is related to water service extension applications. - Appeals. The appeals process related to water service applications is detailed in Section 21.76.050F of the RZC.
5	Comment# 9: We reviewed the cross-connection control program dated January 2024 provided in appendix M. It looks to be a good start and includes the required elements. Consider including reference to the Backflow Incident Report Form (DOH Form 331-457) as part of the City's incident response plan.	The City has updated the cross-connection control program per the suggestion. The following has been added to section 6: "C. In the event of a backflow incident, City staff will complete and submit to DOH the Backflow Incident Report Form (DOH Form 331-457), the latest version of which is appended to this plan." As noted in this text revision, a copy of the DOH form has been included in the WSP Appendix M.
6	Comment #11: Section 8.4.2, page 173, paragraph 2, States, "Under the RTCR, there are two types of violations: acute and non-acute… Not true. The RTCR eliminated the acute and non-acute MCL violations. Generally, there are treatment techniques triggers, and violations defined. Please see our fact sheet, publication 331-206, Treatment technique triggers, violations, and public notification requirements. Please insert this publication into the WSP and resubmit a final copy to DOH: Treatment technique triggers, violations, and public notification requirements (wa.gov).	The City has updated the WSP per the comment. The 2nd paragraph of Section 8.4.2 has been deleted. And, DOH's referenced fact sheet (DOH pub 331-206) has been added to Appendix J.
7	Comment re: Groundwater Rule. Section 8.3.4, page 169, paragraph 2, States 'This means that triggered source water monitoring for E.coli is required… under routine TCR monitoring.' Replace 'E.coli' with the words 'total coliform and E.coli' and replace TCR with RTCR and resubmit a final copy to DOH.	The WSP has been edited per the comment.

STATE OF WASHINGTON
DEPARTMENT OF ECOLOGY
Northwest Region Office
PO Box 330316, Shoreline, WA 98133-9716 • 206-594-0000

October 16, 2024

City of Redmond
c/o Lisa Rigg
PO Box 97010
Redmond, WA 98073

Email: lrigg@redmond.gov

RE: City of Redmond (Water System ID #71650B) - Draft 2023 Water System Plan; Revised Water Supply Resource Evaluation

Dear Lisa Rigg:

Thank you for the opportunity to review a revised version of Chapter 7 of the city of Redmond's (Redmond) Water System Plan (WSP) (revisions received September 9, 2024). The proposed revisions were aimed at addressing Ecology's September 11, 2023, WSP comment letter and to update the water system plan so as to be consistent with Ecology's interpretation of the city's water rights portfolio. These issues were also discussed during two subsequent meetings. We appreciate the city's improvements to more accurately reflect their water rights portfolio; however, the proposed draft still does not meet the agency's minimum standards for reflecting an accurate water rights assessment in a Water System Plan.

Please address the following items prior to finalizing the WSP to ensure accuracy with the city's water rights:

- Additive/Non-additive Nature of Certificate 6675-A
- Status of Surface Water Rights from Seidel Creek
- Self-Assessment and Current and Projected Use of Water Rights

More detail on each is described in the below Advisory Comments section.

Advisory Comments

Section 7.2.1 - Groundwater Rights
Water right certificate 6675-A should be shown in this section (and in the Self-Assessment table) to have a *non-additive* annual quantity of 400 ac-ft/yr. The language (pg. 7-3) is vague

regarding annual quantity for Well 3 and associated certificate 6675-A. It states the well and water right have an annual quantity of 400 acre-feet, but does not correctly specify it as non-additive.

The water rights for Well 3 should be discussed with the same degree of detail as for Well 2. The description for Well 2 refers to the conditions stipulating annual quantities stated in the original Report of Examination. Similar information needs to be added for Well 3.

Sections 7.2.2 & 7.2.3

Remove incorrect statements about the Seidel Creek water rights. Section 7.2.2 states that Redmond has two surface water rights for Seidel Creek (certificates 249 and 250) that "have historically been beneficially used for fish, wildlife, and other instream flow resources or related habitat values pursuant to RCW 90.03.550." Ecology finds this to be a misinterpretation of RCW 90.03.550, as the language of the statute clearly states that water must be ***"withdrawn or diverted"*** under such a right. Intentional non-use of water does not constitute a beneficial use for municipal water supply purposes. The above-referenced statement and any similar references should be removed. Per the above, in Section 7.2.3, Ecology disagrees with Redmond's characterization that Ecology has no abandonment concerns with the city's water rights. All statements to this effect should be removed.

Be aware of the validity of the Seidel Creek water rights before committing to their use. Redmond's description of the history of water use associated with Seidel Creek (see page 2-7 of the draft 2023 WSP) suggests water was diverted from Seidel Creek for municipal supply from approximately 1927 – 1953. Due to the impoundment dam washing out and frequent concerns over non-compliance with Department of Health standards for water quality, it appears that use of Seidel Creek as a municipal water source ceased in 1953. Ecology has not been able to discern any actions taken by Redmond to maintain diversions or diversion works from Seidel Creek or to otherwise maintain these certificates in good standing. *Consequently, there appears to be evidence that both certificate 249 and certificate 250 (storage-only) could be abandoned or relinquished due to non-use*. If there is intention of activating and relying on certificates 249 and 250, Ecology strongly recommends the city perform a thorough assessment of extent and validity of these rights prior to committing any resources toward their use or relying upon their water quantities for future city use.

Table 7-2 - Water Rights Self-Assessment

Correct the table to conform to the comments above. This includes:

- **Correct footnote 1**. Ecology recommends revising the language to state either that Redmond holds these rights and intends to activate them at some point in the future or that that the standing of the rights is uncertain, followed with the existing footnote language stating, "amounts (Qi and Qa) attributable to these water rights are not included in the total water rights currently available to the City's water system."

- **Remove footnote 3.**
- **Update certificate 6675-A so that the 400 ac-ft/yr is in the *non-additive* column under Existing Water Rights and revise totals accordingly.**

Populate the Self-Assessment table with current data and projected production estimates under each respective water right in Redmond's portfolio, along with cumulative totals independent of the water supplied from Cascade Water Alliance; separately include the current and projected quantities of purchased water from Cascade Water Alliance. As populated, it is impossible for Ecology to know how much water is being produced under Redmond's water rights versus what is purchased from Cascade Water Alliance.

Other important items for Redmond to consider regarding their water rights portfolio:

Use of Certificates 249 and 250 and Nature of Certificate 6675-A
Ecology disagrees with the city's interpretation of these water rights, as stated in their April 29, 2024, email to Ecology. The original response to Ecology's 2023 WSP comment letter seemed to assert that Redmond's non-use of water from certificates 249 and 250 "for instream flow purposes" would keep these water rights in good standing as municipal water rights, but at the same time, the rights should not be recognized in Redmond's total allocation (portfolio) of municipal rights because the water is not serving water system customers. Consequently, certificate 6675-A, which is dependent on the status of certificates 249 and 250, is interpreted as being additive to the portfolio. For the purpose of archiving this exchange in the WSP review record, we quote the comment from Redmond's attorney that was emailed to Ecology on April 29, 2024:

> *Ecology issued Certificate 6675-A "as a supplemental supply, the total annual water use under all rights [of the City as of 1969] shall not exceed 2,420 acre-feet". In other words, Certificate 6675-A was supplemental to Certificates 249, 250, 1313-A, and 3420-A. Certificates 249 and 250 are beneficially used for instream flow purposes and are not calculated as part of the City's consumptive use of water. RCW 90.03.550. Therefore, the total Qa of water for Certificates 1313-A, 3420-A, and 6675-A shall not exceed 2,420 afy combined. Combined, these three water rights amount to a Qa of 1,005 afy. As a result, Certificate 6675-A is additive and the City will continue to acknowledge 6675-A as additive while Certificates 249 and 250 are used for instream flow purposes.*

As has been relayed to Redmond several times, in order to consider any portion of certificate 6675-A as additive, formal action must be taken such that certificates 249 and 250 are clearly diminished or unavailable for use by Redmond. In other words, the pre-6675-A portfolio of rights must not exceed the 2,420 ac-ft/yr threshold stated in the 6675-A Report of Examination in order to recognize any portion of the water right as additive.

As discussed in the meeting between Ecology and Redmond on August 26, 2024, Redmond has several options regarding certificates 249 and 250:

- Place the water rights into **Temporary Trust** via Ecology's *Trust Water Program.* This will protect the valid portions of these rights from relinquishment *moving forward*. Be advised that only beneficially used portions of a right (as attested by the applicant) can be placed into trust and a trust donation does not "revive" rights that have already been abandoned or relinquished. A request to remove the rights from Temporary Trust and apply to change the water right(s) (point of diversion, purpose of use) to enable active municipal or other use would result in a full tentative determination analysis by Ecology to determine the extent and validity of the rights.
- Place the water rights into **Permanent Trust** via Ecology's *Trust Water Program* if the city is certain it will not need/use these rights in the future. Be aware that placing water into Permanent Trust necessitates a formal tentative determination of extent and validity prior to Ecology's acceptance into the program.
- **Voluntarily relinquish** all or a portion of the Seidel Creek certificates.

If the certificates are formally placed into trust (Temporary or Permanent) or relinquished, Ecology would then be able to recognize some portion of the allocation provided under certificate 6675-A as additive, dependent upon the total annual quantity available under certificates 249, 250, 1313-A, and 3420-A. The entire 400 ac-ft/yr annual quantity from certificate 6675-A could be recognized as additive if the sum of the authorized quantities of these certificates was 2,020 ac-ft/yr or less.

We hope this information is helpful to the city in ensuring an accurate water rights assessment for your Water System Plan. We appreciate working with you to ensure accuracy and transparency on this issue. Please contact me with any questions at (206) 305-1720 or mike.shaljian@ecy.wa.gov.

Sincerely,



Mike Shaljian
Hydrogeologist
Water Resources Program
Northwest Region Office

Enclosures: 2004 City of Redmond Ecology Water Rights Analysis Letter
2005 City of Redmond Response to Ecology's Analysis

ecc: Derek Pell, Department of Health
Brietta Carter, Department of Health
Crystal Nuño, Department of Health

Comment No.	Comment	Response
King County		
1	It is not clear if the City allows for permit exempt wells within its Retail Service Area. King County Code 13.24.140 Water facilities in urban areas-interim alternative water service, allows for a permit exempt well if connection to the respective Group A system is not timely or reasonable conditioned upon a requirement for future connection. While the District may not expect a situation where the timely and reasonable service provisions would not be met, it would be appropriate to reflect the County's requirement in the Plan document.	The City does not allow permit-exempt wells in the retail service area. This is noted in Section 2.3.2, policies UT-24 and UT-25 (from the City's Comprehensive Plan). Text has been added to the new Section 2.5.1 – Duty to Serve to note that if the T&R requirement isn't met, PE wells are allowed by County code, but the City does not anticipate this will occur.
2	The draft Plan does not appear to address how the City will meet its duty to service (Municipal Water Law), defines Timely and Reasonable Water Service, or identify an appropriate appeal process for properties owners who believe the conditions of service is not timely or reasonable. Please include text to address these topics.	New Section 2.5.1 addresses the duty to serve per the MWL, and references specific portions of the related City code.
3	Has the District considered the impacts of climate change on both water demand and supply? It would be appropriate to include a discussion of how climate change may affect water demand and supply. An example in another water purveyor's plan referenced the change in rainfall impact on surface water source.	Added new Section 7.3.2 to address climate. It's a broad description of key regional coordination activities and City-specific initiatives that have occurred thus far to consider the impacts of climate change and how they will be mitigated in the future. The City (and region as a whole) are well-situated from a planning perspective to be resilient to climate change in the near future.
4	Section 1.4 Local Government Coordination. The second bullet references "King County Planning Regulation Division and Utility Technical Review Committee" to provide determination of consistency with King County planning policies. This reference should be corrected to reference "King County Department of Local Services-Permitting, Utilities Technical Review Committee". It should also be noted that per King County Code 13.24 the water system plan is required to be approved by the King County Council.	Have changed the reference and added a note that the KCC has final approval authority.
5	Figure 2-1. Retail Service Area and Adjacent Purveyors. It is difficult to identify the Retail Service Area as the UGA and City Limit overlap with it. Can the map key be revised to identify the Retail Service Area more clearly in conjunction with other map attributes?	This and other figures have been revised to clarify overlapping boundary lines. Note that part of this involves showing the City's city limits boundary "offset" from its actual location, so as to address the overlap issue.
6	Section 2.2.1. Novelty Hill Service Area. While Figure 2-1 shows that the Novelty Hill Service Area is not contiguous/detached from other City service areas, the text does not explain why the City was the most appropriate water purveyor to provide water service to the residential developments in unincorporated King County. It would be beneficial to clarify when and why the City expanded its service area to service these developments. This explanation may justify the irregular service area boundary.	Text added to section 2.2.1 to broadly describe the history.
7	Section 2.3.1. 2016 King County Comprehensive Plan. The text provides a detailed description of the County's Comprehensive Plan policies and identifies adopted land use designations on Figure 2-3., however, it is appropriate to also provide the acreage associated with each land use designation and identify the development status of the acreage (i.e., vacant, developed, underdeveloped).	A new table (Table 2-1 has been added with this information.
8	Section 2.3.1. 2016 King County Comprehensive Plan. In review of Figure 2-1, it appears the City's service area encompasses unincorporated areas beyond the Novelty Hill Service area; however, the text doesn't appear to acknowledge this. While there is reference to the UGA, does the City's service area include any unincorporated Rural areas? It appears that Figure 2-3 shows a small portion of the service area being designated Rural area. Please clarify.	Yes, small portions of the RSA to the east and northeast serve rural unincorporated King County. Text was added in section 2.4.1 (Retail Service Area Boundaries) to further describe these areas within the RSA in unincorporated King County, and that policy UT-4 in the City's comprehensive plan described how rural water service will be provided.

Comment No.	Comment	Response
9	Section 2.3.1 2016 King County Comprehensive Plan/Section 2.3.2 City of Redmond Comprehensive Plan. The Plan should reference the updated 2021 King County Countywide Planning Policies (CPPs) and that the local jurisdictions' comprehensive plans are required to be updated by the end of 2024. Particularly, the Plan should recognize that the updated CPPs have been adopted with growth targets (2019 – 2044) that are different than the growth targets referenced in Chapter 4.	Text added to section 2.3.1, subsection "Regional Planning," and section 2.3.2, subsection "Housing," to note that King County has updated CPPs and that the City will use the VISION 2050 and King County CPPs to guide development of the 2024 comprehensive plan. The updated CPPs were prepared after the City had completed its demographic analysis used in this plan. Additionally, the Redmond planning department, in coordination with PSRC, has continually monitored growth and development, resulting in growth targets not exactly with the same as the CPPs. For comparison, the housing target currently in the comprehensive plan between 2019 and 2044 is 21,137, or 6% different than the CPP estimate (20,000). The employment target currently in the plan between 2019 and 2044 is 19,162, or -20% different than the CPP estimate (24,000).
10	Figure 2-4 Redmond Comprehensive Land Use Plan. It is difficult to identify the Retail Service Area as the UGA and City Limits overlap with it. Can the map key be revised to identify the Retail Service Area more clearly in conjunction with other map attributes?	Figure revised, as noted in a previous response.
11	Section 2.4.1 Retail Service Area Boundaries. The text states that the City doesn't anticipate any major changes to its retail service area in the immediate future, however, the service area may be expanded to provide service to areas annexed into the City. While Figure 2-1 indicates that the unincorporated UGA adjacent to the City is not within the City's Retail Service Area, adding text to this section would clarify this situation. The text should also acknowledge that if the City expands its Retail Service Area, the water system plan would need to be amended to modify Figure 2-1 and update other appropriate text.	All the Redmond UGA that is not served by the City is already served by other purveyors. Added text to 2.4.1 indicating that the service area may be expanded to provide service to areas annexed into the City in the future <u>that are not currently served by another purveyor</u>. A statement was added that changes to the RSA would require a plan amendment and approval.
12	Section 2.4.1 Retail Service Area Boundaries. The text references an area that the City provides water service to that is not within and will not be included in its service area. The text references Figure 2- 1 to identify the location of this area, however, in review of the figure, it doesn't appear this area is identified. The text also references discussions with Union Hill Water District and Woodinville Water District for future service discussions. Is there a timeframe in which this issue will be resolved? Please clarify?	These parcels show up in figure 3-1, along the transmission main. These have now also been brought back into the other maps and shown as within the RSA. Text revised in section 2.4.1 to clarify that these parcels, by definition, are in the RSA, but no other parcels abutting the line outside the RSA will be provided service.
13	Section 4. Planning Data and Demand Forecast. The text states that Redmond retails water in two areas; the City Service Area and the Novelty Hill Service Area, however, in review of Figure 2-1, it appears that there are other unincorporated areas within the City's Retail Service Area, including the unincorporated area north of NE 116th in the proximately of 184th Ave. NE. Please clarify.	Added a brief statement in the first paragraph of Section 2.4.1. to note service is provided to areas beyond the City limits that are in the Well Service Area. The WSA is within the "City Service Area," therefore, this clears that statement for use in chapter .
14	Section 4.1. Demographics – Historical and Projected. The text refers the reader to Section 3.3.1 for more demographic information related to the Novelty Hill Service Area and application of the demand forecast. This information is not provided in a Section 3.3.1. Please correct the citation or add the referenced information.	This should say Table 4-10 and Section 4.3.1. These references have been updated in the text.

Comment No.	Comment	Response
15	Section 4.1 Demographics – Historical and Projected. This section provides historical and projected demographic statistics only for the City Service Area as it states the Novelty Service Area is assumed build-out. While this may be an accurate assumption, this chapter should acknowledge the existing and future population for this unincorporated area and identify the existing and projected population for the City's entire retail service area. Additionally, this chapter should substantiate the residential and employment statistics cited in Section 1.1 – System Overview.	Three columns have been added to the right of Table 4-1 to show number of single family and multifamily households, and the conversation to population (2.5 persons per SF, 1.8 persons per MF) for Novelty Hill. The population of the City service area and NH service area together is approximately 87,000. Chapter 1 has been revised to state the City serves a residential population of approximately 87,000. The population and employment growth projection summary statements made in Chapter 1 have also been updated to align with the details here in Chapter 4.
16	Section 4.1. Demographics – Historical and Projected. Please recognize the 2019 – 2044 targets provided in the updated King County CPPs and referenced in comment # 9 above.	Added a statement acknowledging that the KC CPPs influence the development of the projections. See the response to comment 9 for more information.
17	Section 4.2.2. Customer Categories, Connections, and Consumption. This section provides detailed information for the City Service Area and Novelty Service Area, however, the text does not provide statistics which represents all the City customers, such as total water consumption. Information in the plan should include statistics that represents the water service in total. Please update as appropriate.	In the draft these comments were produced for, tables in the chapter include a "Combined Service Area." This has been renamed as the "Retail Service Area," as this is more accurate (and the correct regulatory terminology as well). Added new figures and text for percentage of customer class consumption and monthly distributions for the Retail Service Area.
18	Section 7.4 Evaluation of Reclaimed Water Opportunities. While the text provides detailed information on reclaimed water opportunities, please submit a completed King County Water Reclamation Evaluation Checklist.	A checklist has been completed and is included as Appendix H.
19	Section 12.2 Planned Projects and Costs. The text states that there aren't any cost estimates for projects beyond 2028, however, in review of Table 12-1 (Capital Improvement Program), dollar amounts are provided for some projects beyond 2028. Why are there not cost estimates for projects beyond 2028 as these would provide a general indication of cost? And for those Long-term projects that do not have a cost identified, it would be appropriate to explain why they do not have cost estimates.	Costs have been developed and included.
20	Section 13. Financial Program. The text refers readers to Appendix L to review the 2017 water utility rate study. This reference is not consistent with the appendixes attached to the draft plan; the 2017 water utility rate study is labeled as Appendix M.	With the updated Section 13 (see response below), there is no longer a financial program related appendix.
21	Section 13. Financial Program. While the text indicates that the City has a record of funding necessary capital projects, the financial program does not include the minimum information as required by WAC 246-290-100(4)(j) to demonstrate financial viability. The required information includes 1) a summary of past income and expenses, 2) a balanced operational budget for the plan approval period, 3) a plan for collecting the revenue necessary to maintain cash flow stability and to fund the capital improvement program and emergency improvements, and 4) an evaluation that has considered the affordability of water rates and the feasibility of adopting and implementing a rate structure that encourages water demand efficiency.	Section 13 has been updated, with the noted information now provided.
22	Appendix B-SEPA Documentation. As noted in the draft plan the environmental review (SEPA) is pending. The SEPA checklist/determination is required to be submitted with the final plan.	This has been completed and is included in Appendix B.
Cascade Water Alliance		

Comment No.	Comment	Response
1	2.3.4 Cascade Water Alliance Contracts and Planning Documents: The 2002 Interlocal Agreement was replaced in 2012 with the Joint Municipal Utilities Services Agreement. Given this please make the following Changes:	NA
1a	2nd Paragraph: The Joint Municipal Utilities Services Agreement, dated March 28, 2012 ("Joint Agreement"), among the now-seven (upon departure of Covington Water District) members describes Cascade's purposes, funding and governance structure (see Joint Agreement, Article 3). Cascade's 2012 Transmission and Supply Plan ("TSP"), as updated by the 2019 TSP Extension, describes Cascade's programs and water supply projects. Currently Cascade has entered into wholesale water supply agreements with two other regional water supply systems: Seattle Public Utilities (SPU) and Tacoma Public Utilities (TPU).	Edits made.
1b	2nd to Last Paragraph: Under the Joint Agreement, Redmond retains ownership and control of its own groundwater sources. Cascade commits to meeting Redmond's water supply needs exceeding the capacity of Redmond's local sources. In the event Cascade's supplies are not fully sufficient at any given time to meet the full need of all its members, the Joint Agreement, specifies that shortages will be shared among all its members.	Edits made.
2	2.6.4 Sammamish Plateau Water: In Table 2-2, you may want to add a row referencing the 2012 Joint Municipal Utilities Services Agreement as replacing the 2002 Interlocal Agreement.	Revised row to display the 2012 Joint Use Agreement and notes it is the replacement for the 2002 Interlocal Agreement.
3	P. 4-7, 1st Paragraph: An average peaking factor for 2019-2026 of 2.6 is used to convert forecasted ADD to MDD. In Cascade's experience, general practice is to use the maximum peak factor from a hot year (e.g. 2017 when the peaking factor was 3.2) to forecast MDD. This is to make sure the system can handle the extremes, not just average peaks.	In the past, the City has used the average of the prior 3 years to estimate peaking factor. This was the case in the prior plan, where the peaking factor was estimated at 2.1. Additionally, the 2.6 peaking factor is greater than the recommended values in the water system design manual (for those systems without data as granular as the City). While a PF of 2.6 may not represent the absolute maximum peak day the City will experience, this is a reasonable estimate for the future and the City will maintain the 2.6 PF for the demand forecast.
4	P. 4-7, Section 4.2.2: The customer categories could be clarified. It says there are 5 categories but lists 3 main categories (SF, MF, & Commercial (Non-Res) and then 2 more subcategories under Commercial-Irrigation and Fire Service). It explains that Irrigation can be SF, MF or Non-Res, but all are classified as commercial. Fire is defined as only SF Fire Service but is classified as non-residential. Nothing is said about MF or Commercial fire service though it can be assumed that Commercial fire service is classified as commercial. Is MF fire service also classified as commercial or is it MF? We suggest having these as two more categories, as is shown in Table 4-4 on page 4-9, rather than rolling them into Commercial.	Agree with this comment. Makes more sense to list them as their own customer categories and describe how they are distinct from the other categories. Changes have been made to the bullet list.
5	P. 4-15, Table 4.5: We aren't clear why water wheeled to Sammamish Plateau is shown in this table as retail consumption (or in the pie chart on P. 4-12). It is wholesale and reported as such by Redmond in Cascade's annual survey.	The Sammamish wheeled values have been removed from the consumption figures and moved to its own column in Table 4-5. As such, the Sammamish values have been removed from the "Retail" heading in the table. We still want to show that this water passes through the system but have segregated it from consumption data.
6	P. 4-17, 1st Paragraph: "Figures 3-8 to 3-10" should be 4-8 to 4-10. "…greater detail in section 3.2.4 should be 4.2.4.	Edits made.

Comment No.	Comment	Response
7	P. 4-21, Table 4-8: The numbers in this table are different than the data Redmond has provided Cascade over the years. Cascade staff will connect directly with Redmond staff to discuss this. Cascade will defer to Redmond as to whether any changes need to be made to this table.	The primary culprit for the difference is the inclusion of Sammamish wheeled demands in the production and authorized consumption. The reasoning is that the water wheeled to Sammamish comes through a master meter in the Novelty Hill service area (i.e., part of production from the Cascade supply), then supplied to another meter (Sammamish's meter). The values align better in the years 2016 – 2021 when Sammamish demands are removed, though not perfect alignment. We have noted in the text that the values include Sammamish demands.
8	P. 4-21-4-22, Section 4.2.4, 1st Paragraph; This description of how irrigation consumption is allocated between SF, MF and Non-Res makes sense, but it conflicts with the customer class categories as defined on page 4-7.	Customer class categories have been redefined in Section 4.2.2. This gives clarify to the relationship between the SF, MF, and Non-Res categories and the irrigation category.
9	Section 4.3.1: The assumption that demographic growth in Novelty Hill is close to zero is consistent with recently released PSRC demographic forecast for the relevant census tracts. This assumes that future Sammamish Plateau purchases from Redmond will be at contractual maximum, which is quite a bit higher than current demand. However, it is vey small compared to total Redmond demand and has little effect on the forecast.	Comment acknowledged. Hydraulic analyses can be updated if Sammamish expresses an intent to begin regularly taking the contractual maximum to ensure the Novelty Hill system can handle the City's forecasted demands and wheeling water to Sammamish simultaneously.
10	Section 4.3.2: Since the difference between the "with conservation" forecast and the "without conservation" forecast is very small, perhaps the Plan could state that very little additional effect is expected from conservation programs. You could also add that additional improvements in water use efficiency are anticipated from more stringent water codes and standards for fixtures and appliances (such as the updated 2021 state plumbing code) and the impact of increasing water and sewer rates. Finally, you could acknowledge that these anticipated affects have not been modelled and are not reflected in the demand forecast.	Text added after Table 4-11 which includes this information.
11	7.3.1 Water Shortage Response Planning: This section refers to the City's 2009 Water Shortage Response Plan. Cascade's most recent Water Shortage Management Plan (SMP) was produced in 2016 and can be found in Appendix A of our Transmission and Supply Plan Extension. We did not compare our 2016 SMP with the City's 2009 Plan to ensure consistency. This is something you may want to do.	The City updated its WSRP in 2016, which effectively adopts the regional strategy that Cascade describes in the 2016 SMP. Cascade's SMP is included as appendix A to the City's WSRP. The text in section 7.3.1 has been revised to indicate this and the City's WSRP has been included as a new Appendix G to the WSP.
12	Appendix D Interlocal Agreements: Per Cascade's first comment, replace the 2002 Interlocal Contract with the 2012 Joint Municipal Utilities Services Agreement.	The 2002 Interlocal Contract has been replaced with the 2012 agreement in Appendix D.
Dept. of Ecology		

Comment No.	Comment	Response
1	In the water rights documentation presented in the Water Rights Self-Assessment (Table 7-2), and described in Section 7 of the WSP, dated June 2023, an incorrect relationship between those water rights which are additive and those which are non-additive, historically referred to as "supplemental" was identified. The designation of additive/non-additive within a portfolio of water rights is critical….In Redmond's Water Right Self-Assessment on Table 7-2, there appears to be a misinterpretation of the "supplemental" rights prescribed in Certificate 6675-A. While Redmond interprets the annual quantity (Qa) of 400 ac-ft/yr to be primary and available for additive use, the Report of Examination (ROE) for the water right states that at the time of issuance, Redmond was to have primary rights no greater than 2,420 ac-ft/yr to serve the projected population. Ecology's interpretation is that since the total annual quantity held by Redmond at the time of the permit issuance met this number, the permit was issued as completely non-additive. The correct relationship between Redmond's portfolio of water rights appears to be documented in the Report of Examination for Certificate 6675-A. While not on the certificate, the prescribed relationship on the ROE is considered binding.	In the revised WSP, see Table 7-2, footnote 3, which has been added by the City's attorney: Ecology issued Certificate 6675-A "as a supplemental supply, the total annual water use under all rights [of the City as of 1969] shall not exceed 2,420 acre-feet". In other words, Certificate 6675-A was supplemental to Certificates 249, 250, 1313-A, and 3420-A. Certificates 249 and 250 are beneficially used for instream flow purposes and are not calculated as part of the City's consumptive use of water. RCW 90.03.550. Therefore, the total Qa of water for Certificates 1313-A, 3420-A, and 6675-A shall not exceed 2,420 afy combined. Combined, these three water rights amount to a Qa of 1,005 afy. As a result, Certificate 6675-A is additive and the City will continue to acknowledge 6675-A as additive while Certificates 249 and 250 are used for instream flow purposes.
2	Redmond should determine its present and future need for all water rights within its portfolio to ensure that rights are protected from potential risks due to abandonment. Redmond makes clear in the WSP that they are aware of the issue of water rights not being fully utilized to certificated maximum annual and anticipated quantities due to problems with their wells, while also acknowledging a potential need to seek approval with Ecology for changes to points of withdrawal so that groundwater may be pumped up to full utilization of their water rights. Absent actual beneficial use, discussion and documentation of planned use of municipal water rights in current and future WSPs, along with maintaining sources and infrastructure, is an indicator that a water system has no intent to abandon a water right.	Comment acknowledged.
3	In Section 7 of the WSP, Redmond indicates that Well #4 (Water Right Certificate G1-22608) has historically had limited production capacity due to screen clogging and water quality issues, and that this has prevented full utilization of the associated water right. Redmond further states that they have considered drilling a replacement well and submitting a Showing of Compliance to Ecology to remedy this problematic well. Please be advised that the replacement well must fall within the location described in the water right's most recent public notice for a Showing of Compliance to be lawful, and we would also like to remind Redmond of the necessity to decommission Well #4 if that occurs. This is required of any unused or abandoned well.	Comment acknowledged.
4	The Redmond WSP presents use and production data for the years 2019-2021. At the end of 2021, the approximate number of connections served by Redmond totaled 19,581. Each connection served, on average, approximately two equivalent residential units (ERUs). The average number of ERUs served in 2019-2021 was 39,529. The per-ERU water use presented in the Redmond WSP for 2019-2021 was 157 gallons per day.	Comment acknowledged.

Comment No.	Comment	Response
5	Taking the product of total ERUs and per ERU water use over the course of a year, we estimate that on average, about 6,950 ac-ft/yr of water was used in this period. Redmond states that 40% of the water supply comes from their own wells, while the remaining 60% comes from Cascade Water Alliance. Based on this understanding, we conclude that approximately 2,780 ac-ft/yr or 60% of Redmond's available water rights are being utilized. Ecology's analysis indicates that Redmond has 4,605 ac-ft/yr of groundwater rights available for use, while Redmond states in the Water Rights Self-Assessment (Table 7-2) that 46,249 ac-ft/yr are presently available from Cascade Water Alliance.	Comment acknowledged.
6	Redmond did not submit a projection for full buildout but did provide forecasts for projected water use and production capability on 10-yeaar (2023) and 20-year (2043) timelines in the Water Rights Self-Assessment. Redmond estimates that there will be an excess capacity of 40,711 ac-ft/yr on the 10-year timeline and an excess capacity of 39,251 ac-ft/yr on the 20-year timeline. Ecology understands that Redmond plans to import most of its future water from the Cascade Water Alliance. Based on the above, capacity **DOES NOT** appear to be an issue of concern for the water system.	Comment acknowledged.
Dept. of Health		
1	Provide a Statement of Local Government Consistency from the City's Planning Department and an adoption ordinance from the King County Council.	See completed LGC form in Appendix A. Once City obtains concurrence from DOH that responses to comments are satisfactory, City will adopt WSP, followed by King County adoption, and then the WSP will be provided to DOH for approval.
2	Address Ecology's comments from the letter dated September 11, 2023.	Completed. See responses above.
3	We have reviewed Dan Cardwell's UTRC review of your WSP date 7/20/2023 and agree with comment #2. DOH also recommends adding text to address how the City will meet its Duty to Serve obligations in its defined Retail Service Areas and a description of its internal appeal process for Timely and Reasonable disputes.	Text has been added per comment. See also response above to KC comment.
4	Regarding Table 3-4, Pressure Reducing Valves, why is the proposed PRV Setting (psi) column blank?	The proposed PRV setting columns have been deleted. Those were not intended for inclusion.
5	7.3.1 Reliability considerations, references 2009 Water Shortage Response Plan. Since 2009 the City of Seattle has updated their Water Shortage Response Plan. If the City of Seattle is asking customers for voluntary curtailment, how does the City respond? Do the City messages align with Seattle's? Is there value in reviewing and possibly updating the City's Water Shortage Response Plan?	The City's updated Water Shortage Response Plan (2016) has been included (see Appendix G). Section 7 text has been revised to reflect this. With respect to the question posed, the City closely coordinates curtailment measures, along with all water shortage response actions, with Cascade Water Alliance and SPU. This is noted in the 2016 update to the City's plan.
6a	Regarding the hydraulic profiles, Why does the City of Seattle and the City of Redmond have two different datums?	The figures have been updated to reflect the operating ranges depicted in the City's agreement with Cascade Water Alliance. The numbers in the draft document were a holdover from outdated mapping materials.
6b	Regarding the hydraulic profiles, the operating ranges do not appear to align with the Table of Delivery Points in the City's Agreement with Cascade Water Alliance (May 1, 2008, agreement in appendix D Interlocal Agreements). Has the agreement been updated with hydraulic grade line (HGL) operating ranges that align with the hydraulic profiles provided? Please explain.	The figures have been updated to reflect the operating ranges depicted in the City's agreement with Cascade Water Alliance. The numbers in the draft document were a holdover from outdated mapping materials.

Comment No.	Comment	Response
7	Water Use Efficiency Program and Water Rights Assessment: Describe how Cascade Water Alliance's elected governing board developed the goals through a public process. Provide copies of the City of Redmond's resolution or other documentation that identifies the City's action take on the adoption of Cascade's WUE goals. The WUE program will need new updated goals from Cascade. What is the City's process for establishing future goals with Cascade? Does the city have additional goals beyond Cascade? Please describe.	The text in Section 5.1.1 has been revised to note that Cascade's WUE goals establishment process including opportunity for public input. Details of that process are provided in Cascade's documentation, not here in the City's WSP. Excerpts from the City's Environmental Sustainability Action Plan have been included in Appendix E, to provide additional detail regarding the City's adoption of Cascade's goal and additional program elements.
8	The cross-connection control program summary annual summary reports indicate there are several high hazard premises tracked with RPBAs. Consider summarizing in section 11.8 the total number of high hazards, examples of types (dental office for example), and the percent compliance with annual testing of backflow prevention assembly.	The City maintains a database of all premises having RPBAs that are tested. The text in Section 11.8 has been updated to summarize this.
9	Please include your most recent cross-connection control plan in the appendices for our review. Please update the cross-connection control program summary annual summary report indicates the following required elements are missing from written cross-connection control program plan. 1) Hazard Evaluation Procedures and Schedules, 2) Procedures/Schedules for Ensuring Installation of Backflow Preventers, 3) Backflow Incident Response Procedures, and 4) Public Education Program.	The City's January 2024 CCCP has been included as Appendix M in the WSP, and is referenced in Section 11.8.
10	Section 11.10 Record Keeping and Reporting: Lead and Copper Rule Revisions require documentation of service line material type as part of routing operations (meter replacement for example). Has the City developed a process for collecting material type during routine operations? Please include in this section.	This section has been updated to include this text: "During routine maintenance or construction activities resulting in excavation of a service line, maintenance staff will classify the material and size of the public and private side of the service line on their work orders. This information is compiled in a working inventory that is reviewed and updated by the Water Quality Analyst or Water Quality Supervisor. "
11	8.4.2 Total Coliform Rule – Change to Revised Total Coliform Rule. a. Eliminate references to the Total Coliform Rule. Since April 2016, water systems have been operating solely under the Revised Total Coliform Rule, b. Appendix G. Note that the 2020 Coliform Monitoring Plan is stored as Appendix H in Redmond's plan. Please update, c. The City of Redmond Service Area – '20,000 Active Services' update to 33,592 active services, d. Sample Stand Locations for Routing Sampling – 23. Fairwinds Sample Stands Novelty Hill Road missing repeat sample descriptions, e. In the event of an Unsatisfactory Sample (Coliform Presence) Eliminate Bob James (retired), Carol Stuckey (another position). Add Coliform Program Manager (currently Ingrid Salmon) at 253-395-6754.	This section has been revised per the comment. The current version of the City's CMP is provided in Appendix J.
12	If not already addressed, complete a E. coli Response Plan. Link provided for Preparing a Coliform Monitoring Plan for Large or Multiple-Source Systems (wa.gov). Consider using an E. coli Present Sample Response checklist (p. 18) from the 'Preparing a Coliform Monitoring Plan'.	This has been included at the end of the City's CMP (see Appendix J).
13	Section 8.4.3 Surface Water Treatment Rule refers to the requirements to maintain detectable disinfection residual. Please note that the minimum disinfection residual of 0.2 mg/L is required to be monitored every calendar day throughout the distribution system and not just at the entry point. Daily disinfection residual monitoring includes the distribution sample collected at the same time and location as coliform samples. Please update the text and tables as needed.	This section has been revised per the comment.

Comment No.	Comment	Response
14	Distribution Facilities Design and Construction Standards provides links (broken) to the City's standard specifications and design requirements. This chapter references the most recent version as October 2020. We were unable to locate the 2020 version on the website. However, we did find and review a 2019 version. It is noted that no reduced pressure backflow assembly standard detail is included. It is also noted t hat the City references adoption of WDOT standards. We recognize that the standard specification and design requirements we approve in the WSP is a snapshot in time. WDOT standards for example are updated regularly. a. Please include a copy of the current standard specifications and design requirements in the final WSP to complete our records of what we approve. b. Please include the standard detail for reduced pressure backflow assembly.	Both the 2019 and 2020 documents which are referenced in Chapter 6 are valid and applicable. The links in the WSP are functional. The City prefers to retain these as links to living documents as opposed to static documents in the appendix. However, for review/approval purposes, current versions of these documents are also provided in Appendix P. The City recently developed a standard detail for RPBAs. It has been included as Detail No. 731 in Appendix P.
15	Improvement Program – Provide description of the city's asset management program that includes the physical location, life expectancy, and system criticality of all existing facilities.	Section 11.11 provides a summary of the City's asset management program, and current efforts aimed at building upon the current program components.
16	Financial Planning – WAC 246-290-100(4)(jii)(jiii) requires demonstration of a balanced budget for the plan approval period (in this case 10 years) and; a plan for collecting the revenue necessary to maintain cashflow stability to fund the capital improvement program and emergency improvements. The budget should also contain future capital reserve replacement funding that is informed by the City's Asset Management Plan.	Section 13 has been updated, with the noted information now provided.
17	Financial Planning – We understand that the City is conducting a rate study and that this study has been delayed for reasons stated in your WSP, however, we see no reason why a summary level of annual expenses, planned capital expenditures and capital replacement reserve funding with the revenues necessary to support these expenses cannot be provided.	See response above.
18	We understand that a signed SEPA Checklist and a signed Threshold Determination will be provided with the final WSP.	This is now included in Appendix B.
19	The water system must meet the consumer input process outlined in WAC 246-290-100(8). Please include documentation of a consumer meeting discussing the WSP, prior to DOH approval of the WSP. Prior to DOH approval, the City's elected governing body must approve and adopt the WSP.	The City will provide documentation once the following steps are completed for City review and adoption of the final WSP: Planning Commission Study Session June 12th Planning Commission 2nd Study Session and Public Hearing (with 21-day public notice) July 10th Planning Commission Recommendation to Council July 24th Council Staff Report August 20th Council Study Session September 24th Council Approval (with 21-day public notice) October 22nd
20	Please provide copies of any comments made by adjacent purveyors or other interested parties along with the City's response to those comments.	See this complete list of comments and responses.
21	Is the City a member of WAWARN?	Yes, the City is a member. New text has been added to Section 11.6.5 to describe this.
22	Please provide a copy of the existing wheeling agreement with Sammamish Plateau Water and Sewer District.	The intertie/wheeling agreement with Sammamish Plateau was included in Appendix D of the Draft WSP (starting on pdf pg 209 of the appendices document).
City of Kirkland		

Comment No.	Comment	Response
1	Service Area Boundary: Please correct the City of Kirkland Retail Service Area boundary shown on Figure 2-1. Please see the encircled area on the attached Kirkland Existing Water System Map.	Figure has been revised per the comment.
2	South and North Rose Hill Ownership Percentages. Table 3-5, Page 3-35, shows Redmond's contractual ownership of the South and North Rose Hill Reservoirs as 21.5% and 29.2%, respectively. It appears these ownership percentages are from the 1993 Rose Hill Assumption Agreement. The 1997 Interlocal Operations and Maintenance Agreement, amended in 2005, shows that Redmond owns 29.4% of the Rose Hill South Reservoir and 34% of the North Rose Hill Reservoir. The percentage used to define the contractual storage available to the City of Redmond may affect the analyses and text contained in Chapters 10 and 12. Please see the highlighted portions of the attached Interlocal Operations and Maintenance Agreement.	Table 3-5 has been updated, and associated updates in other chapters have also been made.
3	Rose Hill Supply Connection #1 Ownership Percentage. Table 3-7, Page 3-38, shows Redmond's contractual ownership of Rose Hill Supply Connection No. 1 as 42.8%. The 1997 Interlocal Operations and Maintenance Agreement, amended in 2005, shows that Redmond owns 29.4% of Rose Hill supply connection No. 1. The percentage used to define the contractual storage available to the City of Redmond may affect the analyses and text contained in Chapters 7, 10, and 12. Please see the highlighted portions of the attached Interlocal Operations and Maintenance Agreement.	Table 3-7 has been updated, and associated updates in other chapters have also been made.
4	Joint Use CIP Projects 1: Page 10-5, Section 10.2.2 refers to joint-use projects for improvements to Supply Station No. 3 and the North Rose Hill BPS. These CIP projects are not contained in Chapter 12. They are included in the Kirkland 2014 WSP as CIP numbers J1 and J2.	Chapter 12 has been updated to include other Joint Use projects that are either planned for implementation within the 10-year CIP of Redmond or resolve deficiencies that are discussed in Redmond's WSP.
5	North Rose Hill Reservoir Dead Storage: Page 10-9, Dead Storage, the City of Kirkland considers the North Rose Hill Reservoir to have 4.89 MG (35 ft) of dead storage due to high elevation customers in the 450 Zone. The North Reservoir BPS is intended to supply the 545 Zone during low Tolt system heads as described on the bottom of Page 10-4, but it is unknown how operating this BPS at very low/empty tank levels would affect the BPS and 450 Zone level of service. Further analysis is required to fully understand the effects of utilizing the dead storage component of the North Rose Hill Reservoir.	Agreed, but beyond the scope of the WSP analysis. This should be considered as part of future planning by both entities in determining additional storage facilities in the Rose Hill area.
6	Footnote Correction: Table 10-8, Page 10-17, should footnote 12 reference the North Reservoir? The volume appears correct for the North Reservoir. Please see the comments regarding contractual ownership percentages in the above comments.	Footnote has been corrected.
7	Joint-Use Projects 2: Table 12-1, Page 12-3, there is only one joint-use CIP project identified for facilities shared between Kirkland and Redmond. Please see the City of Kirkland 2014 WSP Chapter 9 which identified several proposed Joint-use Facility improvements to be considered by the Joint-Use Board.	Chapter 12 has been updated to include other Joint Use projects that are either planned for implementation within the 10-year CIP of Redmond or resolve deficiencies that are discussed in Redmond's WSP.
Sammamish Plateau Water District		

Comment No.	Comment	Response
1	The Sammamish Plateau Water boundary as shown is out of date. There have been 3 annexations in the District's Cascade View Zone that should be now included in the boundary shown. The up-to-date boundary can be found on the King County IMAP. https://gismaps.kingcounty.gov/iMap/ Turn on the Electoral Districts layer and Sewer Districts (that is where they have put Sammamish Plateau Water).	Figure has been revised per the comment.

No Comments or Response from the following:
Union Hill
City of Bellevue
Northeast Sammamish Water and Sewer
Dawn Breaker Water
Woodinville Water District

STATE OF WASHINGTON
DEPARTMENT OF HEALTH
NORTHWEST DRINKING WATER REGIONAL OPERATIONS
PO BOX 47800 MS:47822 OLYMPIA, WA 98504-7800

December 15, 2023

Lisa Rigg, Senior Engineer
City of Redmond
lrigg@redmond.gov

Subject: City of Redmond, ID #71650
King County
Water System Plan Draft
Submittal #**23-0610**

Dear Lisa Rigg:

Our files show that you submitted your draft water system plan (WSP) to this office for review and approval on June 26, 2023, with the official review period starting on June 28, 2023. Thank you for your patience as we requested additional time for our review on September 21, 2023. We have reviewed the plan and offer the following comments. These comments must be adequately addressed prior to approval of the WSP.

Description of Water System

1. Provide a Statement of Local Government Consistency from the City's Planning Department and an adoption ordinance from the King County Council.

2. Address Ecology's comments from the letter dated September 11, 2023.

3. We have reviewed Dan Cardwell's UTRC review of your WSP date 7/20/2023 and agree with comment #2. DOH also recommends adding text to address how the City will meet its Duty to serve obligations in its defined Retail Service areas and a description of its internal appeal process for Timely & Reasonable disputes.

4. Regarding Table 3-4, Pressure Reducing Valves, why is the Proposed PRV Setting (psi) column blank?

Basic Planning Data

No Comment

System Analysis

5. 7.3.1 Reliability considerations, references a 2009 Water Shortage Response Plan. Since 2009 the City of Seattle has updated their Water Shortage Response Plan. If the City of Seattle is asking customers for voluntary curtailment, how does the City respond? Do the City messages align with Seattle's? Is there value in reviewing and possibly updating the City's Water Shortage Response Plan?
6. Regarding the hydraulic profiles,
    a. Why does the City of Seattle and the City of Redmond have two differing datums?

b. The operating ranges do not appear to align with the Table of Delivery Points in the City's agreement with Cascade Water Alliance (May 1, 2008 agreement in appendix D Interlocal Agreements). Has the agreement been updated with hydraulic grade line (HGL) operating ranges that align with the hydraulic profiles provided? Please explain.

Water Use Efficiency Program (WUE) and Water Rights Assessment

7. Describe how Cascade Water Alliance's elected governing board developed the goals through a public process. Provide copies of the City of Redmond's resolution or other documentation that identifies the City's action taken on the adoption of Cascade's WUE goals. The WUE program will need new updated goals from Cascade. What is the City's process for establishing future goals with Cascade? Does the city have additional goals beyond Cascade? Please describe.

Source Protection

No Comment

Operations & Maintenance

8. The cross-connection control program summary annual summary reports indicate there are several high hazard premises tracked with RPBAs. Consider summarizing in section 11.8 the total number of high hazards, examples of types (dental office for example), and the percent compliance with annual testing of backflow prevention assembly.
9. Please include your most recent cross-connection control plan in the appendices for our review. Please update the cross-connection control program plan to include all the required elements. The 2022 cross-connection control program summary annual summary report indicates the following required elements are missing from written cross-connection control program plan. 1) Hazard Evaluation Procedures and Schedules, 2) Procedures/Schedules for Ensuring Installation of Backflow Preventers, 3) Backflow Incident Response Procedures, and 4) Public Education Program.
10. Section 11.10 Record Keeping and Reporting. Lead and Copper Rule Revisions require documentation of service line material type as part of routine operations (meter replacement for example). Has the City developed a process for collecting material type during routine operations? Please include in this section.
11. 8.4.2. Total Coliform Rule – Change to Revised Total Coliform Rule
    a. Eliminate references to the Total Coliform Rule.
       Since April 2016, water systems have been operating solely under the Revised Total Coliform Rule.
    b. Appendix G. Note that the 2020 Coliform Monitoring Plan is stored as Appendix H in Redmond's plan. Please update.
    c. <u>The City of Redmond Service Area</u>
       '20,000 Active Services' update to 33,592 active services
    d. <u>Sample Stand Locations for Routine Sampling</u>
       23. Fairwinds Sample Stands Novelty Hill Road
       Missing repeat sample descriptions
    e. <u>In the event of an Unsatisfactory Sample (Coliform Presence)</u>
       Eliminate Bob James (retired), Carol Stuckey (another position). Add Coliform Program Manager (currently Ingrid Salmon) at 253-395-6754.
12. If not already addressed, complete a *E.coli* Response Plan
    Preparing a Coliform Monitoring Plan for Large or Multiple-Source Systems (wa.gov)

Consider using an *E. coli*-Present Sample Response checklist (p.18) from the 'Preparing a Coliform Monitoring Plan'

Water Quality

13. Section 8.4.3. Surface Water Treatment Rule refers to the requirement to maintain detectable disinfectant residual. Please note that the minimum disinfectant residual of 0.2mg/L is required to be monitored every calendar day throughout the distribution system and not just at entry point. Daily disinfection residual monitoring includes the distribution sample collected at the same time and location as coliform samples. Please update the text and tables as needed.

Distribution Facilities Design and Construction Standards

14. Distribution Facilities Design and Construction Standards provides links (broken) to the City's standard specifications and design requirements. This chapter references the most recent version as October 2020. We were unable to locate the 2020 version on the website. However, we did find and review a 2019 version. It is noted that no reduced pressure backflow assembly standard detail is not included. It is also noted that the City references adoption of WDOT standards. We recognize that the standard specification and design requirements we approve in the WSP is a snapshot in time. WDOT standards for example are updated regularly.

    a. Please include a copy of the current standard specifications and design requirements in the final WSP to complete our records of what we approve.

    b. Please include the standard detail for reduced pressure backflow assembly.

Improvement Program

15. Provide description of the city's asset management program that includes the physical condition, life expectancy, and system criticality of all existing facilities.

Financial Planning

16. WAC 246-290-100 (4) (jii) (jiii) requires demonstration of a balanced budget for the plan approval period (in this case 10 years) and; a plan for collecting the revenue necessary to maintain cashflow stability to fund the capital improvement program and emergency improvements. The budget should also contain future capital reserve replacement funding that is informed by the City's Asset Management Plan.

17. We understand that the City is conducting a rate study and that this study has been delayed for reasons stated in your WSP, however, we see no reason why a summary level of annual expenses, planned capital expenditures and capital replacement reserve funding with the revenues necessary to support these expenses cannot be provided.

Miscellaneous

18. We understand that a signed SEPA Checklist and a signed Threshold Determination will be provided with the final WSP.

19. The water system must meet the consumer input process outlined in WAC 246-290-100(8). Please include documentation of a consumer meeting discussing the WSP, prior to DOH approval of the WSP.

Prior to DOH approval, the City's elected governing body must approve and adopt the WSP.

20. Please provide copies of any comments made by adjacent purveyors or other interested parties along with the City's response to those comments.

21. Is the City a member of WAWARN?

22. Please provide a copy of the existing wheeling agreement with Sammamish Plateau Water and Sewer District.

We hope that you have found these comments to be clear, constructive and helpful in the development of your final draft WSP. We ask that you submit the revised WSP on or before **March 21, 2024.** In order to expedite the review of your revised submittal, please include a cover letter summarizing how each of the above comments was addressed in the revised WSP and where each response is located (i.e., page numbers, Appendices, etc.)

Regulations establishing a schedule for fees for review of planning, engineering and construction documents have been adopted (WAC 246-290-990). Please note that we have included an invoice in the amount of **$ 5,484.00** for the review of the Water System Plan. This fee covers our cost for review of the initial submittal, plus the review of one revised document. Please remit your complete payment in the form of a check or money order within thirty days of the date of this letter to: **DOH, Revenue Section, and P.O. Box 1099, Olympia, WA 98507-1099.**

Thank you again for submitting your plan for our review. If you have any comments or questions concerning our review, please contact Crystal on the planning subjects or contact Brietta about the engineering and water quality questions.

Sincerely,





Crystal Nuño
Regional Planner
253-395-6769

Brietta Carter, PE
Regional Engineer
564-999-3355

Enclosure: Invoice

Cc: Dan Cardwell, King County UTRC
Seattle King County Health
Ingrid Salmon, DOH
Jeff Hansen, P.E., HDR, Inc.

STATE OF WASHINGTON
Department of Health
OFFICE OF DRINKING WATER
Project And Plan Review

INVOICE

REDMOND, CITY OF
REDMOND WATER SYSTEM CITY OF
15670 NE 85TH ST
REDMOND, WA 98052

WS ID: 71650
Invoice No: 54337
Invoice Date: 12/18/2023
Due Date: 01/17/2024

WS NAME: REDMOND WATER SYSTEM CITY OF

PROJECT AND PLAN REVIEW SUBMITAL#: 23-0610

DESCRIPTION	QTY	COST	AMOUNT
Water System Plan	1	x $5484.00	$5484.00
		Total Amount Due	**$5484.00**

Comments: Submittal #23-0610- Invoiced with Review Letter

1. ***Pay online*** with a credit card, debit card, or electronic check (ACH) using the Environmental Health Payment System at https://secureaccess.wa.gov/.
2. For billing questions, please contact Northwest Drinking Water Regional Operations at (253) 395-6750 or via email DW.NWRO.WSProjects@doh.wa.gov.
3. This invoice is issued in accordance with WAC 246-290-990(3)(c)(iii).
4. For persons with disabilities, this document is available on request in other formats. To submit a request, please call 711 Washington Relay Service.
5. If paying by check:
   Make checks payable to Department of Health, Federal ID #91-1444603.

Please return the bottom portion of this invoice with your check.

Invoice Number: 54337
Invoice Amount: $5484.00
Owner Number: 004821
WS Name: REDMOND WATER SYSTEM CITY OF

Invoice Date: 12/18/2023
Invoice Due Date: 01/17/2024
Region: NW
WS ID: 71650

Reference: PROJECT AND PLAN REVIEW FEES

Please remit to:
ACCOUNTS RECEIVABLE
DOH PROJECT AND PLAN REVIEW FEES
PO BOX 1099
OLYMPIA, WA 98507-1099

BUA1059724010O PP000 [illegible] 0548400

STATE OF WASHINGTON
DEPARTMENT OF ECOLOGY
Northwest Region Office
PO Box 330316, Shoreline, WA 98133-9716 • 206-594-0000

September 11, 2023

City of Redmond
c/o Lisa Rigg
PO Box 97010
Redmond, WA 98073

Email: lrigg@redmond.gov

RE: City of Redmond (Water System ID #71650B)
2023 Water System Plan Comment Letter

Dear Lisa Rigg:

Thank you for the opportunity to review the City of Redmond (Redmond) Water System Plan (WSP), dated June 2023 and received on July 10, 2023. Consistent with the Memorandum of Understanding between the Department of Health (DOH) and Department of Ecology (Ecology), regarding joint review and approval of WSPs, this letter is being sent to your office with Ecology's comments. Specific elements of the WSP review included the Water Rights Self-Assessment as well as additional water rights documentation, including Ecology's water right files and previous Redmond WSPs and project reports, as applicable.

Ecology identified several issues during review of the WSP and supplemental documentation. The issues identified are listed below and discussed in the Advisory Comments. Please address the following items prior to finalizing the WSP.

- Interpretation of Additive/Non-additive Water Rights
- Potential for Abandonment
- Decommissioning of Wells

Advisory Comments

Interpretation of Additive/Non-additive Water Rights

In the water rights documentation presented in the Water Rights Self-Assessment (Table 7-2), and described in Section 7 of the WSP, dated June 2023, an incorrect relationship between those water rights which are additive and those which are non-additive, historically referred to as, "supplemental," was identified. The designation of additive/non-additive within a portfolio of water rights is critical.

Additive rights increase the capacity of the water system, whereas non-additive rights typically add operational flexibility between well fields or wells. Please be advised that often the

additive/non-additive relationship is expressed in documents preceding the water right certificate. In Redmond's Water Right Self-Assessment on Table 7-2, there appears to be a misinterpretation of the "supplemental" rights prescribed in Certificate 6675-A. While Redmond interprets the annual quantity (Qa) of 400 ac-ft/yr to be primary and available for additive use, the Report of Examination (ROE) for the water right states that at the time of issuance, Redmond was to have primary rights no greater than 2,420 ac-ft/yr to serve the projected population. Ecology's interpretation is that since the total annual quantity held by Redmond at the time of permit issuance met this number, the permit was issued as completely non-additive. The correct relationship between Redmond's portfolio of water rights appears to be documented in the Report of Examination for Certificate 6675-A. While not on the certificate, the prescribed relationship on the ROE is considered binding.

Please see Table 1, under General Information below, for what we understand to be the correct relationships between Redmond's portfolio of water rights. After considering the discrepancy with water right certificate 6675-A, it appears that Redmond's other accounting of their allocated water rights agree with Ecology's analysis.

Potential for Abandonment

Although municipal rights are not subject to relinquishment, a water right can be "abandoned" through intentional non-use. Examples of this could be the decommissioning of the well(s) associated with the water right(s), or changes in property ownership and other development of the land so that the well(s), diversion(s), or other infrastructure associated with the water right are no longer accessible or operable.

Redmond should determine its present and future need for all water rights within its portfolio to ensure that rights are protected from potential risks due to abandonment. Redmond makes clear in the WSP that they are aware of the issue of water rights not being fully utilized to certificated maximum annual and instantaneous quantities due to problems with their wells, while also acknowledging a potential need to seek approval with Ecology for changes to points of withdrawal so that groundwater may be pumped up to full utilization of their water rights. Absent actual beneficial use, discussion and documentation of planned use of municipal water rights in current and future WSPs, along with maintaining sources and infrastructure, is an indicator that a water system has no intent to abandon a water right.

Decommissioning of Wells

In Section 7 of the WSP, Redmond indicates that Well #4 (Water Right Certificate G1-22608) has historically had limited production capacity due to screen clogging and water quality issues, and that this has prevented full utilization of the associated water right. Redmond further states that they have considered drilling a replacement well and submitting a Showing of Compliance to Ecology to remedy this problematic well. Please be advised that the replacement well must fall within the location described in the water right's most recent public notice for a Showing of Compliance to be lawful, and we would also like to remind Redmond of the necessity to decommission Well #4 if that occurs. This is required of any unused or abandoned well.

General Information

Water Right Summary

In preparing this comment letter, Ecology reviewed specific elements of the Redmond WSP, including the Water Rights Self-Assessment (Table 7-2), as well as additional water rights documentation.

Please see Table 1 below for a comprehensive list of City of Redmond water rights and their respective relationships and limitations as understood by Ecology. Please note that the water rights summarized here do not fully agree with the City of Redmond Water Right Self-Assessment (Table 7-2), and in Section 7 of the WSP, dated June 2023.

Table 1. Existing Water Rights

Water Right	Priority Date	Source Name	Instantaneous Rate (gpm)		Annual Quantity (ac-ft/yr)	
			Additive	Non-Additive	Additive	Non-Additive
1313-A	7/23/1951	Well 1	200		224	
3420-A	7/25/1958	Well 2	500		381	224
6675-A	11/27/1968	Well 3	480			400
G1-00130C	2/3/1972	Well 1	700		1,120	
G1-22608C	11/5/1975	Well 4	800		1,280	
G1-24204	11/17/1982	Well 5	1,000		1,600	
		TOTALS:	3, 680		4,605	624

gpm = Gallons per Minute; ac-ft/yr = Acre-feet per Year

The total instantaneous rate and annual quantities under all rights is limited to 3,680 gpm and 4,605 ac-ft/yr, respectively.

For a more-detailed, prior review of the City of Redmond's water rights as understood by Ecology, please see Ecology's 2004 letter to the City of Redmond included as an enclosure with this comment letter.

Future Demand

The Redmond WSP presents use and production data for the years 2019-2021. At of the end of 2021, the approximate number of connections served by Redmond totaled 19,581. Each connection served, on average, approximately two equivalent residential units (ERUs). The average number of ERUs served in 2019-2021 was 39,529. The per-ERU water use presented in the Redmond WSP for 2019-2021 was 157 gallons per day.

Taking the product of total ERUs and per-ERU water use over the course of a year, we estimate that on average, about 6,950 ac-ft/yr of water was used in this period. Redmond states that 40% of the water supply comes from their own wells, while the remaining 60% comes from Cascade Water Alliance. Based on this understanding, we conclude that approximately 2,780 ac-ft/yr or

60% of Redmond's available water rights are being utilized. Ecology's above analysis indicates that Redmond has 4,605 ac-ft/yr of groundwater rights available for use, while Redmond states in the Water Rights Self-Assessment (Table 7-2) that 46,249 ac-ft/yr are presently available from Cascade Water Alliance.

Redmond did not submit a projection for full buildout but did provide forecasts for projected water use and production capability on 10-year (2033) and 20-year (2043) timelines in the Water Rights Self-Assessment. Redmond estimates that there will be an excess capacity of 40,711 ac-ft/yr on the 10-year timeline and an excess capacity of 39,251 ac-ft/yr on the 20-year timeline. Ecology understands that Redmond plans to import most of its future water from the Cascade Water Alliance. Based on the above, capacity **DOES NOT** appear to be an issue of concern for the water system.

Service Area

RCW 90.03.386(2) requires that water systems be in compliance with the terms of their WSP and that any alteration of the place of use not be inconsistent with any comprehensive plans or development regulations. An evaluation of any such change should be undertaken if a future expansion of the City of Redmond service area is planned.

Please contact me with any questions you may have by phone at (206) 305-1720 or by email at mike.shaljian@ecy.wa.gov.

Sincerely,



Mike Shaljian
Hydrogeologist
Water Resources Program

Enclosures: 2004 City of Redmond Ecology Water Rights Analysis Letter

ecc: Brietta Carter, Department of Health
Krista Chavez, Department of Health
Noel Philip, Department of Ecology

STATE OF WASHINGTON
DEPARTMENT OF ECOLOGY
P.O. Box 47600 * Olympia, Washington 98504-7600
(360) 407-6000 * TDD Only (Hearing Impaired) (360) 407-6006

August 18, 2004



Jeff Thompson
City of Redmond
Public Works Department
15965 NE 85th Street
P.O. Box 97010
Redmond, WA 98073-9710

Dear Mr. Thompson:

Re: Cursory review of ground water rights held by the City of Redmond

During our meeting on June 22, 2004, you and other City of Redmond representatives expressed interest in having Ecology perform a review of the ground water rights held by the City. The review is to provide some clarity for the City in assessing its water rights. Some of the rights held by the City have annual quantities that are "supplemental" in nature, but this is only expressed in the permits or reports of examination, not on the certificates. In some cases the annual quantity is both primary and supplemental. To further the uncertainty, some subsequent reports of examination incorrectly quantify existing rights held by the City. Other questions posed by the City regarded water availability in the basin and existing water rights in Seidel Creek.

Regarding availability of water, WAC 173-508 establishes that all lakes and streams contributing to the Lake Washington drainage, excluding the Cedar River, are closed to further consumptive appropriation.

The following information is the result of a cursory review by Ecology. The evaluation of the water rights is tentative and does not represent an official determination by Ecology.

Regarding water rights in Seidel Creek not held by Redmond, Ecology's water rights database shows one claim and one surface water right. The claim is for irrigation of one acre, and the surface water certificate has a priority date of 1941 and is for 0.01 cubic feet per second (cfs) or about 4.5 gallons per minute (gpm) and 20 acre-feet per year (afy).

The following table lists the water rights currently and historically held by the City of Redmond.

Water Right Number	Priority Date	Qi/Qa Shown on Final Document	Primary/ Supplemental/ Both	Supplemental to	Present Source/ Well Number	Comments
Surface Water Cert. 249	4-5-1927	5 cfs / No Qa assigned	Primary	--	Seidel Creek	Water right has not been used since 1950's
Surface Water Cert. 250	4-22-1927	Storage certificate for 33 acre-feet	--	--	Seidel Creek	Dam still in place per City of Redmond
Cert. 1313-A	7-23-1951	200 gpm, 224 afy	Primary	--	Well 1	
Cert. 3420-A	7-25-1958	500 gpm, 605 afy	Both, (381 primary, 224 supp.)	Cert. 1313-A, both rights total 605 afy	Well 2	Does not mention existing SW rights
Cert. 6675-A	11-27-1968	480 gpm, 400 afy	Supplemental	All prior rights	Well 3	Does mention SW rights
Permit 10694	2-10-1971	2,000 gpm, 3,200 afy	Both, (962 primary, 2,238 supp.)	All prior rights	--	Permit cancelled
Cert. G1-00130C	2-3-1972	700 gpm, 1120 afy	Both, (pri. And supp. quantities given only for permitted quantity)	All prior rights (including Permit 10694)	Well 1	Permit issued for 1,600 afy (400 prim., 1,200 supp.)
Cert. G1-22608C	11-5-1975	800 gpm, 1,280 afy	Primary	--	Well 4	ROE incorrectly totals all rights held by Redmond
Cert. G1-24202C	11-17-1982	1,000 gpm, 1,600 afy	Primary	--	Well 5	ROE incorrectly totals all rights held by Redmond

It should be noted that the "supplemental" nature of the rights listed above was not stated on the ground water certificates. It was typically found within the report of examination or within the permit that issued prior to issuance of the certificate. Case law (Schuh, 1983 and Kison, 2001) has shown that a "water right" consists of all documents found within the water right record.

There is no difference of opinion with the total instantaneous quantity that the City of Redmond may withdraw from its ground water sources – 3,680 gpm. The key question posed by the City of Redmond regards the City's total primary annual ground water allocation, specifically quantities appropriated under Certificate 6675-A and Certificate G1-00130C.

Certificate 6675-A

The report of examination and permit associated with Certificate 6675-A both clearly state that the water right is supplemental to existing rights. The report of examination notes that other rights held by Redmond include: Certificates 249, 250 (storage only), 1313-A, and 3420-A. The report goes on to state that continuous diversion at a rate of 5 cfs under Certificate 249 would result in an annual diversion of 3,600 afy. It also states that Certificates 1313-A and 3420-A have combined rights for 605 afy annual diversion. The permit writer attempts to quantify all rights held by the City of Redmond by stating, "Issued as a supplemental supply, the total annual water use under all rights shall not exceed 2,420 acre-feet."

The interpretation is that the author of the report of examination intended for Redmond to have total primary rights no greater than 2,420 afy to serve the projected population. Since the total annual quantity held by the City met this number, the permit issued as completely supplemental. Based on the intent of the report writer, **Certificate 6675-A is considered supplemental (or non-additive to existing rights).**

Ecology's opinion regarding supplemental rights is, in specific cases, if a primary right is cancelled or otherwise revoked, the supplemental right can become primary in equal or lesser quantities. Presently, none of the four certificates mentioned in the report of examination have been diminished through action by Ecology. Consequently, all 400 afy allocated under Certificate 6675-A is considered supplemental. If some action reduces the total 2,420 afy that may be taken under Certificates 249, 250 (storage only), 1313-A, and 3420-A, then an equal quantity under 6675-A could become primary.

Certificate G1-00130C

The report of examination and permit associated with Certificate G1-00130C both clearly state that the water right is partially supplemental to existing rights. Both documents state, "Issued as a primary right for 400 acre-feet per year and as a supplemental supply to existing rights for 1200 acre-feet per year. The total withdrawal or diversion under all rights is not to exceed 5600 acre-feet per year."

The list of water rights given in the report of examination includes:

		Primary	Supplemental
Certificate 249	-	3,600 afy	
Certificate 250	-	33 afy*	
Certificate 1313	-	224 afy	
Certificate 3420	-	381 afy	224 afy
Certificate 6675	-	--	400 afy
Permit 10694	-	962 afy	1,238 afy
Total		5,200	2,862

*The report writer mistakenly included 33 afy as a primary right.

The report writer recognized that 5,600 afy was the quantity needed to serve the projected population, so the permit was issued with 400 afy primary and 1,200 afy supplemental. The certificate issued for 1,120 afy with no mention of a portion of the right being supplemental. The reduced quantity in the certificate appears to be the result of production capability of the well.

After issuance of Certificate G1-00130C, Permit 10694 was cancelled (the City of Redmond opted to have the permit cancel due to water quality problems). The report writer intended for all existing water rights to total 5,600 afy primary annual quantity. If the 962 afy authorized in Permit 10694 is taken away from the total 5,200 afy calculated by the report writer, the City of Redmond is left with 4,238 afy, which is 1,362 afy less than the total intended by the report writer. Since this quantity exceeds the 1,120 afy authorized in the certificate, **the entire certificated quantity of 1,120 afy should be considered primary.**

Conclusions

In consideration of the above, Ecology's tentative interpretation of the water right record is that the City of Redmond holds primary rights for 4,605 afy of ground water withdrawal. This quantity includes the total 1,120 afy under Certificate G1-00130C, which originally was partially supplemental. Certificate 6675-A is still considered a supplemental right and can only become primary if the total quantity allocated under Certificates 249, 1313-A, and 3420-A is 2,420 afy or less. If the total sum quantity is below 2,020 afy, then the entire 400 afy under Certificate 6675 should become primary.

The breakdown of the rights is shown below:

	Qi	Qa	Supplemental Qa
Surface Water Cert. 249	5 cfs (2244 gpm)	Unquantified	
Surface Water Cert. 250	--	See table	--
Ground Water Cert. 1313-A	200 gpm	224 afy	--
Ground Water Cert. 3420-A	500 gpm	381 afy	224
Ground Water Cert. 6675-A	480 gpm	--	400
Ground Water Cert. G1-00130C	700 gpm	1,120 afy	--
Ground Water Cert. G1-22608C	800 gpm	1,280 afy	--
Ground Water Cert. G1-24202C	1,000 gpm	1,600 afy	--
Total Surface Water	**5 cfs**	**Unquantified**	
Total Ground Water	**3,680 gpm**	**4,605 afy**	**624 afy**

Surface Water Certificate

Regarding Surface Water Cert. 249, it is clear in the record that the right has not been beneficially used in many years, most likely since the 1950's. If the City of Redmond attempts to change this water right, a tentative extent and validity determination would be made to determine the amount that is eligible to change. Pursuant to RCW 90.03.570, only the perfected portion of a municipal surface water right may be changed or transferred at this time.

At some point, we would like to make a site visit to the Seidel Creek dam and diversion structure. Please let me know a time that would be convenient in the coming months.

Qualifying Statement

The quantities shown in this letter are the result of a cursory review of Redmond's water rights and in no way represent an official determination by the Department of Ecology. The water right documents reviewed for this evaluation may not represent an actual water right. A water right document may be of no value due to non-use of water, unauthorized use, or lack of perfection. The Department of Ecology cannot guarantee the validity of water right claims, permits, or certificates. The validity of water rights can only be determined in Superior Court. You are encouraged to verify and document that historic, current, and future uses are consistent with the water right document as described.

Please contact me with any questions or comments you may have at (425) 649-7186.

Sincerely,

Jay Cook

Jay Cook
Water Resources Program

cc: Jerry Louthain, Peter Fraley

King County
Utilities Technical Review Committee
Department of Local Services
201 S Jackson Street
KSC-LS-0815
Seattle, WA 98104
www.kingcounty.gov

City of Redmond, 2023 Water System Plan (DRAFT)

The City of Redmond submitted a draft Water System Plan ("Plan") for review by the King County Utilities Technical Review Committee (UTRC) on June 26, 2023.

Staff has reviewed the Plan for local statutory requirements and impacts on service to residents in the unincorporated county.

On July 19, 2023, the UTRC held a meeting to review the plan and provide comments to the applicant on the draft Plan. The UTRC requests the following changes and/or clarifications:

General Comments

1) It is not clear if the City allows for permit exempt wells within its Retail Service Area. King County Code 13.24.140 Water facilities in urban areas-interim alternative water service, allows for a permit exempt well if connection to the respective Group A system is not timely or reasonable conditioned upon a requirement for a certificate of future connection. While the District may not expect a situation where the timely and reasonable service provisions would not be met, it would be appropriate to reflect the County's requirement in the Plan document.

2) The draft Plan does not appear to address how the City will meet its duty to service (Municipal Water Law), defines Timely and Reasonable Water Service, or identify an appropriate appeal process for properties owners who believe the conditions of service is not timely or reasonable. Please include text to address these topics.

3) Has the District considered the impacts of climate change on both water demand and supply? It would be appropriate to include a discussion of how climate change me affect water demand and supply. An example in another water purveyor's plan referenced the change in rainfall and impact on surface water source.

Comments on Specific Sections of the Draft Plan

4) Section 1.4. Local Government Coordination. The second bullet references "King County Planning and Regulation Division and Utility Technical Review Committee" to provide determination of consistency with King County planning policies. This reference should be corrected to reference "King County Department of Local Services – Permitting, Utilities Technical Review Committee." It should also be noted that per King County Code 13.24 the water system plan is required to be approved by the King County Council.

5) Figure 2-1. Retail Service Area and Adjacent Purveyors. It is difficult to identify the Retail Service Area as the UGA and City Limits overlap with it. Can the map key be revised to identify the Retail Service Area more clearly in conjunction with other map attributes?

6) Section 2.2.1. Novelty Hill Service Area. While Figure 2-1 shows that the Novelty Hill Service Area is not contiguous/detached from other City service areas, the text does not explain why the City was the most appropriate water purveyor to provide water service to the residential developments in unincorporated King County. It would be beneficial to clarify when and why the City expanded its

service area to service these developments. This explanation may justify the irregular service area boundary.

7) Section 2.3.1. 2016 King County Comprehensive Plan. The text provides a detailed description of the County's Comprehensive Plan policies and identifies adopted land use designations on Figure 2-3., however, it is appropriate to also provide the acreage associated with each land use designation and identify the development status of the acreage (i.e., vacant, developed, underdeveloped).

8) Section 2.3.1. 2016 King County Comprehensive Plan. In review of Figure 2-1, it appears the City's service area encompasses unincorporated areas beyond the Novelty Hill Service area; however, the text doesn't appear to acknowledge this. While there is reference to the UGA, does the City's service area include any unincorporated Rural areas? It appears that Figure 2-3 shows a small portion of the service area being designated Rural area. Please clarify.

9) Section 2.3.1 2016 King County Comprehensive Plan/Section 2.3.2 City of Redmond Comprehensive Plan. The Plan should reference the updated 2021 King County Countywide Planning Policies (CPPs) and that the local jurisdictions' comprehensive plans are required to be updated by the end of 2024. Particularly, the Plan should recognize that the updated CPPs have been adopted with growth targets (2019 – 2044) that are different than the growth targets referenced in Chapter 4.

10) Figure 2-4 Redmond Comprehensive Land Use Plan. It is difficult to identify the Retail Service Area as the UGA and City Limits overlap with it. Can the map key be revised to identify the Retail Service Area more clearly in conjunction with other map attributes?

11) Section 2.4.1 Retail Service Area Boundaries. The text states that the City doesn't anticipate any major changes to its retail service area in the immediate future, however, the service area may be expanded to provide service to areas annexed into the City. While Figure 2-1 indicates that the unincorporated UGA adjacent to the City is not within the City's Retail Service Area, adding text to this section would clarify this situation. The text should also acknowledge that if the City expands its Retail Service Area, the water system plan would need to be amended to modify Figure 2-1 and update other appropriate text.

12) Section 2.4.1 Retail Service Area Boundaries. The text references an area that the City provides water service to that is not within and will not be included in its service area. The text references Figure 2-1 to identify the location of this area, however, in review of the figure, it doesn't appear this area is identified. The text also references discussions with Union Hill Water District and Woodinville Water District for future service discussions. Is there a timeframe in which this issue will be resolved? Please clarify?

13) Section 4. Planning Data and Demand Forecast. The text states that Redmond retails water in two areas; the City Service Area and the Novelty Hill Service Area, however, in review of Figure 2-1, it appears that there are other unincorporated areas within the City's Retail Service Area, including the unincorporated area north of NE 116th in the proximately of 184th Ave. NE. Please clarify.

14) Section 4.1. Demographics – Historical and Projected. The text refers the reader to Section 3.3.1 for more demographic information related to the Novelty Hill Service Area and application of the demand forecast. This information is not provided in a Section 3.3.1. Please correct the citation or add the referenced information.

15) Section 4.1 Demographics – Historical and Projected. This section provides historical and projected demographic statistics only for the City Service Area as it states the Novelty Service Area is assumed build-out. While this may be an accurate assumption, this chapter should acknowledge the existing and future population for this unincorporated area and identify the existing and projected population

for the City's entire retail service area. Additionally, this chapter should substantiate the residential and employment statistics cited in Section 1.1 – System Overview

16) Section 4.1. Demographics – Historical and Projected. Please recognize the 2019 – 2044 targets provided in the updated King County CPPs and referenced in comment # 9 above.

17) Section 4.2.2. Customer Categories, Connections, and Consumption. This section provides detailed information for the City Service Area and Novelty Service Area, however, the text does not provide statistics which represents all the City customers, such as total water consumption. Information in the plan should include statistics that represents the water service in total. Please update as appropriate.

18) Section 7.4 Evaluation of Reclaimed Water Opportunities. While the text provides detailed information on reclaimed water opportunities, please submit a completed the King County Water Reclamation Evaluation Checklist.

19) Section 12.2 Planned Projects and Costs. The text states that there aren't any cost estimates for projects beyond 2028, however, in review of Table 12-1 (Capital Improvement Program), dollar amounts are provided for some projects beyond 2028. Why are there not cost estimates for projects beyond 2028 as these would provide a general indication of cost? And for those Long-term projects that do have costs identified, it would be appropriate to explain why they do have cost estimates.

20) Section 13. Financial Program. The text refers readers to Appendix L to review the 2017 water utility rate study. This reference is not consistent with the appendixes attached to the draft plan; the 2017 water utility rate study is labeled as Appendix M.

21) Section 13. Financial Program. While the text indicates that the City has a record of funding necessary capital projects, the financial program does not include the minimum information as required by WAC 246-290-100(4)(j) to demonstrate financial viability. The required information includes 1) a summary of past income and expenses, 2) a balanced operational budget for the plan approval period, 3) a plan for collecting the revenue necessary to maintain cash flow stability and to fund the capital improvement program and emergency improvements, and 4) an evaluation that has considered the affordability of water rates and the feasibility of adopting and implementing a rate structure that encourages water demand efficiency.

22) Appendix B – SEPA Documentation. As noted in the draft plan the environmental review (SEPA) is pending. The SEPA checklist/determination is required to be submitted with the final plan.

The King County UTRC thanks you for the opportunity to review and comment. Please contact me at (206)263-3733 or dcardwell@kingcounty.gov if you have any questions.

Dan Cardwell 7/20/23

Dan Cardwell, Chair of the King County Utility Technical Review Committee Date

Appendix B
SEPA Documentation

STATE ENVIRONMENTAL POLICY ACT (SEPA) DETERMINATION OF NON-SIGNIFICANCE

For more information about this project visit www.redmond.gov/landuseapps

PROJECT INFORMATION

PROJECT NAME: Water System Plan Update

SEPA FILE NUMBER: SEPA-2023-00122

PROJECT DESCRIPTION:
The Water System Plan Update (WSP Update) is a non-project action that identifies capital improvement projects proposed to be funded and constructed over the next 10 years. Additional information on long-range needs and projects is provided beyond10 years.

PROJECT LOCATION: Citywide

SITE ADDRESS: 15670 NE 85TH ST
REDMOND, WA 98052

APPLICANT: Anne Dettelbach
Anne Dettelbach

LEAD AGENCY: City of Redmond

The lead agency for this proposal has determined that the requirements of environmental analysis, protection, and mitigation measures have been adequately addressed through the City's regulations and Comprehensive Plan together with applicable State and Federal laws.

Additionally, the lead agency has determined that the proposal does not have a probable significant adverse impact on the environment as described under SEPA.

An Environmental Impact Statement (EIS) is not required under RCW 43.21C.030(2)(c). This decision was made after review of a completed environmental checklist and other information on file with the lead agency. **This information is available to the public on request.**

CITY CONTACT INFORMATION

PROJECT PLANNER NAME: Cathy Beam
PHONE NUMBER: 425-556-2429
EMAIL: cbeam@redmond.gov

IMPORTANT DATES

COMMENT PERIOD

Depending upon the proposal, a comment period may not be required. An **"X"** is placed next to the applicable comment period provision.

There is no comment period for this DNS. Please see below for appeal provisions.

'X' This DNS is issued under WAC 197-11-340(2), and the lead agency will not make a decision on this proposal for 14 days from the date below. Comments can be submitted to the Project Planner, via phone, fax (425)556-2400, email or in person at the Development Services Center located at 15670 NE 85th Street, Redmond, WA 98052. **Comments must be submitted by 08/15/2023.**

APPEAL PERIOD

You may appeal this determination to the City of Redmond Office of the City Clerk, Redmond City Hall, 15670 NE 85th Street, P.O. Box 97010, Redmond, WA 98073-9710, **no later than 5:00 p.m. on 08/29/2023**, by submitting a completed City of Redmond Appeal Application Form available on the City's website at www.redmond.gov or at City Hall. You should be prepared to make specific factual objections.

DATE OF DNS ISSUANCE: August 1, 2023

For more information about the project or SEPA procedures, please contact the project planner.

RESPONSIBLE OFFICIAL: Carol V. Helland
Planning Director

SIGNATURE: Carol V Helland

RESPONSIBLE OFFICIAL: Aaron Bert
Public Works Director

SIGNATURE:

Address: 15670 NE 85th Street Redmond, WA 98052

CITY OF REDMOND

ENVIRONMENTAL CHECKLIST
NON-PROJECT ACTION

(*Revised May 2018*)

Purpose of the Checklist:

The State Environmental Policy Act (SEPA), chapter 43.21C RCW, requires all governmental agencies to consider the environmental impacts of a proposal before making decisions. An environmental impact statement (EIS) must be prepared for all proposals with probable significant adverse impacts on the quality of the environment. The purpose of this checklist is to provide information to help you and the City of Redmond identify impacts from your proposal (and to reduce or avoid impacts from the proposal, if it can be done) and to help the agency decide whether an EIS is required.

Instructions for Applicants:

This environmental checklist asks you to describe some basic information about your proposal. Governmental agencies use this checklist to determine whether the environmental impacts of your proposal are significant, requiring preparation of an EIS. Answer the questions briefly, with the most precise information known, or give the best description you can.

You must answer each question accurately and carefully, to the best of your knowledge. In most cases, you should be able to answer the questions from your own observations or project plans without the need to hire experts. If you really do not know the answer, or if a question does not apply to your proposal, write "do not know" or "does not apply" and indicate the reason why the question "does not apply". It is not adequate to submit responses such as "N/A" or "does not apply"; without providing a reason why the specific section does not relate or cause an impact. Complete answers to the questions now may avoid unnecessary delays later. If you need more space to write answers attach them and reference the question number.

Some questions ask about governmental regulations, such as zoning, shoreline, and landmark designations. Answer these questions if you can. If you have problems, the City can assist you.

The checklist questions apply to all parts of your proposal, even if you plan to do them over a period of time or on different parcels of land. Attach any additional information that will help describe your proposal or its environmental effects. When you submit this checklist the City may ask you to explain your answers or provide additional information reasonably related to determining if there may be significant adverse impact.

Review Planner Name: CBeam

Date of Review: 7/10/2023

To Be Completed By Applicant	Evaluation for Agency Use Only
A. BACKGROUND	
1. Name of proposed project, if applicable: Water System Plan Update (2023)	CB
2. Name of applicant: Lisa Rigg, City of Redmond	CB
3. Address and phone number of applicant and contact person: 15670 NE 85th St Redmond, WA 98052 425-556-2295	CB
4. Date checklist prepared: June 20, 2023	CB
5. Agency requesting checklist: City of Redmond WA State Department of Health	CB
6. Give an accurate, brief description of the proposal's scope and nature: i. Acreage of the site: NA	CB
ii. Number of dwelling units/ buildings to be constructed: NA	CB
iii. Square footage of dwelling units/ buildings being added: NA	CB
iv. Square footage of pavement being added: NA	CB
v. Use or principal activity: NA	CB
vi. Other information: NA	CB

To Be Completed By Applicant	Evaluation for Agency Use Only
7. Proposed timing or schedule (including phasing, if applicable): The Water System Plan Update (WSP Update) is a non-project action that identifies capital improvement projects proposed to be funded and constructed over the next 10 years. Additional information on long-range needs and projects is provided beyond10 years. The WSP is updated every 10 years. A separate SEPA review will be completed prior to actual implementation and construction of individual projects (except those that are exempt from SEPA review).	CB
8. Do you have any plans for future additions, expansion, or further activity related to or connected with this proposal? ☑ Yes ☐ No If yes, explain. A WSP Update will be required in the future (approximately every 10 years). At that time, projects that are beyond the 10-year horizon will be updated.	CB
9. List any environmental information you know about that has been prepared or will be prepared directly related to this proposal. City of Redmond is preparing an EIS related to the Comprehensive Plan update, including related population growth projections. The final EIS will be completed after the draft Water System Plan is done. Preliminary numbers for the preferred growth alternative have been incorporated into the draft Water System Plan.	CB
10. Do you know whether applications are pending for governmental approvals of other proposals directly affecting the property covered by your proposal? ☐ Yes ☑ No If yes, explain. This application is not related to a specific property. NOTE: Development that occurs within the City's water service area and needing water service will require local government approval.	CB

To Be Completed By Applicant	Evaluation for Agency Use Only
11. List any government approvals or permits that will be needed for your proposal, if known.	
The Redmond City Council must review and adopt the WSP Update. WA Department of Health must review and approve the WSP Update. King County Council must review and adopt the WSP Update.	CB - This requires a Comprehensive Plan Amendment which is a Type VI process.
12. Give brief, complete description of your proposal, including the proposed uses and the size of the project and site. There are several questions later in this checklist that ask you to describe certain aspects of your proposal. You do not need to repeat those answers on this page.	
The City of Redmond WSP discusses expected growth, water system facilities, water conservation, operation and maintenance, recommended improvements, and financial planning to meet current and future municipal water needs in Redmond's water service area. The proposed projects outlined in the WSP Update will improve the City's ability to provide a sufficient quantity of water meeting state and federal requirements for health and public safety. Most of these are projects to upgrade or expand the local water pipe system that delivers water to City customers. Other distribution system projects are included.	CB
13. Location of the proposal. Give sufficient information for a person to understand the precise location of your proposed project, including a street address, if any, and section, township, and range, if known. If a proposal would occur over a range of area, provide the range or boundaries of the site(s). Provide a legal description, site plan, vicinity map, and topographic map, if reasonably available. While you should submit any plans required by the agency, you are not required to duplicate maps or detailed plans submitted with any permit applications related to this checklist	
The WSP Update covers areas within City limits, as well as the Novelty Hill water service area located to the northeast of the City. Maps of these areas are included in the WSP Update.	CB

To Be Completed By Applicant	Evaluation for Agency Use Only
B. SUPPLEMENTAL	
Because these questions are very general, it may be helpful to read them in conjunction with the list of the elements of the environment.	
When answering these questions, be aware of the extent the proposal or the types of activities likely to result from the proposal, would affect the item at a greater intensity or at a faster rate than if the proposal were not implemented. Respond briefly and in general terms.	
1. How would the proposal be likely to increase discharge to water; emissions to air; production, storage, or release of toxic or hazardous substances; or production of noise?	
Adoption of the WSP Update itself is not anticipated to increase any of these to an appreciable extent. Individual capital improvement projects described in the Update will submit specific SEPA checklists (unless exempt) providing site-specific, detailed information when applying for permits.	CB - Not likely to increase.
Proposed measures to avoid or reduce such increases are:	
Follow proper construction practices, along with standard erosion and sediment control measures during construction. Contain any pumps within structures (to control noise levels). Continue to use best management practices for storage and use of chemicals or hazardous substances.	CB
2. How would the proposal be likely to affect plants, animals, fish, or marine life?	
The WSP update itself will not affect plants, animals, fish or marine life. The projects listed in the document are, primarily, found within the right-of-way and underground in nature and therefore will not come in contact with the resources listed above. Construction sites that impact vegetation will be revegetated in accordance with applicable permits. Some projects may require boring under a stream. Individual project SEPAs will address.	CB - Not likely to affect.
Proposed measures to protect or conserve plants, animals, fish or marine life are:	
Projects described in the WSP Update will be designed and implemented in accordance with permits issued for the site-specific activities.	CB

To Be Completed By Applicant	Evaluation for Agency Use Only
3. How would the proposal be likely to deplete energy or natural resources?	
Operation of the City's water system requires pumping of groundwater from the City's wells and use of water from watersheds managed by Seattle Public Utilities and contracted with Cascade Water Alliance. Water consumption is projected to grow from a current level of 7+ million gallons per day to approximately 10 million gallons per day in 2043 (20-year projection). All water used now or in the future will be delivered under Redmond's existing water rights or water supply contracts.	CB - Not likely to deplete.
Proposed measures to protect or conserve energy and natural resources are:	
Redmond participates in a regional water conservation program administered by Cascade Water Alliance. Conservation goals are achieved through: classroom and community education, soil and water stewardship program, participation in Fix-a-Leak week, rebates for ENERGY STAR certified fixtures, other free water efficient fixtures, irrigation efficiency audits, toilet leak prevention testing, system leak detection and repair, and other programmatic measures. Redmond has regulations in place for the Critical Aquifer Recharge Area to protect groundwater quality.	CB
4. How would the proposal be likely to use or affect environmentally sensitive areas or areas designated (or eligible or under study) for governmental protection; such as parks, wilderness, wild and scenic rivers, threatened or endangered species habitat, historic or cultural sites, wetlands, floodplains, or prime farmlands?	
No changes are proposed under this plan for the use of sensitive areas or areas designated for governmental protection within Redmond. The Water System Plan Update outlines actions taken by the City to actively protect the City's shallow drinking water aquifer from contamination. The Cedar and Tolt Watersheds that supply water to the City include habitat for federally listed salmon species. SPU actively manages these watersheds to minimize impacts to threatened and endangered species.	CB - Not likely to use or affect.
Proposed measures to protect such resources or to avoid or reduce impacts are:	
City technical assistance and inspection programs provide stormwater and groundwater pollution prevention assistance at sites Citywide, with emphasis placed on sites within Critical Aquifer Recharge Areas (CARA). Environmentally sensitive areas are avoided when possible for construction of utility improvements. If avoidance is not possible, City requirements ensure proper mitigation. SEPAs for individual capital projects will describe proposed measures, as appropriate.	CB

To Be Completed By Applicant	Evaluation for Agency Use Only
5. How would the proposal be likely to affect land and shoreline use, including whether it would allow or encourage land or shoreline uses incompatible with existing plans?	
All planned land use and new development follows guidelines set forth in the City's Comprehensive Plan and the County Comprehensive Plan. The WSP Update does not include any land or shoreline uses incompatible with existing comprehensive plans.	CB - Not likely to affect.
Proposed measures to avoid or reduce shoreline and land use impacts are:	
Does not apply. This is a non-project action.	CB
6. How would the proposal be likely to increase demands on transportation or public services and utilities?	
The proposal is not expected to increase demands on transportation. It will improve public services and utilities by improving the City's ability to deliver public water supplies for direct use and fire protection.	CB - Not likely to increase.
Proposed measures to reduce or respond to such demand(s) are:	
Does not apply. This is a non-project action.	CB

To Be Completed By Applicant	Evaluation for Agency Use Only
7. Identify, if possible, whether the proposal may conflict with local, state, or federal laws or requirements for the protection of the environment. Conflicts with local, state, or federal laws or requirements for the protection of the environment are not anticipated. WSP Update follows Washington Department of Health guidelines and Washington Administrative Code requirements. Use of water under the WSP Update is consistent with water rights issued by the Washington State Department of Ecology.	CB

C. SIGNATURE

The above answers are true and complete to the best of my knowledge. I understand that the lead agency is relying on them to make its decision.

Applicant Signature: Lisa Rigg

Name of Signee: Lisa Rigg

Position and Agency/Organization: Sr. Engineer, Redmond

Relationship of Signer to Project: Project Manager

Date Submitted: 6/23/2023

Appendix C
2023 Water Facilities Inventory

Washington State Department of Health
Division of Environmental Health
Office of Drinking Water

WATER FACILITIES INVENTORY (WFI) FORM

ONE FORM PER SYSTEM

Quarter: 1
Updated: 01/09/2023
Printed: 2/14/2023
WFI Printed For: On-Demand
Submission Reason: Pop/Connect Update

RETURN TO: Central Services - WFI, PO Box 47822, Olympia, WA, 98504-7822 or email wfi@doh.wa.gov

1. SYSTEM ID NO.	2. SYSTEM NAME	3. COUNTY	4. GROUP	5. TYPE
71650 B	REDMOND WATER SYSTEM CITY OF	KING	A	Comm

6. PRIMARY CONTACT NAME & MAILING ADDRESS	7. OWNER NAME & MAILING ADDRESS
JOHN R. BURTSCHE [OP SUPERVISOR] 18080 NE 76TH ST REDMOND, WA 98073-9710	REDMOND, CITY OF AARON L. BERT 15670 NE 85TH ST REDMOND, WA 98052 PUBLIC WORKS DIRECTOR
STREET ADDRESS IF DIFFERENT FROM ABOVE	**STREET ADDRESS IF DIFFERENT FROM ABOVE**
ATTN ADDRESS CITY STATE ZIP	ATTN ADDRESS CITY STATE ZIP

9. 24 HOUR PRIMARY CONTACT INFORMATION		10. OWNER CONTACT INFORMATION	
Primary Contact Daytime Phone: (425) 556-2819		Owner Daytime Phone: (425) 556-2880	
Primary Contact Mobile/Cell Phone: (425) 830-9524		Owner Mobile/Cell Phone: (425) 553-5814	
Primary Contact Evening Phone: (xxx)-xxx-xxxx		Owner Evening Phone:	
Fax:	E-mail: jxxxxxxxe@redmond.gov	Fax: (425) 553-5814	E-mail: axxxt@redmond.gov

11. SATELLITE MANAGEMENT AGENCY - SMA (check only one)

- [x] Not applicable (Skip to #12)
- [ ] Owned and Managed
- [ ] Managed Only
- [ ] Owned Only

SMA NAME: _____ SMA Number:

12. WATER SYSTEM CHARACTERISTICS (mark all that apply)

- [ ] Agricultural
- [x] Commercial / Business
- [x] Day Care
- [x] Food Service/Food Permit
- [x] 1,000 or more person event for 2 or more days per year
- [x] Hospital/Clinic
- [x] Industrial
- [x] Licensed Residential Facility
- [x] Lodging
- [ ] Recreational / RV Park
- [x] Residential
- [x] School
- [ ] Temporary Farm Worker
- [ ] Other (church, fire station, etc.): _____

13. WATER SYSTEM OWNERSHIP (mark only one)

- [ ] Association
- [x] City / Town
- [ ] County
- [ ] Federal
- [ ] Investor
- [ ] Private
- [ ] Special District
- [ ] State

14. STORAGE CAPACITY (gallons)

31,836,000

- SEE NEXT PAGE FOR A COMPLETE LIST OF SOURCES -

WATER FACILITIES INVENTORY (WFI) FORM - Continued

1. SYSTEM ID NO.	2. SYSTEM NAME	3. COUNTY	4. GROUP	5. TYPE
71650 B	REDMOND WATER SYSTEM CITY OF	KING	A	Comm

15	16	17	18									19			20	21						22	23	24			
	SOURCE NAME	INTERTIE	SOURCE CATEGORY									USE				TREATMENT						DEPTH		SOURCE LOCATION			
Source Number	LIST UTILITY'S NAME FOR SOURCE AND WELL TAG ID NUMBER. Example: WELL #1 XYZ456 IF SOURCE IS PURCHASED OR INTERTIED, LIST SELLER'S NAME Example: SEATTLE	INTERTIE SYSTEM ID NUMBER	WELL	WELL FIELD	WELL IN A WELL FIELD	SPRING	SPRING FIELD	SPRING IN SPRINGFIELD	SEA WATER	SURFACE WATER	RANNEY / INF. GALLERY	OTHER	PERMANENT	SEASONAL	EMERGENCY	SOURCE METERED	NONE	CHLORINATION	FILTRATION	FLUORIDATION	IRRADIATION (UV)	OTHER	DEPTH TO FIRST OPEN INTERVAL IN FEET	CAPACITY (GALLONS PER MINUTE)	1/4, 1/4 SECTION	SECTION NUMBER	TOWNSHIP	RANGE
S03	Well 3 ABR043		X									X			Y		X		X		X	36	435	NE SE	06	25N	06E
S04	Well 4 ACJ523		X									X			Y		X		X		X	35	578	S E	02	25N	05E
S05	42250T/Kirkland	40850 E										X			Y	X							975	NW SE	02	25N	05E
S06	05575B/Bellevue	05575 B										X			Y	X							0			00N	00E
S07	Well 5 ABR041		X									X			Y		X		X		X	20	1000	SE NE	12	25N	05E
S08	77050Y/Seattle (2)	77050 Y											X		Y	X							7600	NE SE	33	26N	06E
S09	77050Y/Seattle (2)	77050 Y										X			Y	X							0	NE SE	33	26N	06E
S10	90260/Union Hill (3)	90260 3												X	Y	X							0			00N	00E
S11	41600/Woodinville (2)	41600 Y												X	Y	X							0			00N	00E
S12	10900/Sammamish Plateau (1)	40900 9												X	Y	X							0	SW NE	04	24N	06E
S13	75265/NE Sammamish (1)	75265 X												X	Y	X							0			00N	00E
S14	Well 1R & 2R			X								X			Y		X		X		X	50	1400	NE NW	12	25N	05E
S15	Well 1R				X							X			Y		X		X		X	50	900	NE NW	12	25N	05E
S16	Well 2R				X							X			Y		X		X		X	53	500	NE NW	12	25N	05E

WATER FACILITIES INVENTORY (WFI) FORM - Continued

1. SYSTEM ID NO.	2. SYSTEM NAME	3. COUNTY	4. GROUP	5. TYPE
71650 B	REDMOND WATER SYSTEM CITY OF	KING	A	Comm

	ACTIVE SERVICE CONNECTIONS	DOH USE ONLY! CALCULATED ACTIVE CONNECTIONS	DOH USE ONLY! APPROVED CONNECTIONS
25. SINGLE FAMILY RESIDENCES (How many of the following do you have?)		32578	Unspecified
A. Full Time Single Family Residences (Occupied 180 days or more per year)	15832		
B. Part Time Single Family Residences (Occupied less than 180 days per year)	0		
26. MULTI-FAMILY RESIDENTIAL BUILDINGS (How many of the following do you have?)			
A. Apartment Buildings, condos, duplexes, barracks, dorms	1942		
B. Full Time Residential Units in the Apartments, Condos, Duplexes, Dorms that are occupied more than 180 days/year	16746		
C. Part Time Residential Units in the Apartments, Condos, Duplexes, Dorms that are occupied less than 180 days/year	0		
27. NON-RESIDENTIAL CONNECTIONS (How many of the following do you have?)			
A. Recreational Services and/or Transient Accommodations (Campsites, RV sites, hotel/motel/overnight units)	0	0	
B. Institutional, Commercial/Business, School, Day Care, Industrial Services, etc.	1014	1014	
28. TOTAL SERVICE CONNECTIONS		33592	

29. FULL-TIME RESIDENTIAL POPULATION

A. How many residents are served by this system 180 or more days per year? 69900

30. PART-TIME RESIDENTIAL POPULATION	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
A. How many part-time residents are present each month?												
B. How many days per month are they present?												

31. TEMPORARY & TRANSIENT USERS	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
A. How many total visitors, attendees, travelers, campers, patients or customers have access to the water system each month?	11840	11840	11840	11840	11840	11840	11840	11840	11840	11840	11840	11840
B. How many days per month is water accessible to the public?	31	28	31	30	31	30	31	31	30	31	30	31

32. REGULAR NON-RESIDENTIAL USERS	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
A. If you have schools, daycares, or businesses connected to your water system, how many students, daycare children and/or employees are present each month that are NOT already included in the residential population?	53242	53242	53242	53242	53242	53242	53242	53242	53242	53242	53242	53242
B. How many days per month are they present?	31	28	31	30	31	30	31	31	30	31	30	31

33. ROUTINE COLIFORM SCHEDULE	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
	100	100	100	100	100	100	100	100	100	100	100	100

34. NITRATE SCHEDULE	QUARTERLY	ANNUALLY	ONCE EVERY 3 YEARS
(One Sample per source by time period)			

35. Reason for Submitting WFI:

☐ Update - Change ☐ Update - No Change ☐ Inactivate ☐ Re-Activate ☐ Name Change ☐ New System ☐ Other _____

36. I certify that the information stated on this WFI form is correct to the best of my knowledge.

SIGNATURE: _____ **DATE:** _____

PRINT NAME: _____ **TITLE:** _____

Intentionally left blank

WS ID	WS Name
71650	REDMOND WATER SYSTEM CITY OF

Total WFI Printed: 1

Washington State Department of Health
Division of Environmental Health
Office of Drinking Water

Water Facilities Inventory (WFI)

Report Create Date:	2/14/2023		
Water System Id(s):	71650B		
Print Data on Distribution Page:	ALL		
Print Copies For:	DOH Copy		
Water System Name:	ALL		
County:	-- Any --		
Region:	ALL		
Group:	ALL		
Type:	ALL		
Permit Renewal Quarter:	ALL		
Water System Is New:	ALL		
Water System Status:	ALL		
Water Status Date From:	ALL	**To**	ALL
Water System Update Date	ALL	**To**	ALL
Owner Number:	ALL		
SMA Number:	ALL		
SMA Name:	ALL		
Active Connection Count From:	ALL	**To:**	ALL
Approved Connection Count	ALL	**To:**	ALL
Full-Time Population From:	ALL	**To:**	ALL
Water System Expanding	ALL		
Source Type:	ALL		
Source Use:	ALL		
WFI Printed For:	On-Demand		

Appendix D
Interlocal Agreements

CASCADE WATER ALLIANCE
JOINT MUNICIPAL UTILITY SERVICES AGREEMENT

March 28, 2012

Sections:

Article 1. Agreement

Article 2. Definitions

Article 3. Formation of Entity – Purpose and Powers

3.1 Formation.

3.2 Membership.

3.3 Purposes.

3.4 Powers.

Article 4. Organization Structure – Board

4.1 Composition, bylaws and meetings.

4.2 Powers of the board.

4.3 Voting.

4.4 Officers and committees.

4.5 Executive committee.

4.6 Staff, consultants and contractors.

4.7 Budget – Dues – Financial management.

Article 5. Asset Development and Supply Commitment

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5.2 Supply commitment.

5.3 Financing of assets.

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5.5 Regional capital facilities charges.

5.6 Transfer upon mergers, consolidations and assumptions.

Article 6. New Independent Supply

Article 7. Asset Management

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7.2 Conservation.

7.3 Shortages and emergency.

7.4 Water quality.

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7.7 Sales of water to nonmembers.

7.8 Payment procedures – Default – Step-up provisions.

Article 8. Planning

8.1 Water supply plan.

8.2 Watershed management plan.

8.3 System reliability methodology.

Article 9. Duration and Dissolution – Withdrawal

9.1 Duration.

9.2 Withdrawals.

9.3 Disincorporation.

9.4 Successor entity.

Article 10. Amendments

Article 11. Applicable Law and Venue

Article 12. No Third Party Beneficiaries

Article 13. Severability

Article 14. Entire Agreement

Article 1. Agreement

Effective upon approval by 65% Dual Majority Vote of the Board (as ratified within one hundred and twenty (120) days of such Dual Majority Vote by 65% Dual Majority of the Members' legislative authorities) the Interlocal Contract is hereby amended and restated as provided herein under the authority of the Act and shall be known as the Cascade Water Alliance Joint Municipal Utility Services Agreement. [Res. 2012-06 § 1; Res. 2004-18 § 1].

Article 2. Definitions

"Act" means the Joint Municipal Utilities Services Act, codified as Chapter 39.106 RCW, or as hereafter amended.

"Agreement" means this Joint Municipal Utilities Services Agreement.

"Asset Transfer Agreement" means an agreement between Cascade and a Member by which the Member transfers title to Water Supply Assets to Cascade, with or without monetary consideration, to be operated and maintained as part of the Cascade Water Supply System.

"Authority" means a joint municipal utility services authority formed under the Act and the successor in interest to Cascade as an interlocal agency.

"Authorized Issuer" means either: (a) Cascade (or a successor entity); or (b) a Member or other entity authorized to issue Bonds for the benefit of Cascade approved by Resolution of the Board.

"Board" means the Board of Directors of Cascade.

“Bonds” means short-term or long-term bonds, notes, warrants, certificates of indebtedness, or other obligations issued by, or on behalf of Cascade.

“ByLaws” means the ByLaws of Cascade, as adopted and amended by the Board.

“Cascade” means Cascade Water Alliance, a joint municipal utilities services authority.

“Cascade ERUs” (“CERUs”) means equivalent residential units, calculated according to the Regional Capital Facilities Charge Methodology.

“Cascade Supply Date” means the date, established by a Resolution of the Board for each Member upon which Cascade undertakes a Supply Commitment.

“Demand Share” means either a Member’s current share of water provided through the Supply System, or estimated share of water to be provided through the Supply System, whether Full Supply or Interruptible Supply, expressed in millions of gallons per day. Demand Share is calculated according to the Rate Calculation Methodology.

“Dual Majority Vote” means Board approval of a proposal on the basis of a simple majority of all Members, allowing one vote per Member, together with a simple majority of all Members on the basis of each Member’s Weighted Vote. A “simple majority” means a majority of all Members of Cascade, not just the Members present and voting.

“65% Dual Majority Vote” means Board approval of a proposal on the basis of a 65% supermajority of all Members, allowing one vote per Member, together with 65% supermajority of all Members on the basis of each Member’s Weighted Vote. A “supermajority” means 65% of all Members of Cascade, not just the Members present and voting.

“Gross Cascade Revenue” means all of the earnings and revenues received by Cascade from any source whatsoever including but not limited to: (a) Member Charges; (b) revenues from the sale, lease or furnishing of commodities, services, properties or facilities; (c) the receipt of earnings from the investment of money in any maintenance fund or similar fund; and (d) withdrawals from any rate reserve or rate stabilization fund or account.

However, Gross Cascade Revenue shall not include: (a) principal proceeds of Bonds or any other borrowings, or earnings or proceeds from any investments in a trust, defeasance or escrow fund created to defease or refund obligations relating to the Water Supply System (until commingled with other earnings and revenues included in Gross Cascade Revenue) or held in a special account for the purpose of paying a rebate to the United States Government under the Code; (b) taxes and other

income and revenue which may not legally be pledged for revenue bond debt service; (c) improvement district assessments; (d) federal or state grants allocated to capital projects; (e) payments under Bond Insurance or other credit enhancement policy or device; (f) insurance or condemnation proceeds used for the replacement of capital projects or equipment; (g) earnings in any construction fund or bond redemption fund; (h) deposits to any rate reserve or rate stabilization fund or account; or (i) any revenues generated by any Independent Supply except those amounts that are payable to Cascade pursuant to this Agreement or another agreement.

“Independent Supply” or “Independent Supplies” means a Member’s Water Supply Assets that are not part of the Supply System.

“Joint Municipal Utilities Services Act” or “Act” means Chapter 39.106 RCW, or as hereafter amended.

“Member” or “Members” means one or more member agencies of Cascade.

“Member Charges” means all payments that Cascade Members are required by this Agreement to make to Cascade, including but not limited to all Rates and Charges, RCFCs, dues, assessments and other payments from Members.

“Net Cascade Revenue” means Gross Cascade Revenue less Operations and Maintenance Costs.

“Non-Member” means any person or agency that is not a party to this Agreement.

“Operations and Maintenance Costs” or “O&M Costs” means all expenses incurred by Cascade to operate and maintain the Supply System in good repair, working order and condition, including without limitation, payments made to any other public or private entity for water or other utility service. Except as approved by the Board, Operations and Maintenance Costs shall not include any depreciation, capital additions or capital replacements to the Supply System.

“Rates and Charges” means the rates and charges (not including RCFCs) chargeable to each Member using the Rate Calculation Methodology plus any late payment or other charge that may be due.

“Rate Calculation Methodology” means the method of setting Rates and Charges adopted by the Board in accordance with Section 7.5.

“Regional Capital Facilities Charges” (“RCFCs”) means the charges to each Member for new CERUs connected to that Member’s water distribution system.

“Regional Capital Facilities Charge Methodology” (“RCFC Methodology”) means the method of determining the RCFCs adopted by the Board in accordance with Section 5.5.

“Satellite Systems” means water supply facilities identified as such by the Board, including but not limited to facilities that serve a portion of a Member’s customers but that are not part of the Member’s main water system.

“Shortage Management Plan” means the plan adopted by the Board in accordance with Section 7.3.1.

“Supply Commitment” means the obligation undertaken by Cascade, established by Resolution of the Board to supply water to a Member. With respect to Members, that obligation shall be characterized as “Full Supply Commitment,” or an “Interruptible Supply Commitment” defined as follows:

“Full Supply Commitment” or “Full Supply” for any or all of a Member’s water needs means that those needs, as projected in the Cascade Water Supply Plan and as agreed to by that Member, shall be met from the Supply System, net of Independent Supply and subject to the other limitations established in this Agreement, on an equal parity with all other Full Supply Commitments, and with a guaranteed priority no lower than for any other Supply Commitment made by Cascade; provided that no Member is guaranteed any given amount of supply or capacity.

“Interruptible Supply Commitment” or “Interruptible Supply” means a supply of all or part of a Member’s water needs from the Supply System on an as-available basis on a lower priority than any Full Supply Commitment.

The Supply Commitment for a Member shall be defined by this Agreement, the terms and conditions of membership, and the Supply Commitment resolution.

“Supply System” or “Water Supply System” means the Water Supply Assets owned or controlled by Cascade.

“Water Supply Assets” means tangible and intangible assets usable in connection with the provision of water supply, including without limitation, real property, physical facilities (e.g., dams, wells, treatment plants, pump stations, reservoirs, and transmission lines), water rights, capacity and/or contractual rights in facilities or resources owned by other entities, and investments in conservation programs and facilities.

“Watershed Management Plan” means any Watershed Management Plan that existed on the effective date of the Authority which shall be considered a plan of the Authority.

“Water Supply Plan” or “Cascade’s Water Supply Plan” means the Cascade’s Regional Water Supply Plan adopted by the Board as provided in Section 8.1.

“Weighted Vote” means a vote in which each Member’s vote is counted according to the Member’s Demand Share, but no Member shall have a Weighted Vote of less than one. [Res. 2012-06 § 1; Res. 2004-18 § 1].

Article 3. Formation of Entity – Purpose and Powers

3.1 Formation.

Effective on the date of filing of this Agreement with the Washington state secretary of state, Cascade shall be a joint municipal utility services authority formed under the Act; and is the successor for all purposes to the former Cascade created under the Interlocal Contract as an intergovernmental entity existing under the laws of Chapter 39.34 RCW; and is no longer functioning as a watershed management partnership. All rights and obligations of the former intergovernmental entity are transferred to Cascade, the new Authority, which obligations shall be treated as having been incurred, entered into, or issued by Cascade, the successor, and those obligations (including without limitation, outstanding Bonds issued by the former Cascade) shall remain in full force and effect and shall continue to be enforceable in accordance with their terms.

Cascade Water Alliance, as a joint municipal utility services authority, is a municipal corporation. [Res. 2012-06 § 1; Res. 2004-18 § 1].

3.2 Membership.

Subject to restrictions on future Cascade water rights, or to limitations upon place of use of water supply imposed by contract or permit, any city, town, county, water-sewer district, public utility district, other special purpose district, municipal corporation, or other unit of local government of this or another state that provides utility services, and any Indian tribe recognized as such by the United States government (or as may be allowed by amendments to the Act) may be admitted as a member of Cascade. The decision to admit new Members rests with the sole discretion of the Board, which shall determine whether to extend a membership offer taking into consideration the audit findings (as described in this Section 3.2), Cascade water resources, and any other factors the Board deems advisable.

When an entity that is eligible for membership under the Act, applies for membership, Cascade shall conduct a water supply audit according to the methodology and within the period determined by the Board. Audit results shall be provided to the Board and to the applicant.

If a membership offer is extended, it shall address the nature of the Water Supply Assets being transferred or retained and the “value” of those assets in terms of the calculation of an applicant’s Demand Share, RCFCs and other matters relating to the rights and obligations of the applicant and Cascade, which must be recorded in the form that the Board determines and which will constitute, along with this Agreement, the conditions under which an applicant becomes a Member of Cascade. An applicant for membership shall be admitted by adoption of a Resolution of the Board accepting the application for membership and incorporating the terms and conditions of membership.

Each membership application must be accompanied by a nonrefundable application fee based on the estimated cost of the audit and other costs related to the admission of a new Member or a request for new supply. The Board shall set the application fee for each applicant based on the estimated cost of processing the application, including the cost of the audit.

As a condition of membership, each new Member admitted to Cascade shall, in addition to any other applicable fees, rates, charges or assessments, pay to Cascade the membership fee, as established by the Board.

If an applicant’s planning process or plans are materially out of compliance with the requirements of applicable state law, the Board may condition an offer of membership upon the applicant’s compliance with that state law. [Res. 2012-06 § 1; Res. 2004-18 § 1].

3.3 Purposes.
Cascade’s purposes include those related to water resources, or any other utility service as allowed under the Act, as authorized by a unanimous vote of the Board, and do not include the provision of other general services to the public, and are to:

a. Provide a safe, reliable and high quality drinking water supply to meet the current and projected demands of Cascade Members, and for non-Members as determined by Cascade, and to carry out this task in a coordinated, cost-effective, and environmentally sensitive manner;

b. Develop, contract for, manage, acquire, own, maintain and operate Water Supply Assets, including without limitation, surface water supplies, groundwater supplies, reclaimed water supplies, and other water supply resources as determined by the Board;

c. Purchase and provide water supply, transmission services, treatment facilities and other related services;

d. Provide conservation programs to promote the wise and efficient use of resources;

e. Carry out emergency water supply and shortage management programs for its Members when demands exceed available supply;

f. Coordinate and plan cooperatively with other regional or local water utilities and other entities to maximize supply availability and to minimize system costs;

g. Develop a Water Supply Plan addressing the needs of Cascade and its Members and Cascade itself and develop a regional water supply plan with other water providers as Cascade may find convenient or necessary to meet regional, state and federal planning requirements, and to take a leadership role in developing and coordinating those supply plans;

h. Share costs and risks among Members commensurate with benefits received; and

i. Carry out, or to further other water supply purposes that the Members determine, consistent with the provisions of this Agreement. [Res. 2012-06 § 1; Res. 2004-18 § 1. Formerly 3.4].

3.4 Powers.

To further its purposes, Cascade has the full power and authority to exercise all powers authorized or permitted under the Act and any other laws that are now, or in the future may be, applicable or available to Cascade and to engage in all activities incidental or conducive to fulfill the purposes set forth in Section 3.3 of this Agreement, including but not limited to the authority to:

a. Acquire, construct, receive, own, manage, lease and sell real property, personal property, intangible property and other Water Supply Assets;

b. Operate and maintain facilities;

c. Enter into contracts;

d. Administer personnel matters in a manner generally consistent with the laws applicable to a code city (population over 20,000), to the extent applicable and with discretion left to the Authority, to the fullest extent otherwise permitted by law, related to the appointment, removal and/or compensation of officers, the establishment and/or administration of employee health and welfare benefit programs, and/or the establishment and/or administration of civil service/merit systems, retirement benefits/systems, and/or pension benefits/systems;

e. Sue and be sued;

f. Exercise all powers of eminent domain granted under Chapter 8.12 RCW and other applicable statutes (e.g. Chapter 8.25), now or as hereafter amended;

g. Impose, alter, regulate, control and collect rates, charges, and assessments;

h. Purchase and sell water and services within and outside the geographical boundaries of its Members;

i. Borrow money (through its Members or other entities at their individual discretion or as authorized by the Act and this Agreement now or as hereafter amended), or enter into other financing arrangements;

j. Lend money or provide services or facilities to any Member, other governmental water utilities, or governmental service providers;

k. Invest its funds;

l. Establish policies, guidelines, rules or regulations by either ByLaws or resolution to carry out its powers and responsibilities;

m. Purchase insurance, including participation in pooled insurance and self-insurance programs, and indemnify its Members, its Board of Directors and Alternate Board Members, officers and employees in accordance with law;

n. Exercise all other powers within the authority of, and that may be exercised individually by all of its Members with respect to water supply, conservation, reuse, treatment and transmission, or any of the other purposes set forth in Section 3.3;

o. Exercise, without limitation, all other corporate powers that Cascade may exercise under the law relating to its formation and that are not inconsistent with this Agreement or the Act or other applicable law;

p. For the purposes of contracting and public works, exercise all powers of a code city (population over 20,000) under RCW 35A.40.200 – 35A.40.210, now or as hereafter amended;

q. For disposal of surplus property, exercise all powers granted under RCW 35A.11.010, now or as hereafter amended, to code cities;

r. In the event Cascade charges connection charges or Rates and Charges for services supplied or available to its customers' property on a retail basis, exercise all powers granted under RCW 57.08.081, now or as hereafter amended, for the establishment of liens; and

s. For purposes of a Cascade code of ethics, exercise all powers of a municipal corporation and observe the requirements under Chapter 42.23 RCW, now or as hereafter amended. [Res. 2012-06 § 1; Res. 2004-18 § 1. Formerly 3.5].

Article 4. Organization Structure – Board

4.1 Composition, bylaws and meetings.
Cascade is governed by a Board of Directors consisting of one individual representative appointed by Resolution by each of the Member's legislative authority. Members may similarly appoint Alternate Board Members. Each Board Member and each Alternate Board Member must be an elected official of the Member.

The Board shall adopt ByLaws consistent with this Agreement that specify, among other matters, the month of Cascade's Annual Meeting, Board powers and duties and those of the Executive Committee, Standing Committees, Officers and employees.

The Board shall meet as required by the ByLaws, but not less than quarterly. [Res. 2012-06 § 1; Res. 2004-18 § 1].

4.2 Powers of the board.
The Board has the power to take all actions on Cascade's behalf in accordance with voting provisions set forth in Section 4.3. The Board may delegate or assign to the Executive Committee or to specific Cascade Officers or employees any action that is not expressly reserved to the Board under this Agreement. [Res. 2012-06 § 1; Res. 2004-18 § 1].

4.3 Voting.
All Board actions must be approved by Dual Majority Vote of all Members, except where this Agreement requires either a 65% Dual Majority Vote, as provided in Sections 4.7, 5.5, 7.3, and 7.5; or ratification by the Members' legislative authority, as provided in Sections 9.3 and 9.4 and Article 10. The Board may act by voice votes, as set forth in the ByLaws. Any Member may require a recorded tabulation of votes either before or immediately after a voice vote is taken. Although voting is, in part, based on Weighted Vote, the Members expressly agree that there is only one class of voting membership, and voting occurs within that single class.

Any Member that has been declared to be in default of its obligations under this Agreement by the Board shall lose its right to vote until the Board has declared the default to be cured. [Res. 2012-06 § 1; Res. 2004-18 § 1].

4.4 Officers and committees.
Cascade Officers shall include a Chair, a Vice Chair, a Secretary, and a Treasurer. The Chair serves as the chair of the Board (and may be known as the “President,” if the ByLaws so designate) and performs those duties set forth in the ByLaws.

The Vice Chair shall perform the duties of the Chair in the Chair’s absence and shall perform other duties as set forth in the ByLaws. The Secretary shall be responsible for Cascade records and perform other duties as set forth in the ByLaws. The Treasurer shall be responsible for Cascade accounts and financial records and perform other duties as set forth in the ByLaws.

Consistent with the provisions of this Agreement, the Board may, in the ByLaws, establish additional Officers and set forth their duties.

The Board may create and appoint Members to Standing Committees and special committees as it deems appropriate. Committee Members need not be elected officials or employees of Members, but Standing Committee Chairs must be Board Members or Alternate Board Members. [Res. 2012-06 § 1; Res. 2004-18 § 1].

4.5 Executive committee.
The Chair, Vice Chair, Secretary, and Treasurer shall constitute Cascade’s Executive Committee. The Chair (or acting Chair) shall vote on matters before the Executive Committee only if necessary to break a tie. The Executive Committee’s duties and responsibilities are set forth in the ByLaws. The Executive Committee shall not have the power to:

a. Approve any contract for a term longer than three (3) years;

b. Approve any contract involving expenditure by, or revenue to Cascade in excess of such amounts and under such circumstances as set forth in the ByLaws;

c. Retain or dismiss the chief executive officer or determine the chief executive officer’s compensation; or

d. Take any actions expressly reserved to the Board by this Agreement or the ByLaws.

The Executive Committee shall have the authority, if necessary, to avoid default on any Bond, to withdraw from any capital reserve fund or rate stabilization fund, an amount equal to the amount necessary to avoid a default and to authorize payment of that amount to avoid default. [Res. 2012-06 § 1; Res. 2004-18 § 1].

4.6 Staff, consultants and contractors.
Cascade staff shall consist of a chief executive officer and other positions established by resolution of the Board. The Board shall appoint, designate the title of, and establish the compensation range of the chief executive officer. The Board shall hire auditors for Cascade. The chief executive officer may hire all other staff and consultants, and those appointments may be subject to ratification by the Board or the Executive Committee if the ByLaws so provide. The Board may also provide that administrative, professional or technical services be performed by contract. [Res. 2012-06 § 1; Res. 2004-18 § 1].

4.7 Budget – Dues – Financial management.
The Board shall approve a budget for each fiscal year, determining Cascade's revenues and expenditures no later than sixty (60) days before the beginning of the fiscal year in which that budget will be in effect. The budget shall be developed and approved according to a schedule established by the ByLaws. The budget must identify the levels of Member Charges on which revenue projections are based. The Board may amend the budget.

Each Member shall pay dues to defray part or all of Cascade's administrative costs based on the number of CERUs served by its water system, regardless of water usage or capacity, and regardless of whether those units are served by the Supply System or by Independent Supply. Total administrative dues collected from all Members may not exceed nine percent (9%) of Cascade's revenue requirement. This limit may be amended in the budget by a 65% Dual Majority Vote of the Board. The Board may establish minimum dues per Member and may provide that less than all of a Member's CERUs be taken into account in establishing dues.

All Cascade books and records shall be open to inspection by the Washington State Auditor.

The Board shall approve, by Resolution, the treasurer of Cascade, which may be the treasurer or chief finance officer of any Member, or the treasurer of any Washington county in which any Member is located; or, if the total number of utility customers of all of the Members of Cascade is greater than two thousand five hundred (2,500), the treasurer may be an officer or employee of Cascade (or as may be allowed by amendments to the Act). [Res. 2012-06 § 1; Res. 2004-18 § 1].

Article 5. Asset Development and Supply Commitment

5.1 Property acquisition, ownership and disposition.
Cascade may construct, purchase, rent, lease, manage, contract for, or otherwise acquire and dispose of Water Supply Assets and other assets. Cascade may control and manage both the assets it owns and the assets that are owned by Members that have transferred control and management of those

assets to Cascade. This Agreement does not vest in Cascade any authority with respect to Members' other facilities or assets, such as Water Supply Assets retained by Members as Independent Supply.

Subject to Cascade's agreement, a Member may transfer to Cascade its title to, or operational control and management of Water Supply Assets. Water Supply Assets may also be fully retained by Members as Independent Supply, subject to the provisions of Article 6. At the discretion of the Board, Cascade may accept title to, or operational control and management of Water Supply Assets offered by Members or accept supply assets that constitute all or part of a Member's Satellite System(s). The Board may accept supply assets subject to the terms and conditions arranged between Cascade and the Member, based on the result of the audit process and mutual needs.

Cascade may enter into Asset Transfer Agreements which shall provide for the terms and conditions of: (a) Cascade's operation of the transferred Water Supply Asset with respect to the Member transferring the asset; (b) Cascade's operation, maintenance and replacement of the Water Supply Asset as part of the Supply System; (c) return or disposition of the Water Supply Asset if Cascade terminates its existence or the Member withdraws; (d) continuation of service (if appropriate) to Members or former Members by the Member receiving the Water Supply Asset at reasonable rates and charges or payment to Cascade of the cost of replacing the Water Supply Asset; and (e) such other conditions as the Board and the Member agree upon.

Subject to Cascade's agreement, a Member that transfers title or operation, control and/or management to Cascade of any Water Supply Asset shall be deemed to also transfer, assign and/or convey the franchises, if any, associated with that Water Supply Asset.

Members shall not be deemed to hold legal ownership rights in any Water Supply Assets owned by Cascade whether those Water Supply Assets have been developed by, purchased by, or transferred to Cascade, and regardless of the accounting treatment of RCFC payments and other payments made to Cascade. [Res. 2012-06 § 1; Res. 2004-18 § 1].

5.2 Supply commitment.

A. Commitment to Members. Beginning on the Cascade Supply Date, Cascade shall provide a Supply Commitment to each Member. Cascade shall provide a Full Supply Commitment to a Member that joins with Water Supply Assets sufficient to provide for its needs during the following fifteen (15) years (whether or not those Water Supply Assets are transferred to Cascade or retained as Independent Supply.)

Any Full Supply Commitment shall be subject to water shortages, to Cascade's ability to implement the Water Supply Plan, and to the portion of the Member's needs that can be served by the audited

capacity of its Independent Supply. If the needed supply is not available, the shortage shall be shared by all the Members in accordance with Cascade's Shortage Management Plan, except as otherwise provided in Section 5.5. Cascade shall be obligated to provide water supply to the entire service area of each Member (as that service area is defined in terms under which the Member is admitted or as in the Member's adopted and approved Water System Plan as of the Effective Date of this Agreement), whether or not some of that service area is within the Member's current jurisdictional boundaries and/or within the current urban growth boundary. Cascade is not obligated to provide water supply to service area expansions in or outside the urban growth boundary, unless Cascade agrees to such expanded service area. Cascade is not obligated to provide increased water supply to any Member if it is determined that the Member's planning process or plans are materially out of compliance with the requirements of applicable state law.

A Member that joins with Water Supply Assets insufficient to provide for its needs for fifteen (15) years receives the Full Supply it desires only if, when, and to the extent it is available within reliability standards determined by Cascade's system reliability methodology. If sufficient Full Supply is not available within reliability standards determined by Cascade's system reliability methodology, the Member receives partial Full or Interruptible Supply, and Full Supply must be provided within fifteen (15) years. Cascade shall then undertake to include in Cascade's Water Supply Plan, and to acquire the facilities or other assets necessary in the Board's determination to provide for the identified deficit. If Cascade fails to develop sufficient assets to timely provide the increased Full Supply, the commitment becomes a Full Supply Commitment at the end of that fifteen (15) year period, and any shortage shall be shared by all Members in accordance with Cascade's Shortage Management Plan.

If multiple Members request new Full Supply, requests must be honored in the order received (i.e., in the order in which application is made accompanied by the application fee). With respect to new Members, requests for Full Supply "vest" no earlier than the date that membership is effective. In cases of conflict or ambiguity, the Board may determine the order of requests.

B. Additional Rules for Members Retaining Independent Supply. Members are not required to share shortages resulting from the loss of all or part of Independent Supply, although Cascade may make Interruptible Supply available to a Member that loses Independent Supply at prices that are consistent with the price of Interruptible Supply being made available to others at that time. Cascade may at any time and at its cost and expense carry out audits of a Member's Independent Supply.

A Member requesting an additional Full Supply Commitment due to loss of Independent Supply shall make that request by Resolution of the requesting Member's legislative authority. When and as determined by the Board, the Member shall pay an amount equal to the RCFCs allocable to the number of CERUs that can be served by the replacement supply provided or to be provided by

Cascade. Cascade shall then include the supply in its Water Supply Plan, and provide the supply when it becomes available, but in any event within fifteen (15) years. If, within fifteen (15) years the supply is not available, Cascade's commitment becomes a Full Supply Commitment and any shortage with respect to that supply must be shared by all the Members in accordance with the Shortage Management Plan, except as otherwise provided in Section 7.3. [Res. 2012-06 § 1; Res. 2004-18 § 1].

5.3 Financing of assets.

The acquisition of new capital facilities and other Water Supply Assets may be financed using RCFCs, transfers or Water Supply Assets, Rates and Charges, the issuance of revenue Bonds and such other sources as the Board may deem appropriate.

A. Issuance of Bonds. An Authorized Issuer may issue Bonds payable from and secured solely by all or a portion of Net Cascade Revenue, evidencing indebtedness up to an amount approved by Resolution for the Board in order to provide financing or refinancing to acquire, construct, receive, own, manage, lease or sell real property, personal property, intangible property and other Water Supply Assets, to establish debt service reserves, to provide for capitalized interest and to pay the costs of issuance of, and other costs related to the issuance of the Bonds. Such Bonds shall be payable solely from all or a portion of the Net Cascade Revenue or (if the Authorized Issuer is other than Cascade) from payments to be made by Cascade out of all or a portion of Net Cascade Revenue, and such Bonds shall not pledge the full faith and credit or taxing power or, except as expressly provided by contract, the revenue, assets or funds of any Member.

Members serving as Authorized Issuers may conduct the financing through "separate systems" permitted by their applicable bond resolutions, or in some other appropriate manner, and Cascade may compensate those Members for all costs associated with the financing. Bond-related documents of Authorized Issuers other than Cascade must expressly permit the Bonds to be refunded or prepaid without penalty prior to their stated maturity, on and after such dates as are approved by the Authorized Issuer and the Board, to allow for a transfer of the obligation to Cascade or to Cascade's successor entity, including without limitation, a joint operating agency or similar entity, as may be permitted by law.

B. Pledge of Revenues. For as long as any Bonds payable from Net Cascade Revenue (or any portion thereof) are outstanding, Cascade irrevocably pledges to establish, maintain and collect all Member Charges in amounts sufficient to pay when due the principal of and interest on the Bonds (and, if the Authorized Issuer is other than Cascade, in addition to the foregoing pledge, to pledge to make timely payments to that Authorized Issuer for the payment of principal of and interest on the Bonds), together with amounts sufficient to satisfy all debt service reserve requirements, debt service coverage requirements, and other covenants with respect to the Bonds.

Each Member hereby irrevocably covenants that it shall establish, maintain and collect rates, fees or other charges for water and other services, facilities and commodities related to the water supply it receives from Cascade and/or its water utility at levels adequate to provide revenues sufficient to enable the Member to: (a) make the payment required to be made under this Agreement; and (b) pay or provide for payment of all other charges and obligations payable from or constituting a charge or lien upon such revenues. Each Member hereby acknowledges that this covenant and its covenant in Section 7.9 of this Agreement may be relied upon by Bond owners, consistent with this Agreement.

Each Member shall pay the Member Charges imposed on it whether or not the Water Supply Assets to be financed through the issuance of Bonds are completed, operable or operating, and notwithstanding the suspension, interruption, interference, reduction or curtailment in the operation of any Water Supply Assets for any reason whatsoever, in whole or in part. Member Charges shall not be subject to any reduction, whether by offset or otherwise, and shall not be conditioned upon the performance or nonperformance of any Member, or of any entity under this or any other agreement or instrument. However, credits against future RCFCs and Rates and Charges described in Sections 5.5 and 7.5, respectively, for development or addition of excess capacity that is either transferred to Cascade or retained as Independent Supply, shall not be considered “offsets” or “reductions” for the purposes of this Section.

If, in connection with the issuance of obligations, any Member establishes a new lien position on revenues relating to its water utility, that Member shall covenant in the relevant documents that the amounts to be paid to Cascade as Member Charges shall be treated either: (a) as part of that Member’s internal operation and maintenance costs payable prior to debt service on those obligations; and/or (b) for any portion of those Member Charges that is allocable to capital costs, as a contract resource obligation payable prior to debt service on those obligations. If any Member has existing outstanding revenue obligations relating to its water utility, it shall include substantially similar “springing covenants” in the documents relating to any new parity obligations.

C. Continuing Disclosure. To meet the requirements of United States Securities and Exchange Commission (“SEC”) Rule 15c2-12(b)(5) (the “Rule”) as applicable to a participating underwriter for any Bonds and any obligation of each Member as an “Obligated Person” under the Rule, Cascade and each Member agree to make an appropriate written undertaking, respectively, for the benefit of holders of the Bonds consistent with the requirements of the Rule.

D. Preservation of Tax Exemption for Interest on the Bonds. Each Member covenants that it will take all actions necessary to prevent interest on tax-exempt Bonds from being included in gross income for federal income tax purposes, and it will neither take any action nor make or permit any use of proceeds of tax-exempt Bonds or other funds treated as proceeds of those Bonds at any time during

the term of those Bonds that will cause interest on those Bonds to be included in gross income for federal income tax purposes.

E. Additional Certificates. Each Member further agrees to provide such certificates or verifications as are reasonably requested by an Authorized Issuer in connection with the issuance of Bonds under this Section. [Res. 2012-06 § 1; Res. 2004-18 § 1].

5.4 Supply system – Development.

Cascade must provide for Supply System development to meet the needs of additional water customers of Members, subject to consistency with applicable state law, Cascade's Water Supply Plan, orderly asset development, reasonable cost and financing capacity. The Board shall establish a water supply development process, including criteria governing the evaluation of new projects, and that process must promote equality of costs and services (other than direct local services), regardless of geographic location. The results of the water supply planning process must be reflected in Cascade's Water Supply Plan. The Board shall have the authority to undertake new projects identified in Cascade's Water Supply Plan for the expansion of Water Supply Assets and regional transmission system extensions to meet Members' projected needs. To reduce costs, Cascade may, to the extent that the Board deems advisable, enter into agreements with Members to wheel water through their existing systems. When facilities are constructed that are used partially by Cascade for wheeling water and partially by Members or other entities for their purposes, the Board may determine an appropriate Cascade contribution to the cost of those facilities. Existing arrangements among Members (and between Members and Non-Members), in place when a Member joins Cascade, remain unaffected except as otherwise agreed between Cascade and the other entities concerned. [Res. 2012-06 § 1; Res. 2004-18 § 1].

5.5 Regional capital facilities charges.

To allocate growth costs to those Members that require capacity increases, each Member shall pay to Cascade an RCFC for each new CERU connected to its water distribution system. Growth in water usage by existing CERUs is not subject to RCFCs unless that growth constitutes a CERU increase as provided in the RCFC Methodology. Members with a supply deficit must pay an RCFC commensurate with that deficit. To the extent that a Member transfers to Cascade or retains an Independent Supply water supply in excess of its needs, it receives a corresponding credit against future RCFCs.

A new Member with adequate supply shall commence paying RCFCs fifteen (15) years prior to the date that its Water Supply Assets are projected to be insufficient to provide for its needs as determined by the Board (taking into consideration the results of the Water Supply Audit).

A Member that joins with Water Supply Assets that are projected to be insufficient to provide for its needs for fifteen (15) years shall immediately pay RCFCs for the number of CERUs representing the deficit as determined by the Board.

RCFCs shall be calculated according to the RCFC Methodology, which shall define the analytical steps required to calculate the RCFCs according to the average unit cost of past construction of the existing system plus the Supply System improvements planned at the time of the calculation. The methodology shall provide for an annual escalator, recalculation and update not less frequently than every fifth year, and a methodology for determining CERUs. The RCFCs shall be imposed on the Member for each new CERU of that Member in accordance with the terms of this Agreement. Amendments to the RCFC Methodology shall require a 65% Dual Majority Vote.

If a Member owns Water Supply Assets or transfers Water Supply Assets to Cascade under Section 5.1, to the extent the audited capacity of those assets exceeds the Member's needs, that Member shall receive a credit against future RCFCs. If a Member seeks to transfer assets substantially in excess of its foreseeable needs, Cascade may negotiate appropriate compensation arrangements for the transfer.

Members that develop new Independent Supply that is approved by the Board in accordance with Article 6, similarly receive a credit effective when the Independent Supply is placed in service as determined by the Board.

A Member that accepts ownership of a Satellite System that Cascade agrees to serve shall pay an RCFC for the amount of supply needed to serve that system in excess of its rated capacity.

Members that experience a net reduction in the number of CERUs served shall receive a CERU-for-CERU credit against future RCFCs.

RCFC credits may not be transferred among Members without Board approval.

Members shall not be required to pass RCFCs to their customers as capital facilities charges, but may provide for the payment of RCFCs in whatever manner they deem appropriate.

For Members joining with an unmet net supply need, Cascade may, under circumstances determined by the Board, require the prepayment of RCFCs allocable to the full amount of the requested supply, e.g., when funds are needed to begin the construction of facilities immediately. [Res. 2012-06 § 1; Res. 2004-18 § 1].

5.6 Transfer upon mergers, consolidations and assumptions.

If: (a) two or more Members merge or consolidate; (b) a Member or a Non-Member assumes jurisdiction of part or all of a Member; or (c) a Member assumes jurisdiction of part or all of a Non-Member, the jurisdictions' water supply rights from and obligations to Cascade shall be transferred or assumed under applicable law and consistent with the requirements of this Agreement and the obligations of Cascade. [Res. 2012-06 § 1; Res. 2004-18 § 1].

Article 6. New Independent Supply

Members may not bring new Water Supply Assets on-line as Independent Supply without Board approval. That approval may be granted or denied following an evaluation process, based on whether the Board determines that development of the proposed Independent Supply will benefit or be adverse to the interests of the Members as a whole. Recognizing that in certain circumstances the acquisition of additional Independent Supply might benefit (or cause no material harm to) the Members, new supplies under one (1) MGD may be approved by the Board regardless of the provisions of the Water Supply Plan and without a formal evaluation process. New supplies in amounts greater than one (1) MGD must be described in and be consistent with the Water Supply Plan.

Members that have invested in the development of new Independent Supply assets may offer to sell their interest in such assets to Cascade. Cascade may, in its sole discretion and subject to mutually agreeable terms and conditions, purchase the Member's interest in such Independent Supply asset by reimbursing or otherwise compensating the Member for its investment in the project to the extent that investment has been capitalized. Once Cascade has purchased a Member's interest in a project, the project will be considered a Water Supply Asset of Cascade

and will be incorporated into the Water Supply Plan. [Res. 2012-06 § 1; Res. 2004-18 § 1].

Article 7. Asset Management

7.1 Supply system management.

Cascade is responsible for managing, on behalf of all Members, the Supply System. Cascade is not responsible for managing Independent Supply unless it has expressly agreed to do so. Supply System management responsibilities shall be governed by Cascade's system management plan adopted by the Board. Cascade's system management plan concerns, without limitation, matters such as daily system operations and maintenance, interface with other supply providers, contractual obligations, water quality, billing, management and administration. Cascade may delegate and/or contract out its Supply System responsibilities.

Cascade must manage the Supply System in compliance with applicable laws, regulation, and Cascade's minimum service standards. [Res. 2012-06 § 1; Res. 2004-18 § 1].

7.2 Conservation.

Cascade shall develop and carry out, and Members must participate in, water conservation programs that are uniform among Members. The Board shall develop and implement a Cascade conservation management plan that provides a mandatory base conservation program that functions to reduce both average and peak demands and may establish a charge or assessment to fund development and implementation of the program. Members may implement additional conservation programs. The Board may adopt wholesale charges in addition to normal Demand Share charges to encourage resource conservation. The Board may also provide or contribute to additional local conservation programs that are not offered to all Members, and these local programs may be locally funded or funded by Cascade. Members that fail to comply with base programs as set forth in Cascade's conservation management plan may be required to assume a disproportionate reduction in water supply or to pay penalty charges, or both. [Res. 2012-06 § 1; Res. 2004-18 § 1].

7.3 Shortages and emergency.

A. Shortages. Members must respond to water shortages in a collective, shared fashion under a Cascade Shortage Management Plan adopted by the Board. Resources must be shared in a manner that reduces the risk of severe shortages to each Member. Cascade's Shortage Management Plan may include without limitation, a definition and classification of shortages, a shortage contingency plan including mandatory programmatic actions among all Members in the event of shortages, allocation of authority for determining and responding to shortages, and a communications and outreach program

for the public. Members shall not be required to implement Cascade's Shortage Management Plan in areas not served by the Supply System.

In the event of shortages, Cascade shall reduce or halt Interruptible Supply before invoking the Shortage Management Plan with respect to all Members with a Full Supply Commitment. However, the Board may, by 65% Dual Majority Vote, continue service in the amounts it deems appropriate to one or more Members receiving Interruptible Supply.

The Board may require that Members failing to comply with mandatory shortage management programs implemented under Cascade's Shortage Management Plan assume a disproportionate reduction in supply or pay penalty charges, or both.

In the event of a Cascade-wide water shortage, Members with Independent Supply may, without penalty, decline to participate in the shortage management program for that shortage by foregoing all supply from Cascade for the duration of the emergency or shortage.

To avoid shortages resulting from emergencies or the inability to develop sufficient supplies, the Board may, by 65% Dual Majority Vote, establish moratoria on connections or additional commitments for future water services by the Members. A moratorium may be discontinued by a Dual Majority Vote of the Board.

B. Emergency. The Board shall include in Cascade's Shortage Management Plan policies and procedures for addressing short-term disruptions of water supply, transmission or water quality, and it may delegate to the chief executive officer authority to address such disruptions according to such policies and procedures. [Res. 2012-06 § 1; Res. 2004-18 § 1].

7.4 Water quality.

In addition to agreements under Section 5.1 of this Agreement, Cascade shall be responsible for water quality that meets or exceeds all federal or state requirements at the point of delivery from Cascade to the Member, consistent with applicable laws and regulations. Cascade assumes source water quality responsibility and liability with respect to Water Supply Assets under its ownership or control (including water wheeled to a Member through another Member's facilities). Cascade is also responsible for preparing and carrying out water quality activities compatible with the water quality requirements of regional water suppliers integrated with Cascade's system (e.g., Tacoma, Everett, and Seattle).

Cascade may, in its sole discretion, determine and adjust the appropriate method and level of treatment of water that it supplies, so long as that water meets applicable state and federal requirements. If water that it supplies meets those requirements, Cascade shall not be obligated to adjust the method or level of treatment so that the water can be more readily blended with a Member's

Independent Supply or more readily transmitted through a Member's internal system. Each Member shall remain responsible for water quality within its respective distribution system, assuming that adequate water supply quality is provided by Cascade at the point of delivery from Cascade.

Each Member shall be responsible for all costs related to making water supplied by Cascade compatible with that Member's internal system, including but not limited to, costs of additional treatment. [Res. 2012-06 § 1; Res. 2004-18 § 1].

7.5 Water supply rates and charges.

The Board shall set Rates and Charges according to a Rate Calculation Methodology adopted from time to time by the Board. The Rate Calculation Methodology for Members' Supply Commitment shall provide for the definition and calculation of Demand Shares and for a uniform pricing structure with a commodity charge and fixed charges allocated by Demand Share.

Cascade may sell water to a Non-Member under terms and conditions established by a 65% Dual Majority Vote of the Board. Revenue received from the sale of water to Non-Members shall be used to offset or reduce Rates and Charges to Members to the extent practicable, except that such revenue need not be treated as reducing or offsetting those amounts that are necessary for the payment of debt service on Bonds and for the provision of reserve and coverage requirements for the Bonds.

A Member shall be assigned a Demand Share based on the Board's best estimate of capacity to be used by that Member. The Demand Share shall be established based on an audit of that Member's past three (3) years of water use. After three (3) years as a Member, the baseline demand and capacity obligation for that Member shall be fixed based on actual experience as a Member. A specific Demand Share may be set by the Board to account for circumstances, such as (by way of example and not by limitation) costs of extending the Supply System to a Member, or when Independent Supplies affect regional demand patterns. When water supply from Cascade is wheeled through a Member to another Member, Cascade may presume that the first Member receiving the water is the "User" for calculation of Demand Shares unless the Members concerned instruct Cascade to use a different allocation. Rate credits for Water Supply Asset transfers are not deducted in the calculation of Demand Shares but are applied to reduce what a Member would otherwise pay.

The Board must set Member Charges at levels it determines to be sufficient, together with other available revenue sources, to provide adequately for Operation and Maintenance Costs, Bond debt service, coverage and other covenants, replacement and renewal of facilities, reserve, and other costs that the Board deems appropriate. The Board may provide that a Member's failure to participate in the planning process may result in penalty charges.

A Member that has transferred Water Supply Assets shall receive a credit, determined when those assets are audited and transferred, based on the useful life of those facilities and on the Member's use of the water produced by those assets or an amount of water equivalent to the amount of supply from them.

The Board may implement wholesale charges (additional to Demand Share-based charges and variable commodity charges) to reduce extreme peak use (e.g., "peaking-off of the pipe").

Water Rates and Charges must be the same for all Members receiving the same class of service (subject to credits, surcharges and penalty charges). [Res. 2012-06 § 1; Res. 2004-18 § 1].

7.6 Franchises and easements.

Except to the extent otherwise required by state law, each Member shall provide franchises and rights of way on, under or across that Member's streets or other property, to Cascade and to other Members for Water Supply Assets, without charging any fees, rent or charges other than the customary and usual right-of-way permit and inspection fees. [Res. 2012-06 § 1; Res. 2004-18 § 1. Formerly 7.7].

7.7 Sales of water to nonmembers.

Unless approved by the Board, a Member shall not sell water supplied by Cascade, nor shall a Member sell Independent Supply offset by water supplied by Cascade to a Non-Member. Notwithstanding the foregoing, any Member may sell water supplied by Cascade to a Non-Member to the extent required by a contract in effect as of the date the Member joins Cascade. [Res. 2012-06 § 1; Res. 2004-18 § 1. Formerly 7.8].

7.8 Payment procedures – Default – Step-up provisions.

A. Invoice and Payment.

1. Cascade shall provide each Member with periodic invoices showing the Member Charges payable by that Member for the billing period and the due date. Invoices shall be provided monthly or on other such periodic schedule as determined by the Board, but no more frequently than monthly nor less frequently than once every six months. The Board will determine a due date for all invoices.

2. Payment of any and all invoices shall be due and payable on or before the due date, and shall be made by wire transfer or such other means as are agreed to by Cascade and the Member. If a treasurer, trustee, fiscal agent or escrow agent is appointed in connection with the issuance of Bonds, Cascade may require, and specify on the invoice, that certain amounts be provided directly to that person or entity, and the Member shall pay those amounts in the manner and to the person so specified.

3. If full payment of any invoice is not received on or before the due date, such payment shall be considered past due and a late payment charge shall accrue for each day that the invoice remains unpaid. The late payment charge shall equal the product of the unpaid amount and an interest rate established by the Board. Late payment charges shall continue to accumulate until the unpaid amount of the invoice and all late payment charges are paid in full. Further, if an invoice or any portion thereof remains unpaid for more than sixty (60) days after the due date, Cascade may pursue any legally available remedy at law or equity for the unpaid amount, including without limitation, specific performance and collection of the late payment charge. Cascade's right to enforce payments in this regard may be assigned to a treasurer, trustee, credit enhancement provider or other entity. Furthermore, upon written notice, Cascade may reduce or suspend delivery of water until the invoice and late payment charges are paid.

4. If any Member disputes all or any portion of an invoice, it shall notify Cascade immediately upon receipt. If Cascade does not concur, the Member shall remit payment of the invoice in full, accompanied by written notice to Cascade indicating the portions of the invoice that the Member disputes and the reasons for the dispute. The Member and Cascade shall make a good faith effort to resolve such dispute. If the Member fails to remit payment of the invoice in full pending resolution of the dispute, the prevailing party in an action relating to the collection of that invoice shall be entitled to reasonable attorney fees and costs.

B. Default and Step-Up.

1. If any Member fails to make any payment in full for more than fifty (50) days past the due date, Cascade shall make written demand upon that Member to make payment in full within ten (10) days of the date that the written demand is sent by Cascade. If the failure to pay is not cured within the ten (10) day period, the Member shall be deemed to be in default.

2. Upon an event of default as described in subsection (B)(1) of this section, the other Members shall pay Cascade (in addition to Member Charges otherwise due) the defaulting Member's Member Charges in proportion to each remaining Members' Demand Share in accordance with a schedule established by Resolution of the Board.

3. The payment of a proportionate share of the existing defaulted Member's Member Charges by Members shall not relieve the defaulting Member of its liability for those payments. Cascade shall have a right of recovery from the defaulting Member on behalf of each Member. Cascade may commence such suits, actions or proceedings at law or in equity, including but not limited to, suits for specific performance, as may be necessary or appropriate to enforce the obligations of this Agreement against any defaulting Member. Cascade's right to enforce payments in this regard

may be assigned to a treasurer, trustee, credit enhancement provider or other entity. Amounts recovered by Cascade as payment of amounts due shall be passed through to each Member in proportion to the share that each assumed, in cash or in credit, against future Member Charges as the Board shall determine.

4. The prevailing party in any such suit, action or proceeding, shall be entitled to recover its reasonable attorney fees and costs. [Res. 2012-06 § 1; Res. 2004-18 § 1. Formerly 7.9].

Article 8. Planning

8.1 Water supply plan.
Cascade must plan for its Members' water supply needs. That planning shall be compatible with the equivalent planning responsibilities of other wholesale water providers and with state, county and city planning responsibilities under state law. The Board must adopt, and may from time to time amend, a Water Supply Plan that must be based on no less than a twenty (20) year planning horizon. Cascade shall coordinate its planning effort with local and regional utilities and other appropriate agencies and work to encourage cooperative region-wide planning and coordination.

Each Member shall actively participate in Cascade's water supply planning and shall provide to Cascade accurate data regarding its facilities and operations together with good faith estimates of future needs and a description of any involvement in the development of new Independent Supplies. Each Member's water comprehensive or system plan shall be consistent with any plans adopted by Cascade, and shall be consistent with applicable requirements of state law and comprehensive plans. [Res. 2012-06 § 1; Res. 2004-18 § 1].

8.2 Watershed management plan.
Upon the effective date of formation of the Authority under Article 3 of this Agreement, Cascade will no longer be a Watershed Partnership under RCW 39.34; and any Watershed Management Plans existing on the effective date shall become the plans of the Authority. Nothing herein shall limit Cascade's powers to adopt Watershed Management Plans or to enter into interlocal agreements thereafter. [Res. 2012-06 § 1; Res. 2004-18 § 1].

8.3 System reliability methodology.
Cascade shall develop and adopt a system reliability methodology for planning, operation, and management purposes. [Res. 2012-06 § 1; Res. 2004-18 § 1].

Article 9. Duration and Dissolution – Withdrawal

9.1 Duration.

Except as provided in Section 9.3, Cascade shall remain in existence for the longer of the following: (a) the period it holds any assets; (b) the period during which Bonds are outstanding; or (c) the period it continues to include Members. [Res. 2012-06 § 1; Res. 2004-18 § 1. Formerly 10.1].

9.2 Withdrawals.

A Member may notify Cascade of its intent to withdraw by delivery to Cascade of a Resolution of its legislative authority expressing such intent. Upon receipt of such Resolution, the Member shall lose its right to vote and the Board shall determine (a) the withdrawing Member's allocable share of the cost of the then-existing obligations of Cascade; and (b) the withdrawing Member's obligations to Cascade. "Then-existing obligations of Cascade" means obligations or costs incurred by Cascade as of the date the Member's withdrawal notice is received, including but not limited to, Bond obligations, contract obligations, and cash financed capital projects; provided that a withdrawing Member's allocable share shall in no event include an obligation for future expenses for which Cascade has not incurred a legal obligation; and provided further, that to the extent the Member's obligation (with respect to such costs) is re-paid over time, the Member shall be entitled to a credit for supply abandoned by the Member and is otherwise used by Cascade. A "withdrawing Member's obligation to Cascade" includes but is not limited to, the Member's share of fixed operating costs, any other expenses contained in Cascade's adopted budget for that year, and any assessments or other similar charges lawfully imposed by Cascade. For purposes of the preceding sentence, "fixed operating costs" shall be determined in the year of withdrawal, and the Member's obligation with respect to such costs shall be limited only to that amount required to pay for supply abandoned by the Member and not otherwise used by Cascade.

The allocable share of cost or obligations shall be determined by the Board, taking into consideration as deemed applicable by the Board: (a) the ratio of the Member's Demand Share to total Member demand; (b) the ratio of the Member's contribution to Cascade revenue to total Cascade revenue including RCFCs; (c) the cost or a portion of the cost of capital projects or facilities specially benefiting the Member; and (d) and any other factor the Board deems appropriate to consider. The Member's withdrawal shall be effective on payment of such allocable share or provision for arrangements to pay such allocable share that are satisfactory to the Board. Until the effective date of withdrawal, the Member shall continue to comply with all applicable provisions of this Agreement.

Upon withdrawal, except as provided in an Asset Transfer Agreement, the withdrawing Member shall have no right to, or interest in any Water Supply Assets owned by Cascade. The withdrawing Member shall be deemed to have abandoned any and all rights to service, to the use of Cascade Water Supply Assets or other rights with respect to Cascade (except as otherwise expressly provided in this Agreement).

Notwithstanding the provisions of this Section 9.2, Cascade will, upon the withdrawal of a Member that has transferred operational control and management of (but not title to) an Independent Supply Asset to Cascade under Section 5.1, return operational control of such asset to the withdrawing Member. Return of operational control and management will be subject to: (a) continued use by Cascade, to the extent and for such time as the Board deems such use necessary for Cascade to continue providing service to its Members; and (b) payment or provision for payment of any Cascade costs, including but not limited to, those associated with the withdrawing Member's Independent Supply Asset.

The Board may establish additional generally applicable conditions and requirements for withdrawal. [Res. 2012-06 § 1; Res. 2004-18 § 1. Formerly 10.2].

9.3 Disincorporation.

Cascade may vote by a 65% Dual Majority Vote (as ratified within one hundred and twenty (120) days of such Dual Majority Vote by 65% Dual Majority of the Members' legislative authorities), to disincorporate. Upon disincorporation except as provided in an Asset Transfer Agreement, Cascade's assets initially shall be held by its then current Members as tenants in common. Each Member's ownership interest must be based on that Member's Demand Share as of the time of the dissolution. Cascade's liabilities (including Bonds and other contractual obligations) initially shall be distributed based on Members Demand Shares as of the time of the disincorporation. Assets and liabilities must be distributed in accordance with agreement or contract, under a voluntary mediation process, or by a court of law. A court may appoint an arbitrator or special master. Distribution shall be based on the best interests of efficient and economic water supply in the entire area served by the Members, subject to a rebuttable presumption that Water Supply Assets will be returned to the Member that originally transferred them to Cascade. That presumption may be overcome by a showing that another asset distribution is in the best interests of efficient and economic water supply. The proceeds of any sale of assets must be distributed among the then current Members based on the Demand Shares at the time of disincorporation. [Res. 2012-06 § 1; Res. 2004-18 § 1. Formerly 10.3].

9.4 Successor entity.

Notwithstanding the provisions of Section 9.3, upon a 65% Dual Majority Vote of the Board (as ratified within one hundred and twenty (120) days of such Dual Majority Vote by 65% Dual Majority of the Members' legislative authorities), all assets, liabilities, and obligations of Cascade may be transferred to any successor entity (including without limitation, a joint operating agency or other municipal corporation, as permitted under state law), and all obligations of Members and parties contracting with Cascade become obligations to the successor entity. [Res. 2012-06 § 1; Res. 2004-18 § 1. Formerly 10.4].

Article 10. Amendments

Amendments to this Agreement shall be effective upon approval by 65% Dual Majority Vote of the Board (as ratified within one hundred and twenty (120) days by 65% Dual Majority of the Members' legislative authorities). [Res. 2012-06 § 1; Res. 2004-18 § 1. Formerly Art. 11].

Article 11. Applicable Law and Venue

This Agreement is governed by the laws of the state of Washington. The venue for any legal action arising from a dispute under this Agreement is the Superior Court for King County. [Res. 2012-06 § 1; Res. 2004-18 § 1. Formerly Art. 12].

Article 12. No Third Party Beneficiaries

There are no third party beneficiaries to this Agreement except for the rights of Bond owners as provided in Section 5.3.2, no person or entity other than an agency signatory to this Agreement shall have any rights hereunder or any authority to enforce its provisions, and any such rights or enforcement must be consistent with and subject to the terms of this Agreement. [Res. 2012-06 § 1; Res. 2004-18 § 1. Formerly Art. 13].

Article 13. Severability

If any provision of this Agreement or its application is held by a court of competent jurisdiction to be illegal, invalid, or void, the validity of the remaining provisions of this Agreement or its application to other entities or circumstances shall not be affected. The remaining provisions continue in full force and effect, and the parties' rights and obligations must be construed and enforced as if the Agreement did not contain the particular invalid provision. But if the invalid provision or its application is found by a court of competent jurisdiction to be substantive and to render performance of the remaining provisions unworkable and infeasible, is found to seriously affect the consideration, and is inseparably connected to the remainder of the Agreement, the entire Agreement is deemed void. [Res. 2012-06 § 1; Res. 2004-18 § 1. Formerly Art. 14].

Article 14. Entire Agreement

This Agreement constitutes the entire and exclusive agreement between the parties relating to the specific matters covered in this Agreement. All prior or contemporaneous verbal or written agreements, understandings, representations or practices relative to the foregoing are superseded, revoked and rendered ineffective for any purpose. This Agreement may be altered, amended or revoked only as set forth in Article 10. No verbal agreement or implied covenant may be held to vary

the terms of this Agreement, any statute, law, or custom to the contrary notwithstanding. [Res. 2012-06 § 1; Res. 2004-18 § 1. Formerly Art. 15].

* Code reviser's note: Recitals to Res. 2012-06 follow at the request of the Cascade Water Alliance:

A. WHEREAS, the Members of Cascade Water Alliance ("Cascade") entered into an Interlocal Contract ("Interlocal Contract"), effective April 1, 1999, and amended and restated on December 15, 2004, and on October 26, 2011. Under the Interlocal Contract, Cascade was created as a public body and an instrumentality of its Members, which exercised essential governmental functions on its Members' behalf as authorized by the Interlocal Cooperation Act (Chapter 39.34 RCW), and has been functioning as a watershed management partnership, as authorized by RCW 39.34.200. Cascade was incorporated as a public nonprofit corporation in the manner set forth in the Nonprofit Miscellaneous and Mutual Corporations Act (Chapter 24.06 RCW).

B. WHEREAS, Section 3.3 of the Interlocal Contract provides that Cascade may be converted into a separate municipal corporation if and as permitted by law, and that upon the creation of such a separate municipal corporation, all Cascade rights and obligations and all Member rights and obligations shall transfer to that new municipal corporation. Section 10.4 of the Interlocal Contact provides that "upon a 65 percent Dual Majority Vote (ratified within 120 days by 65 percent), as measured by Dual Majority Vote of the Members' legislative authorities, all assets, liabilities, and obligations of Cascade may be transferred to any successor entity (including, without limitation, a joint operating agency or other municipal corporation, as permitted under state law), and all obligations of Members and parties contracting with Cascade become obligations to the successor entity." Cascade's Board resolutions also reserved Cascade's right to convert into a municipal corporation.

C. WHEREAS, the Washington Legislature enacted the Joint Municipal Utilities Services Act, (Chapter 258, Laws of 2011), codified as Chapter 39.106 RCW ("the Act"), which provides in RCW 39.106.080 for the conversion of existing an intergovernmental entity formed under the Interlocal Cooperation Act (Chapter 39.34 RCW) into a joint municipal utility services authority under the Act, if:

• The public agencies that are parties to an existing interlocal agreement would otherwise be eligible to form an authority to provide the relevant utility services;

• Those public agencies amend, restate, or replace that interlocal agreement so that it materially complies with the requirements of RCW 39.106.050;

• The amended, restated, or replacement agreement is filed with the Washington state secretary of state consistent with RCW 39.106.030; and

• The amended, restated, or replacement agreement expressly provides that all rights and obligations of the entity formerly existing under Chapter 39.34 RCW or other applicable law will thereafter be the obligations of the new authority created under Chapter 39.106 RCW.

D. WHEREAS, under the Act, upon compliance with the requirements set forth in Recital C above, the new joint municipal utility services authority shall be a successor of the former intergovernmental entity for all purposes, and all rights and obligations of the former entity shall transfer to the new joint municipal utility services authority. Those obligations shall be treated as having been incurred, entered into, or issued by the new joint municipal utility services authority, and those obligations shall remain in full force and effect and shall continue to be enforceable in accordance with their terms.

E. WHEREAS, in accordance with Sections 3.3 and 10.4 of the Interlocal Contract, Cascade's Members (who are all public agencies that are parties to an existing interlocal agreement) are otherwise eligible to form a joint municipal utility services authority under the Act to provide the relevant utility services.

F. WHEREAS, Cascade's Members intend to amend and restate the Interlocal Contract in compliance with the Act in order to convert Cascade into a joint municipal utility services authority.

G. WHEREAS, Cascade's Members intend to transfer all Cascade rights, assets, liabilities, and obligations to the joint municipal utility services authority, to be created as provided herein.

H. WHEREAS, Cascade's Members intend that, as a joint municipal utility services authority, it will constitute a municipal corporation and will no longer function as a watershed management partnership.

The Cascade Water Alliance Code is current through Resolution 2023-11, passed May 24, 2023.

Disclaimer: The Cascade Water Alliance has the official version of the Cascade Water Alliance Code. Users should contact the Cascade Water Alliance for ordinances passed subsequent to the ordinance cited above.

Alliance Website: https://www.cascadewater.org/
Alliance Telephone: (425) 453-0930

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AGREEMENT FOR WATER DISTRIBUTION BETWEEN THE CITY OF BELLEVUE AND THE CITY OF REDMOND

This Interlocal Agreement is made and entered into by and between the City of Bellevue, hereinafter referred to as "Bellevue", a municipal corporation of the State of Washington, and the City of Redmond, hereinafter referred to as "Redmond", a municipal corporation of the State of Washington.

WHEREAS, there currently exists an Interlocal Agreement dated November 6, 1998, between Bellevue and Redmond, providing for the operation of a water supply and distribution system within the service areas specified in said agreement; and

WHEREAS, Bellevue and Redmond are members of Cascade Water Alliance (Cascade) which is now the wholesale water supplier for the cities; and

WHEREAS, it is necessary and desirable to enter into a new Interlocal Agreement between Bellevue and Redmond which updates the respective duties and responsibilities of said cities with respect to distribution of water supplied by Cascade within the respective service areas of said cities; and

WHEREAS, it is in the interests of the public served by both Bellevue and Redmond to enter into a new Interlocal Agreement;

NOW, THEREFORE, it is covenanted and agreed as follows:

1. **Purpose**. The purpose of this Interlocal Agreement is to provide for the respective responsibilities and obligations of Bellevue and Redmond to provide for the operation and maintenance of water supply facilities within the common service area set forth in the Agreement.
2. **Joint-use/Ownership Distribution Mains**. The existing watermains listed below are to be classified as joint-use/ownership. Each city shall have a 50 percent (50%) ownership of these joint-use/ownership mains. The city identified as having responsibilities for each

watermain is responsible for all maintenance and operation of the watermain, including mainline valves, hydrants and hydrant piping. Each city is responsible for maintenance and repair of its own individual service lines (including saddles, corporation stops and any valves) and any mainline connection to a joint-use/ownership main. The cost of replacement of a joint-use/ownership main shall be shared equally between each city. The city identified as having responsibility for each joint-use/ownership main shall have the authority to determine when the joint-use/ownership main needs to be replaced. Each city shall provide at least two years notice of any scheduled replacement to the other city so budget impacts can be planned for.

Joint-Use/Ownership Distribution Mains:

A. Existing watermain on 148th Avenue NE between NE 20 Street and NE 51st Street - City of Bellevue's responsibility.

B. Existing watermain on NE 20th Street and Bellevue-Redmond Road from 148th Avenue NE to 156th Avenue NE – City of Redmond's responsibility.

C. Existing watermain on 156th Avenue NE from Bellevue-Redmond Road to NE 28th Street – City of Redmond's responsibility.

Joint-Use/Ownership Transmission Mains:

The existing watermains listed below were constructed pursuant to an "Agreement for Construction, Operation and Maintenance of Joint-Use Storage and Pumping Facility" dated September 28, 1990. The ownership in these mains is 56% Bellevue and 44% Redmond according to the terms of that Agreement.

- Existing transmission main on NE 40th Street between the Seattle meter at 140th Avenue NE and the joint-use pump station and reservoir.

This section is not intended to amend the terms of said Agreement but to document the water mains constructed under the terms of said Agreement.

3. **Service Area**. Redmond and Bellevue have established their common service area boundary to be as shown on Exhibit 1. Each city shall be the direct provider of water service within its service area boundary except for those properties shown on Exhibit 1 or defined by subsequent amendment to this Agreement.

Unless otherwise agreed, ownership and water service responsibilities for any non-joint-use watermains, services and customers are placed with the city in which they exist.

Within the Redmond service area there are herby established "direct read meter areas" and a "master meter area". The boundaries for direct read meter areas are shown on Exhibit 1. Remaining areas within Redmond with water delivered under this Agreement are in the master meter area.

Within the Bellevue service area there is hereby established a "direct read meter area" as shown on Exhibit 1 for water delivered by Redmond.

4. Metering

A. Master Meter Areas

1) Redmond. Redmond shall operate and maintain three master meters to measure the quantity of water entering the Redmond master meter area. The location of the meters are as follows:

a. NE 40th Street between SR 520 and 156th Avenue NE.

b. 156th Avenue NE between NE 31st Street and NE 36th Street.

c. NE 24th Street between 171st Avenue NE and 173rd Avenue NE.

The meters shall be maintained to provide 98 percent (98%) accuracy for a flow range between 50 gpm and 1,000 gpm.

2) Bellevue. Bellevue shall operate and maintain one master meter to measure the quantity of water leaving the Redmond master meter area. The location of the meter is as follows:

a. Bellevue-Redmond Road between NE 32nd Street and NE 35th Street. The meter shall be maintained to provide 98 percent (98%) accuracy for a flow range between 50 gpm and 1,000 gpm.

3) Ownership/Maintenance. Each city shall own its respective master meters and shall provide routine operation and maintenance.

B. Direct Read Meter Areas.

1) Redmond. The City of Redmond shall construct, operate, and maintain individual service meters to all water users to measure the quantity of flow consumed in the Redmond direct read meter area. These meters shall be the standard distribution meters used by the City of Redmond.

2) Bellevue. The City of Bellevue shall construct, operate, and maintain individual service meters to all water users to measure the quantity of flow consumed in the Bellevue direct read meter area. These meters shall be the standard distribution meters used by the City of Bellevue.

3) Ownership/Maintenance. Each city shall own all individual service meters in its service area and shall provide routine operation and maintenance.

C. Calibration and Replacement of Meters. All meters two (2) inches and smaller shall be replaced after 20 years of service from the time of installation. All meters three (3) inches and larger shall be calibrated at regular intervals to provide for proper measurement of water usage. Meters shall be calibrated according to the following schedule:

1) Master Meters: The first quarter of every odd numbered year.

2) All meters three (3) inches and larger: Every five (5) years.

The cost of meter calibration or replacement shall be paid by the owner of the meter. Any meter with accuracy limits which do not meet or exceed those listed in the latest edition of the AWWA Manual M6 under "Accuracy Limits for Removal from Service" shall be replaced by the owner of the meter. Each city shall provide a calibration and replacement report to the other city on an annual basis.

5. **Interconnection or Extensions with Other Parts of Redmond Water Systems**. Redmond agrees not to interconnect the water system within the direct read meter areas to other parts of its water system or customers outside the direct read meter areas without the written (or oral, in case of emergency) approval of Bellevue.

6. **Distribution of Water**. Any restriction of the distribution of water to Redmond shall be on an equitable basis in relation to the service provided to Bellevue customers in the general vicinity.

7. **Water Consumption Reporting**.

A. Determining consumption. Redmond shall read the individual service meters in the Redmond direct read meter areas. All meters shall be read monthly or bi-monthly. The Redmond direct read meter area consumption shall be determined by summing the consumption of all individual service meters then multiplying the total by 1.11. (The factor is to provide for unaccounted system losses of 10% of the total direct meter area usage.)

Redmond shall read the Redmond master meters monthly and the Bellevue master meter monthly. The total master meter consumption shall be determined by summing the totalized flow of the three Redmond master meters and subtracting the totalized flow of the Bellevue master meter.

Bellevue shall read the individual service meters in the Bellevue direct read meter areas. All meters shall be read monthly or bi-monthly. The Bellevue direct read meter area consumption shall be determined by summing the consumption of all individual service meters then multiplying the total by 1.11. (The factor is to provide for unaccounted system losses of 10% of the total direct meter area usage.)

B. Reporting Consumption. Each city shall report to the other city and to Cascade the total individual service meter consumption and the calculated direct read meter area

consumption. Redmond shall report to Bellevue and Cascade the master meter totalized flow. Each city shall report consumption data to the other city on a quarterly basis. Each city may request a report of the other city listing all meters within the direct meter area. This report shall be provided to the other city for its use in verifying that all direct read metered consumption is being reported.

8. **Old Water Allowance**. To the extent there is any current or future benefit from "old water" provisions of prior Seattle Water Purveyor Contracts the following "old water" allowances are hereby allocated from Bellevue's water usage to Redmond (hundreds of cubic feet):

	Month	Cumulative
January	17,656	17,656
February	17,235	34,891
March	14,686	49,577
April	18,425	68,002
May	16,794	84,796
June	23,462	108,258
July	22,386	130,644
August	29,010	159,654
September	29,897	189,551
October	27,946	217,497
November	23,128	240,625
December	20,667	261,292
	261,292	

9. **Responsibility for Damages, Repair and Replacement**. Redmond and Bellevue shall each be separately responsible for maintenance, repair and replacement of those facilities which are solely owned by such city. In the event of damages, repair, replacement, and maintenance of joint-use watermains where each city has a 50 percent (50%) ownership of such main pursuant to Section 2 of this Agreement, the cities shall each contribute to the cost of such repair, replacement, or maintenance on a 50/50 percent basis. To the extent that any joint ownership main is damaged in whole or part by the negligent activities of one of the cities, the city so causing such damage shall, in addition to its obligation to pay 50 percent (50%) of the cost of repair, replacement, or maintenance pursuant to the preceding

paragraph, also pay the same percentage of the remaining expense as its degree of negligence bears to 100 percent (100%).

10. **Liability/Hold Harmless**. Bellevue shall indemnify, defend, and hold harmless Redmond, it officers, agents, and employees, from and against any and all claims, losses, or liability, including attorneys fees, arising from injury or death to persons or damage to property occasioned by any act, omission, or failure of Bellevue, its officers, agents, and employees, in the performance of this Agreement. With respect to the performance of this Agreement and as to claims against Redmond, its officers, agents, and employees, Bellevue expressly waives its immunity under Title 51 of the Revised Code of Washington, the Industrial Insurance act, for injuries to its employees and agrees that the obligation to indemnify, defend and hold harmless provided for in this paragraph extends to any claim brought by or on behalf of any employee of Bellevue. This paragraph shall not apply to any damage resulting from the negligence of Redmond, its agents, and employees. To the extent any of the damages referenced by this paragraph were caused by or resulted from the concurrent negligence of Redmond, its agents, or employees, this obligation to indemnify, defend and hold harmless is valid and enforceable only to the extent of the negligence of Bellevue, its officers, agents, and employees.

Redmond shall indemnify, defend and hold harmless Bellevue, its officers, agents, and employees, from and against any and all claims, losses, or liability, including attorneys fees, arising from injury or death to persons or damage to property occasioned by any act, omission, or failure of Redmond, its officers, agents and employees, in the performance of this Agreement. With respect to the performance of this Agreement and as to claims against Bellevue, its officers, agents, and employees, Redmond expressly waives its immunity under Title 51 of the Revised Code of Washington, the Industrial Insurance Act, for injuries to its employees and agrees that the obligation to indemnify, defend and hold harmless provided for in this paragraph extends to any claim brought by or on behalf of any employee of Redmond. This paragraph shall not apply to any damage resulting from the negligence of Bellevue, its agents, and employees. To the extent any of the damages referenced by this paragraph were caused by or resulted from the concurrent negligence of

Bellevue, its agents, or employees, this obligation to indemnify, defend and hold harmless is valid and enforceable only to the extent of the negligence of Redmond, its officers, agents, and employees.

11. **Dispute Resolution**. Each city shall designate representatives for the purposes of administering this Agreement and resolving disputes arising from this Agreement. Each city shall notify the other in writing of its designated representatives. Each city may change its designated representatives on notice to the other.

    Disputes that cannot be resolved by the representatives designated herein shall be referred to the chief executive officer of each city for mediation and/or settlement. If not resolved by them within sixty (60) days, either city, or both of them, may file a demand for arbitration, in which event the issues shall be submitted to an arbitrator acceptable to both parties and the matter shall be arbitrated pursuant to the rules and procedures of the American Arbitration Association. The decision of the arbitrator shall be final and binding on both cities.

12. **Modification of Agreement**. This Agreement may only be modified in writing signed by both cities.

13. **Severability**. If any provision of this Interlocal Agreement shall be held invalid, such invalidity shall not affect the other provisions of this Agreement which could be given effect without the invalid provision, and to this end the provisions of this Agreement are declared to be severable.

14. **Effective Date**. This agreement shall take effect on January 1, 2004.

15. **Repeal**. Upon the effective date of this agreement, the previous Interlocal Agreement dated November 6, 1998 between Bellevue and Redmond is no longer in effect.

HEREBY AGREED TO AND ACCEPTED on this the 8 day of June, 2005.

CITY OF BELLEVUE

By: _____
Steve Sarkozy, City Manager

Approved as to form:

By: _____
Assistant City Attorney

CITY OF REDMOND

By: _____
Rosemarie Ives, Mayor

Approved as to form:

By: _____
City Attorney

AGREEMENT FOR WATER SYSTEM INTERTIE
(NE 95th STREET)

This Agreement made and entered into between Union Hill Water Association ("Association"), a non-profit corporation, and the City of Redmond ("City"), a municipal corporation of the State of Washington.

W I T N E S S E T H:

WHEREAS, the City is a non-charter, optional municipal code city organized and operating pursuant to Chapter 35A RCW; and

WHEREAS, the Association is organized and operating pursuant to chapter 24.03 RCW and is authorized to operate a water system within its boundaries; and

WHEREAS, The City and Association entered into a Water Service Agreement on August 17, 1966 that provided that the City furnish water to the Association at a point of delivery at NE 95th Street approximately 520 feet east of Bear Creek; and

WHEREAS, the Water Service Agreement also provided terms and conditions regarding the provision of operating and maintenance service, pricing of services, and billing procedures; and

WHEREAS, the Water Service Agreement has a contract term of 40 years and will expire on December 31, 2006; and

WHEREAS, the existing metering station would provide the Association with an emergency source of additional water, and the parties mutually desire to change the nature of the Association's connection to the City from a source of supply to an emergency intertie pursuant to the terms and conditions set forth below;

NOW, THEREFORE, the parties do hereby agree as follows:

1.0 **Purpose.** The purpose of this Agreement is to provide an Intertie of the water system from the City to the Association with an emergency water source.

2.0 **Definitions.** For purposes of this Agreement, "emergency" shall mean an unforeseen circumstance of short duration resulting from a failure of the Association's water system equipment or piping or from a fire which necessitates transfer of water from the City to meet life safety demands and satisfy minimum levels of service for customers. An emergency shall not be construed to exist as a result of the inability of a party to meet higher than anticipated demands by customers as a result of weather, new connections to the respective system or other causes not related directly to a failure of equipment or piping.

3.0 **Description of Intertie.** The Intertie is currently located along NE 95th Street. This is a 10" Intertie and is within the King County right-of-way of NE 95th Street at approximately 191st Ave NE just east of the Redmond City limits.

4.0 **Ownership.** Effective January 1, 2007, the City does hereby transfer and convey to the Association all right title and interest in the Intertie, consisting of a meter, valves, vault and appurtenances located at the address specified in Section 3.0.

5.0 **Maintenance.** The Association shall maintain the Intertie in good working order in accordance with sound maintenance procedures, good engineering practices and applicable laws, rules and regulations such that the association will receive and enjoy the emergency use of the Intertie as provided in this Agreement. Maintenance shall include meter calibration, to be performed no less frequently than every 10 years.

6.0 **Replacement.** In the event of total loss or destruction of the Intertie, or a portion thereof, the Association shall be entitled but not obligated to rebuild that section at its sole cost and expense.

In the event the Intertie is destroyed or damaged during the term of this agreement and the Association makes the decision not to repair or replace the Intertie, the Association shall, at the Association's expense, take the necessary steps to permanently abandon the Intertie.

7.0 Notification, Use, and Payment.

7.1 Notification. Prior to use of the Intertie to deliver water from the City to the Association, the Association shall notify the City of the nature of the emergency, and its expected duration. In the event the emergency requires immediate operation to protect lives or property, notification should occur as soon as practicable under the circumstances. Within ten days of use of the Intertie to deliver water from the City to the Association, the City and the Association will provide a report of its use to the Cascade Water Alliance, stating the nature of the emergency, the date and time of use, and the quantity of water used.

7.2 Use. Operations personnel from both parties will participate in activating and deactivating the Intertie to preclude unanticipated impacts within respective systems. In the event the emergency requires immediate operation to protect lives or property, either party may operate the Intertie, with notification to occur as soon as practicable under the circumstances, but not later than 24 hours following such incident.

7.3 Payment for Water Delivered. Water sold for emergency purposes shall be priced at the wholesale rate of the regional water provider in effect at the time of sale.

8.0 General.

8.1 Duration. The parties acknowledge and agree: (1) that the use of said Intertie is essential to the operations of the Association in providing water service to its customers under emergency conditions; and, (2) that each party will rely

upon the continued existence of the Intertie and rights of usage granted hereunder in its long range planning and issuing bonds, notes and other financing documents. Thus, each party covenants and agrees with the other not to interfere with the other's rights granted hereunder; not to violate applicable laws, rules and regulations of agencies with regulatory jurisdiction over the parties; and not to take any action inconsistent with this Agreement. This Agreement may be terminated only through the mutual written Agreement of both parties.

8.2 Not a Partnership. This Agreement shall not constitute or create a partnership or a joint venture.

8.3 Compliance with Laws and Regulations. Each party shall, with respect to its duties, responsibilities and operations hereunder, comply with all applicable laws, rules and regulations governing the same. Each party shall comply with the Department of Health "Intertie Statute", section 90.03.383 RCW.

8.4 Specific Performance. In addition to all other remedies available to a party hereunder, whether in law or equity, each party to this Agreement shall have the right to seek and obtain specific performance of the terms hereof. The parties agree that damage occurring by reason of the breach hereof is difficult, if not impossible, to ascertain and that remedies of law are inadequate.

8.5 Assignment. Neither party shall have the right in whole or in part to assign this agreement or its rights and obligations hereunder or its interest in the Intertie without prior written consent of the other party, which shall not be unreasonably withheld, delayed, or conditioned.

8.6 Authority. This Agreement is entered into by the parties hereto pursuant to the authority contained in RCW 35.67.300 and RCW 24.03.

8.7 Attorney's Fees. If a suit or other action is instituted in connection with any controversy arising out of this Agreement, the prevailing party shall be entitled to recover all of its costs and expenses including such sum as the court may judge reasonable for attorneys fees, including fees upon appear of any judgement or ruling.

8.8 Non Waiver. No waiver by either party of any term or condition of this Agreement shall be deemed or construed as a waiver of any other term or condition or of any breach hereof, whether pertaining to the same or a different provision of this Agreement.

8.9 Severability. If any section, subsection, sentence, clause, phrase, or other portion of this Agreement is, for any reason, declared invalid, in whole or in part of any court or agency of competent jurisdiction, said decision shall not affect the validity of the remaining portions hereof.

8.10 Indemnity. Each party agrees to indemnify, defend and hold harmless the other party, its officers, agents, and employees, from and against any and all claims, losses, or liability, for injuries, sickness or death of persons, or damage to property, arising out of any willful misconduct or negligent act, error, or omission of the indemnifying party, its officers, agents, subcontractors or employees, in connection with actions taken pursuant to this Agreement. Provided, however, that the indemnifying party's obligations to indemnify, defend and hold harmless for injuries, sickness, death or damage caused by or resulting from the concurrent negligence or willful misconduct of the indemnitee and the indemnifying party, or of the indemnifying party and a third party other than an officer, agent, subcontractor or employee of the indemnifying party, shall apply only to the extent of the negligence or willful misconduct of the indemnifying party.

9.0 **Execution of Documents.** Each party agrees to execute any and all documents and instruments necessary to give effect to and carry out the terms of this Agreement and to obtain the necessary approval of the same by government agencies as required by law.

10.0 **Term.** The term of this agreement shall be 40 years, commencing and terminating December 31, 2046.

UNION HILL WATER ASSOCIATION

BY Frank Pendleton
President
Date Feb. 13, 2007

CITY OF REDMOND

BY Rosemarie Ives
Rosemarie Ives, Mayor
Date 2/27/07

ATTEST:

BY _____
Secretary
Date _____

ATTEST:

BY _____
Malisa Files, City Clerk
Date 2/28/07

APPROVED AS TO FORM:

BY _____
Date _____

APPROVED AS TO FORM:

BY _____
Date 2-27-07

o:\agenda\Union Hill-Red Ridge Intertie Agrmt.doc

MEMBERSHIP AUDIT ACCEPTANCE AGREEMENT

Between

CASCADE WATER ALLIANCE

And

CITY OF REDMOND

MEMBER

May 23, 2008

Cascade Water Alliance ("Cascade") and the City of Redmond ("Redmond") enter into this Membership Audit Acceptance Agreement (the "Audit Agreement") with respect to Redmond's public water system.

Article I: Authority – Audit Predicate – Audit – Definitions

Section 1.1 Authority. Article V, Section 5.2.2 of the Cascade Water Alliance Amended and Restated Interlocal Contract, dated December 15, 2004, (the "Interlocal") requires an audit of each Member's water system and Independent Supply, if any, for the purposes of (1) determining Cascade's supply obligation to that Member, (2) recognizing when the Member has lost Independent Supply, and (3) allocating credits against the Member's Regional Capital Facility Charge for its Independent Supply.

Section 1.2 Audit Predicate. Cascade's supply obligations (water quantity and quality) and related supply obligations and the Member's obligations concerning planning, conservation, shortage management, Independent Supply, and payment of Rates and Charges are established by the Interlocal. This Audit Agreement is intended to implement, not modify the Interlocal, and nothing herein shall change the benefits or obligations of a party to the Interlocal.

Section 1.3 Audit. This Audit Agreement incorporates and adopts the audit of Redmond's public water system, dated May 23, 2008, performed by Cascade Water Alliance (the "Audit"). *The Audit was performed according to a methodology adopted by the Board of Directors of Cascade (the "Board") in Resolution No. 2008-04.* The original Audit is on file with Cascade. A true and accurate copy is attached hereto as Exhibit A.

Section 1.4 Definitions. Capitalized terms not otherwise defined in this Agreement shall have the meaning assigned to them in the Interlocal. The following words have the following meanings when used in this Agreement:

a) Production Requirement – The quantity (seasonal and annual) of water a Member is required to supply from its Independent Supply as established by the Audit and set forth in Section V of Exhibit A.

b) Failure to meet Production Requirement – A Member's voluntary or involuntary failure to meet Production Requirements and so declared by a resolution of the Board.

c) Loss of Supply – A Member's permanent Failure to Meet Production Requirements, or a portion thereof, and so declared by a resolution of the Board.

Article II: Independent Supply

The Audit accurately identifies and quantifies Redmond's Independent Supply for the purpose of establishing Cascade's supply commitment to Redmond.

Article III: Supply Commitment

Cascade's supply commitment, as provided in the Interlocal and further defined by the Audit, shall be implemented through the Points of Delivery that are identified in Exhibit A.

Article IV: Wheeling

All existing wheeling arrangements between Members or between Members and non-members as described in Exhibit A shall remain in effect. For future wheeling arrangements, Cascade shall pay wheeling charges when, in the judgment of the Board, a wheeling arrangement represents a cost-effective way to provide water to a Member or non-member.

Article V: Points of Delivery

Section 5.1 Cascade shall either own, or by contract with Seattle, have wholesale master meters at all points of delivery of the regional transmission system as set forth in Exhibit A.

Section 5.2 Costs related to installation of future wholesale master meters initiated by Cascade shall be borne by Cascade. The cost of installing any future wholesale master meters not initiated by Cascade and not listed in Exhibit A shall be charged pursuant to Cascade's fiscal policies to the entity (Member or non-member) receiving the water.

Section 5.2.2 Between the time of formation of Cascade and the offer of this Membership Audit Acceptance Agreement Redmond initiated the installation of two of the wholesale master meters included in Table 1 of Exhibit A, one at Trilogy Parkway NE and one at NE 172nd Street. The initiation of the installation of the meters and many of the costs of installation were incurred prior to the adoption of Cascade's fiscal policies which at this time state that the costs of installation of the meters would be charged directly to Redmond. In consideration of the fiscal policies and the specifics of the situation Redmond and Cascade agree that Redmond shall pay Cascade $28,077.51 for the costs of installation of these meters.

Section 5.3 The hydraulic gradients for the points of delivery are established in Exhibit A. A Member may request changes to such hydraulic gradient(s) to avoid adverse impacts to their distribution system. Cascade shall assume the initial cost of any adjustments required at the Member supply connection to match the defined range. Cascade shall also assume the initial cost of any adjustments (within the Member's distribution system) resulting from changes to the defined hydraulic gradient range caused by Cascade. Thereafter, the cost of any subsequent adjustments shall be borne by each individual Member. Under emergency conditions or other unusual short-term operating situations, Cascade shall not be obligated to meet minimum hydraulic gradients.

Article VI: RCFC Credits – Independent Supply – Production Requirements – Loss

Section 6.1 Award of Credits. According to the Audit, Redmond is entitled to and shall have 1,603 credits against the Regional Capital Facilities Charge. These credits may be taken only in such amount, at such time, and in such manner as provided by the Interlocal and by resolutions of the Board.

Section 6.2 Production Requirements – Waiver

6.2.1 Redmond accepts the Audit and the Production Requirement established by the Audit and set forth in Exhibit A, and agrees to produce water from its Independent Supply in an amount at least sufficient to meet its Production Requirements.

6.2.2 The Board may temporarily modify or waive Production Requirements when:

a. the modification or waiver will not result in any increased demand upon Cascade or any increased cost to Cascade;

b. the modification or waiver is based upon unforeseen events such as equipment failure, natural disaster, or other situation that could not have been reasonably foreseen by Member(s);

c. the modification or waiver is based upon a planned temporary interruption of production as might be needed to perform routine maintenance or modification to a Member's system, the impacts of which have been coordinated in advance with Cascade;

d. the modification or waiver is warranted by considerations of equity and fairness as determined in the sole discretion of the Board;

e. the modification or waiver is based upon an agreed demand mitigation plan submitted by a Member and accepted by the Board; or

f. The modification or waiver is in effect only for a specified and limited (not to exceed one year) period of time.

Section 6.3 Production Requirements – Administration and Enforcement. Production Requirements shall be administered and enforced as follows:

6.3.1 Cascade will monitor Members' Independent Supply and Cascade's supply to Members through the collection of necessary reports and data. Cascade will evaluate Independent Supply production relative to Production Requirements and periodically report to Members on status. The frequency of such reports will be determined by practical timeframes for receipt and compilation of necessary data from regional and local sources. If a Member fails to meet Production Requirements, Cascade will notify the Member and the Board as soon as practical.

6.3.2 Each year, Cascade will periodically assess the supply and demand situation to determine whether Production Requirements may be waived or reduced based on a finding of surplus in water supply capacity or capability relative to demands. In the event of shortage conditions invoking shortage response, Cascade will work with Members to maximize those

Members' reliance on Independent Supply while recognizing that concurrent demand reductions may cause de facto reductions in the ability to put Independent Supply to full productive use.

6.3.3 The Production Requirement shall be reduced pro rata to reflect a reduction in demand levels in any year. For this purpose, Cascade shall determine the actual Cascade usage per CERU for its collective Members, divide this usage by the standard usage per CERU established and used by Cascade, and multiply this ratio times the Production Requirement. This shall be done separately for annual and peak season demands and Production Requirements.

6.3.4 Shortfalls in production that are not waived by the Board or otherwise satisfied by any of the foregoing shall be documented by a resolution of the Board that shall impose penalties according to a graduated series of financial surcharges and operational sanctions, as follows:

Cascade Actions for Member Shortfall in Independent Supply Production			
Frequency	**Financial Response** *(applies to volume of shortfall)*		**Operational Response**
	Peak Season Shortfall	**Annual Shortfall**	
1st occurrence in 20-year rolling period	None	None	Cascade notifies Member and Board adopts resolution declaring production failure
2nd occurrence in 20-year rolling period	Surcharge equal to 25% of Cascade's *average cost* per ccf delivered*	Surcharge equal to 5% of Cascade's *average cost* per ccf delivered*	Cascade notifies Member and Board adopts resolution declaring 2nd production failure, imposing penalties, and detailing consequences of further failures
3rd and subsequent occurrences in 20-year rolling period	Surcharge equal to 200% of Cascade's *average cost* per ccf delivered*	Surcharge equal to 80% of Cascade's *average cost* per ccf delivered*	Cascade notifies Member and Board adopts resolution declaring 3rd production failure, imposing penalties, and warning that a fourth failure will be deemed a Member declaration of "loss of supply"
** "average cost per ccf delivered" is defined as total annual Cascade Demand Share revenue divided by total annual Cascade volume delivered.*			

Provided that only one occurrence of a shortfall in Independent Supply Production may be declared per year, and provided further that in the event of multiple shortfalls in the same year (e.g. both peak season and annual shortfalls), the financial penalty shall be the greater of the calculated penalties.

6.3.5 A resolution declaring a permanent Loss of Supply shall be adopted by the Board upon the 4th occurrence of a Failure to Meet Production Requirements in a 20 year rolling period.

6.3.6 Whenever a resolution declaring a Loss of Supply has been adopted by the Board, (a) the Member shall concur in the declaration of Loss of Supply and formally request an additional Full Supply Commitment from Cascade in accordance with Section 5.2.2 of the Interlocal; (b) Cascade shall, at the Member's expense, perform an audit according to the approved audit methodology to quantify Cascade's additional Full Supply Commitment to the Member; and (c) Cascade shall impose, by resolution of the Board, the applicable annual financial penalties provided for in Section 6.3.4 of this agreement for that Loss of Supply, until the Member submits to Cascade a formal request for an additional Full Supply Commitment according to the Interlocal.

6.3.7 Whenever a Member experiences a Loss of Supply, that Loss of Supply shall be documented in a resolution of the Board and copy provided to the Member. The resolution shall state the basis for the Board's declaration. A resolution declaring a Loss of Supply may be rescinded upon a showing satisfactory to the Board of replacement of lost supply consistent with the requirements of the Interlocal.

ARTICLE VII: General

Section 7.1 Integrated Agreement. This Agreement implements provisions of the Interlocal and shall be construed and interpreted to that effect; otherwise, this document and all attachments integrates all prior oral and written representations between the parties and is the complete agreement between Cascade and Redmond concerning the Audit of Redmond's public water system.

Section 7.2 Amendment. Except as otherwise provided, this Audit Agreement may be amended only in writing and only if such writing is signed by the Member and by Cascade; provided, however, an approved water system plan that modifies the Member's service area shall amend the service area described in Section 2.1 pending a further Audit of the Member's public water system in accordance with the Interlocal.

Section 7.3 Interpretation and Venue. This Audit Agreement shall be interpreted and construed according to the laws of the State of Washington; provided that the Interlocal, the Audit, and applicable Cascade resolutions may be consulted as aids to interpretation and construction. Any action to enforce this Agreement shall be brought in King County, Washington.

Section 7.4 Effective Date. This Audit Agreement shall be effective on the date that it is approved by resolution of the Board.

CASCADE WATER ALLIANCE
By:

Ed Oberg, Chief Executive Officer

9/3/08
Date

Date _____.

S

Pursuant to Cascade Water Alliance Resolution No. 2008-12, Section 4, adopted 8/27/08, the Chief Executive Officer is authorized to execute the Audit Acceptance Agreements for the seven Cascade Members listed in Section 2.

Date _____.

MEMBER
By:

Jane Anderson

Mayor or City Manager or President of Commissioners

Date 8/26/08.

Attest:

Michelle M. McGehee

Date 8/26/08.

EXHIBIT A

MEMBER WATER AUDIT

CITY OF REDMOND

PREPARED FOR CASCADE WATER ALLIANCE

May 1, 2008

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Exhibit A. Master Meter

Section I: Purpose & Background

This water audit outlines the supply relationship between Cascade Water Alliance (Cascade) and its Members, documenting each Member's official service area and independent supply sources. As a condition for membership in Cascade, the City of Redmond participated in a water system audit in 1999. The audit included a review of the City's independent supply sources, which resulted in an award of independent supply credits to the City for use against future Regional Capital Facilities Charge (RCFC) payments. The prior audits were conducted on the premise that Cascade would commence operation and supply delivery in 2000 – however, Cascade did not begin delivering water until 2004.

Cascade has recognized the need to update the prior audits for Members with independent supply sources to establish Member obligations to produce water from independent supplies, and to define RCFC credits (redeemable beginning in 2008). This document has been prepared in accordance with Article V, Section 5.2.2 of the Amended and Restated CWA Interlocal Contract (dated December 15, 2004), which authorizes Cascade to conduct audits of the independent supplies of its Members at any time.

Section II: Utility Description

The City of Redmond is a municipal corporation that owns and operates a public water system serving customers inside its water service area. Table 1 summarizes information pertinent to the City's water system:

Table 1: General Water System Information – City of Redmond

Water System Name:	City of Redmond
Water System ID No:	71650
Water System Classification:	Group A – Community Type
Type of Ownership:	Local Government
Owner No:	4821
Address:	15670 N.E. 85th Street, Redmond, 98052
System Contact Person:	Scott Thomasson
CERU Count as of 12/31/04:	27,945
Sources of Information:	**Cascade / City Records**

Section 2.1 Service Area

The City's water service area generally conforms to the city limits and Redmond's future annexation areas, with the exception of the Novelty Hill service area northeast of the City along Novelty Hill Road.

The City does not anticipate any major changes to its water service area in the immediate future, although the service area may be expanded to provide service to areas annexed into the City. It should also be noted that the Redmond water system does provide water service outside its official service area to a small number of isolated customers along Old Redmond Road. These customers were connected to the original pipeline from Sidell Creek. The City is intending to abandon this facility, and these customers should look to Union Hill for service. The City does not plan to provide any additional services from this line in the future, as demonstrated by its official water service area boundaries.

The City serves several areas outside the city limits, including: Marymoor Park, Avondale Road and Avondale Park, 60 Acres Park, and portions of the Rose Hill water service area in unincorporated King County. For the portions of the City's system in unincorporated King County, the City has franchise agreements with, or will obtain franchise agreements from the County.

The City is divided into a number of distinct areas, each of which is served by a different source:

- The well service area is supplied by wells, with a wholesale connection to Seattle's Tolt Pipeline No. 2.
- The Overlake / Viewpoint area receives most of its water from Seattle's Tolt Eastside Supply Line (TESSL) through jointly owned and operated Redmond / Bellevue facilities.
- The Rose Hill area obtains its supply from Seattle's Tolt Eastside Supply Line.
- The Novelty Hill service area, including the Redmond Ridge and Trilogy Urban Planned Developments (UPDs), receives water from the Tolt Tie Line, which is supplied from Tolt Pipeline #1 and Tolt Pipeline #2.

Section 2.2 Pre-Existing Service Commitments to Non-Members

The City does not currently have any pre-existing service commitments to non-members. It had been selling water to Union Hill Water Association under an existing forty-year agreement that expired at the end of 2006, and did not renew the agreement upon its expiration. In accordance with Cascade practice regarding terminated service, Redmond's CERU count will be adjusted to reflect the expiration of the City's agreement with Union Hill Water Association.

Section 2.3 Distinguishing Characteristics & Considerations

The following considerations are unique to the City of Redmond's system:

- Much of the City's projected near-term growth is expected to occur in the Novelty Hill Service Area (including the Redmond Ridge East, which will be primarily residential development). However, the water audit awards RCFC credits to the City based on its surplus well capacity, which the City can only use in its well service area. While the distinction between the City and Novelty Hill Service Areas is fairly irrelevant to Cascade, it is worth noting that given the City's ability to use its wells to meet demands in the well service area, the City may choose to limit the rate at which it redeems its credits and meets the corresponding production requirements.

- The water audits generally assume that Members can sustain peak production levels of two-thirds (roughly 67%) of their instantaneous flow capacity throughout the peak season. However, the City indicated that it would be able to consistently run its wells at 75% of their instantaneous flow capacity during the summer months. This results in a greater number of credits for the City, but also increases the incremental peak-season production requirement associated with each credit redeemed by the City.

- Well No. 4 was under construction during part of the three-year period used in the audit. During construction water was produced during start-up and testing. The City requested that Well No. 4 be considered a new source of supply for the water audit. Cascade's Board of Directors approved the City's request – therefore, Well No. 4 is considered to be a new source of supply with no existing utilization.

Section III: Supply Commitment

Section 3.1 Delivery Points

The specific Points of Delivery are identified in Figure 1. The location of each Point of Delivery is listed in Table 1 and is the Points of Delivery as defined by the Member agency at the time the water audit was finalized.

Redmond Water Service Area
Legend
Cascade Member Well
Supply Intertie
Key Map
CASCADE WATER ALLIANCE
HDR
February 2008

Figure 1

Table 1

TABLE OF DELIVERY POINTS

LOCATION	JURISDICTION	STA_NO	HYDRAULIC GRADIENT (Ft)		TYPE
			Minimum	Maximum	
140th Avenue NE & 40th Street	Bellevue /Redmond	65	500	720	SUPPLY
152nd Avenue NE & NE 8th ST	Bellevue /Redmond	61	460	720	SUPPLY
132nd Avenue NE & NE 113th Street	Kirkland / Redmond	74	545	720	SUPPLY
132nd Avenue NE & NE 85th Street	Kirkland / Redmond	75	535	720	SUPPLY
140th Avenue NE & NE 70th Street	Kirkland / Redmond	72	530	720	SUPPLY
160th Avenue NE & NE 104th Street	Redmond	165	515	720	SUPPLY
Trilogy Parkway NE & NE 125th Street	Redmond	164	610	720	SUPPLY
Trilogy Parkway NE & NE 125th Street	Redmond/Plateau	167	610	720	SUPPLY
NE 172nd Street & Tolt Pipeline No. 2	Redmond	300	515	720	SUPPLY

Section 3.2 Water Quality

As part of the Cascade Interlocal Contract, Cascade is responsible for the quality of water delivered through its system up to the delivery points specified in Section 3.1. The City maintains responsibility for the water quality of its independent supply sources. Beyond this, Cascade and its Members continue to develop policy and practice related to relative duties and responsibilities for water quality monitoring, management, and compliance.

Section 3.3 Shortages and Other Supply Restrictions

Section 7.3 of the Interlocal Contract specifically addresses the actions that Cascade and the Members will take in the event of supply shortages. In summary, Cascade will reduce or halt interruptible supply commitments first; in cases where further usage restrictions are needed, Members will share the associated burden under a shortage management plan adopted by Cascade's Board of Directors.

Section IV: RCFC Credits

Section 4.1 Audit Methodology

The City's water audit is prepared in accordance with the Audit Methodology, which establishes the general methodology to be used in the water audits. Sections 4.2 – 4.4 discuss the methodology in more detail, to the extent that it specifically applies to the City.

Section 4.2 Assessment of Surplus Independent Supply Capacity

Credits are awarded to the City based on its surplus independent supply capacity. The audit calculates the City's surplus independent supply capacity as the difference between the maximum capacity of its independent supply sources and its utilization of that capacity.

Section 4.2.1 Audit of Independent Supply Sources

As previously noted, the City of Redmond owns and operates five wells as independent water supply sources. The existing physical capacities for each of the City's supply wells are summarized in Table 3 along with the water rights relevant to each supply source.

Table 3: Summary of Independent Supply Sources

Supply Source	Ground Water Certificate(s)	Instantaneous Flow Capacity	Permitted Yield
Well No. 1	1313-A and G1-00130C	900 gpm	1,344 ac-ft/yr
Well No. 2	3420-A	500 gpm	605 ac-ft/yr
Well No. 3	6675-A	350 gpm	400 ac-ft/yr
Well No. 4	G1-22608C	500 gpm	1,280 ac-ft/yr
Well No. 5	G1-24204C	1,000 gpm	1,600 ac-ft/yr
Total		**3,250 gpm**	**5,229 ac-ft/yr**

As shown in Table 3, there are two water rights certificates currently in place for Well No. 1. Certificate 1313-A includes a permitted flow rate of 200 gpm and an annual yield of 224 acre-feet with a priority date of July 23, 1951, while Certificate G1-00130C has a priority date of February 3, 1972 with a permitted flow rate of 700 gpm and a 1,120 acre-foot annual yield.

Well No. 2 operates under Certificate 3420-A with a priority date of July 25, 1958, a permitted flow rate of 500 gpm, and an annual yield of 605 acre-feet.

Water Right Certificate 6675-A covers Well No. 3 with a priority date of November 27, 1968, a permitted flow rate of 480 gpm and an annual yield of 400 acre-feet. City staff has indicated that Well No. 3 has a physical peak season pumping limitation of 350 gpm. Water Right Certificate G1-22608C covers Well No. 4 and includes an 800 gpm permitted flow rate and a 1,280 acre-foot annual yield with a priority date of November 5, 1975 – however, City staff has indicated that Well No. 4 has a physical pumping limitation of 500 gpm. Well No. 5's Water Right Certificate G1-24204C carries a November 17, 1982 priority date, a permitted flow rate of 1,000 gpm, and an annual yield of 1,600 acre-feet.

In addition to the water rights described above, the City owns surface water rights. The surface water rights are for diversion of an instantaneous quantity of 5 cubic feet per second (cfs) (2,244 gpm) with an unspecified annual quantity. Portions of the rights for Wells 1, 2, and 3 are supplemental to the other well rights and this surface water right. The City also owns a reservoir storage right of 33 AF.

If future improvements expand physical production capacity, the additional capacity would be treated as new independent supply capacity under the terms of the CWA Interlocal, with corresponding credits and production requirements.

Section 4.2.2 Audit of Independent Supply Utilization

For the purpose of the audit, the City's independent supply utilization is calculated as a three-year average (2001 – 2003) of independent supply production – a three-year average is used to attenuate the effects of abnormal demand years.

Table 4 summarizes Redmond's demand from 2001 – 2003, as provided by the City:

Table 4: Summary of Redmond Demand (2001 – 2003, in ccf)

2001	Wells	Bellevue	Kirkland	Seattle	Total
January	89,662	28,901	70,943	0	189,506
February	82,055	42,511	63,530	0	188,096
March	94,811	27,557	72,011	1	194,380
April	91,930	33,821	61,952	0	187,703
May	103,861	47,990	69,752	0	221,603
June	110,477	68,826	102,355	5	281,663
July	89,179	47,862	112,523	35,032	284,596
August	93,856	78,368	118,879	45,882	336,985
September	84,571	82,555	93,474	42,550	303,150
October	67,897	45,833	72,447	33,911	220,088
November	51,487	30,134	70,071	30,640	182,331
December	82,189	38,459	78,204	17,964	216,816
Total	**1,041,975**	**572,817**	**986,141**	**205,985**	**2,806,917**

2002	Wells	Bellevue	Kirkland	Seattle	Total
January	88,833	25,997	66,706	6,988	188,524
February	75,705	34,906	64,965	6,700	182,276
March	84,703	27,514	90,907	8,279	211,403
April	84,832	35,207	59,240	8,585	187,864
May	100,365	36,083	96,205	10,544	243,197
June	111,856	42,349	114,998	16,771	285,974
July	105,634	73,404	165,151	56,455	400,644
August	105,559	101,990	124,287	95,966	427,802
September	91,467	88,057	100,543	84,869	364,936
October	65,980	65,621	85,228	58,661	275,490
November	77,515	40,711	70,361	26,872	215,459
December	61,586	34,240	62,821	4,598	163,245
Total	**1,054,033**	**606,079**	**1,101,412**	**385,288**	**3,146,812**

2003	Wells	Bellevue	Kirkland	Seattle	Total
January	82,107	37,409	78,352	4,819	202,687
February	75,670	28,260	65,967	4,548	174,445
March	73,140	47,098	86,952	5,402	212,592
April	77,586	33,098	82,181	6,091	198,956
May	109,654	37,198	103,201	18,368	268,421
June	135,024	63,496	117,058	41,727	357,305
July	136,820	82,402	157,445	75,630	452,297
August	114,643	143,408	168,596	106,547	533,194
September	81,159	115,601	105,910	67,609	370,279
October	84,235	75,427	80,645	20,131	260,438
November	71,314	50,405	74,789	7,439	203,947
December	77,762	47,821	39,534	4,304	169,421
Total	**1,119,114**	**761,623**	**1,160,630**	**362,615**	**3,403,892**

Table 5 summarizes the City's demand information in a different format:

Table 5: Summary of Redmond Demand (2001 – 2003, in mgd)

	2001	2002	2003	01-03 Average
Average Daily Demand:				
Produced From Wells	2.14	2.16	2.29	2.20
Purchased	3.62	4.29	4.68	4.20
Total	5.75	6.45	6.98	6.39
Peak Season Demand:				
Produced From Wells	2.32	2.54	2.87	2.58
Purchased	5.08	6.53	7.64	6.41

	2001	2002	2003	01-03 Average
Total	7.40	9.07	10.50	8.99

Section 4.3 Calculation of Credits

Given the data available, the updated audit calculates credits as described in the Audit Methodology:

Section 4.3.1 Peak Day Credit Basis

The calculation of peak day credits is based on the difference between the total peak day capacity of the City's independent supply sources and the City's current utilization of that capacity. As shown in Table 3, the City can withdraw a maximum of 3,250 gallons per minute from its independent supply sources – this capacity is discounted to account for physical system limitations with respect to how long the peak capacity can be maintained during the peak day.

The updated audit assumes that the City can maintain its peak capacity for 20 out of the 24 hours of the peak demand day. Given this, the estimated operational peak day capacity of the City's independent supply sources is approximately 83 percent of the 3,250 gpm instantaneous flow limit cited above, or about 2,708 gpm. This corresponds to a capacity of about 3.90 mgd.

The City of Redmond provided its peak day well production records for the period considered in the audit (2001 – 2003). Table 6 summarizes this information:

Table 6: Annual Peak Day Production – City of Redmond (Gallons, 2001 – 2003)

	2001	2002	2003	2001 – 2003 Average
Well No. 1	970,000	954,000	974,000	966,000
Well No. 2	577,000	541,000	553,000	557,000
Well No. 3	471,000	498,000	565,000	511,333
Well No. 4	0[1]	819,000	801,000	540,000
Well No. 5	1,391,000	1,382,000	1,362,000	1,378,333
Total	**3,409,000**	**4,194,000**	**4,255,000**	**3,952,667**

Redmond's estimated operational peak day capacity is approximately 3.90 mgd – given the information presented in Table 6, it appears that the City is fully utilizing its operational peak day capacity. As noted in Section 2.3, Well No. 4 is considered to be a new source of supply and is awarded full credit for its estimated operational peak day capacity (0.60 mgd of the 3.90 mgd). Assuming that 550 gpd of peak day capacity is needed to serve a CERU, the capacity from Well No. 4 will be able to serve 1,091 CERUs.

Section 4.3.2 Peak Season Credit Basis

The updated audit also includes a calculation of credit for peak season surplus capacity, to the extent that it exceeds the estimated peak day surplus capacity (since credits are already being awarded for that capacity). As noted in Section 2.3, the estimated operational peak season capacity of the City's wells is assumed to be 75% of their instantaneous flow capacity –

[1] In 2001, Well No. 4 was still being relocated (and was out of service).

consequently, the City's 3,250 gpm of well capacity is discounted to 3.51 mgd for the purpose of establishing peak season operational capacity.

Table 5 indicates that the City pumped about 2.58 mgd from its wells during the summers of 2001, 2002, and 2003. This is a three-year average of production records, used to mitigate the effects of year-to-year variations caused by external factors (such as the weather). Therefore, the City has about 0.93 mgd of unused peak season capacity. Well No. 4 represents 0.54 mgd of this unused peak season capacity – since it is awarded full credit on a peak day basis, it is not awarded any peak season credits.

Assuming that a CERU contributes 385 gpd of peak season demand to the Cascade system, the remaining 0.39 mgd of surplus peak season capacity will be able to meet the peak season demand of roughly 1,024 additional CERUs. The Audit Methodology indicates that the City would get credits for 50% of its additional CERU capacity, or 512 credits.

Section 4.4 Audit Findings

Given the calculations outlined above, Table 7 shows the calculation of credits for the City of Redmond:

Table 7: Calculation of RCFC Credits – City of Redmond

Estimated Peak Day Capacity of Sources:	
Well No. 1	1.08 mgd
Well No. 2	0.60 mgd
Well No. 3	0.42 mgd
Well No. 5	1.20 mgd
Total	3.30 mgd
Average Utilization of Sources (2001-2003)	3.95 mgd
Unused Peak Day Capacity	-
Estimated Peak Season Capacity of Sources:	
Well No. 1	0.97 mgd
Well No. 2	0.54 mgd
Well No. 3	0.38 mgd
Well No. 5	1.08 mgd
Total	2.97 mgd
Average Utilization of Sources (2001-2003)	2.58 mgd
Unused Peak Season Capacity	0.39 mgd
Peak Day Credit Basis (Lesser of Unused Peak Day/Peak Season Capacity)	-
Plus: Future Capacity From Well #4 (Discounted to 20/24 of the permitted flow rate)	0.60 mgd
Total Peak Day Surplus Capacity	0.60 mgd
Peak Day Conversion Basis (gpd per CERU)	550
Equivalent Number of Peak Day CERUs	1,091
Number of Peak Day Credits Awarded (100% of Equivalent CERU Basis)	***1,091***
Unused Peak Season Capacity	0.39 mgd
Less: Peak Day Credit Basis	-
Peak Season Credit Basis	0.39 mgd
Peak Season Conversion Basis (gpd per CERU)	385
Equivalent Number of Peak Season CERUs	1,024
Number of Peak Season Credits Awarded (50% of Equivalent CERU Basis)	***512***
Total Number of RCFC Credits Awarded	**1,603**

This is based on the following assumptions:

1. Peak day operational capacity is defined as being 20/24 (roughly 83%) of the instantaneous flow capacity. This is based on the assumption that the independent supply sources can be run at full capacity for 20 out of the 24 hours of the peak demand day.

2. Based on direction provided by City staff, peak season operational capacity is assumed to be equal to 75% of the instantaneous flow capacity. This implies that the independent supply sources can be run at full capacity for an average of 18 hours per day from June through September.

3. Peak day demand is equal to 2.2 times the average day demand.

4. Upon auditing Redmond's independent supply sources, Cascade determined that Well No. 4 is "new" supply and is consequently eligible for credits as such.

As noted in Section 2.2, Redmond's CERU count will be adjusted at the end of 2006 to reflect the expiration of the City's agreement with Union Hill Water Association. Redmond serves Union Hill via a 6-inch meter, which corresponds to 50 CERUs. Section 5.5 of the Interlocal Contract states that Members experiencing a net reduction in the number of CERUs served will receive a CERU-for-CERU credit against future RCFC payments.

Assumptions (1) and (2) above are based on reasonable expectations with respect to the operational capacity of the City's independent supply sources. With these assumptions comes a certain expectation regarding independent supply production – higher operational capacity estimates will produce more credits, but come with more stringent production requirements. It is important to note that the City's decision to increase the estimate of peak season operational capacity will increase the incremental peak season production requirement associated with each credit redeemed.

Section 4.5 Provisions for the Use of RCFC Credits

Section 6 of the RCFC Methodology imposes the following restrictions on the use of RCFC credits:

1. No RCFC credits may be redeemed for growth occurring prior to January 1, 2008.

2. The City may redeem credits at its convenience – nothing requires Redmond to redeem its credits. However, the maximum number of credits that the City can redeem in any reporting period is limited to 50% of the growth occurring in that reporting period. This limit is independent of any decisions made by the City to defer the use of its credits.

While these provisions are intended to ensure Cascade a stable flow of RCFC revenues, they may create problems for Members with unique growth expectations. In light of the fact that the Members with independent supply sources agreed to postpone the use of RCFC credits (for the sake of preserving Cascade's financial stability in its early years), Cascade will take steps to help ensure that these agencies are able to realize intended compensation for the benefits that their independent supply sources provide to the regional water system.

The credits attributable to Union Hill are not subject to these limitations, as Redmond's agreement with Union Hill is not an independent supply issue. Redmond served Union Hill with regional water until the previously existing agreement expired at the end of 2006 – given that the City is no longer obligated to provide water service to Union Hill, the consequent drop in Redmond's total CERU count may be used to offset near-term growth for the purpose of calculating RCFC payments.

Section V: Production Requirement

As previously discussed, the updated water audit establishes RCFC credits and defines the City's independent supply production requirements. By accepting the offer of RCFC credits ensuing from this audit, the City of Redmond agrees to maintain independent supply production levels that are consistent with those used in the audit.

The City's independent supply production requirement will not increase above the levels used for the calculations in this audit until it redeems credits. For each credit that the City redeems, its independent supply production requirement will increase as follows:

Peak Day Credits: Each credit redeemed will increase the City's independent supply production requirement by the supply required to serve a CERU (250 gpd on an average-day basis, 385 gpd on a peak-season basis, and 550 gpd on a peak-day basis).

Peak Season Credits: On an average-day basis, each credit redeemed will increase the City's independent supply production requirement by 250 gpd (the amount required to serve a CERU). The peak season production requirement will increase by 770 gpd, or 2 times the 385 gpd of assumed peak season demand per CERU – this reflects the 50% discount of surplus peak season capacity in excess of the surplus peak day capacity. Peak day production requirements do not increase because peak season credits are awarded on the premise that there is no peak day surplus capacity.

While the CERU demands were respectively assumed to be 250 gpd, 385 gpd, and 550 gpd for the purpose of calculating the City's credits, Cascade will recalculate them every year when establishing independent supply production requirements. This will ensure that the City's independent supply production requirement reflects exhibited demand patterns, avoiding any unfair penalties or benefits from deviations between actual demands and the averages used in this supply audit.

The Audit Methodology establishes a set of general equations that Cascade will use to determine annual requirements for average day, peak season, and peak day independent supply production (note that the peak day requirement relates to capacity rather than actual production, as Members may not have enough demand to warrant the required production levels). Table 8 summarizes the City's independent supply production requirements:

Table 8: Independent Supply Production Requirements – City of Redmond

Production Requirement	Initial (2008)	Incremental Per Credit Redeemed	Ultimate (All Credits Used)
Average Day	2.20 mgd	250 gpd	2.60 mgd
Peak Season	2.58 mgd	583 gpd	3.51 mgd
Peak Day	3.90 mgd	0 gpd[2]	3.90 mgd

The peak season production requirement associated with redeeming each credit is based on the pro rata increase in production to realize full supply, namely the remaining capacity divided by the number of credits. In Redmond's case, the mixture of credits based both on peak day and peak season surpluses results in a composite production requirement that varies from both other members and the standard CERU definition.

Since the annual calculation of production requirements intends to address immediate fluctuations in demand, it seems most reasonable to use current year demands (making this an after-the-fact calculation). In addition to this more explicit definition of production requirements, the Board may elect to waive or reduce the independent supply production requirement in any given year.

[2] The City of Redmond is fully utilizing its estimated operational peak day capacity (including Well No. 4, which the audit considers as new supply) – thus, its peak day capacity requirement does not increase.

The policy structure related to the administration of production requirements is under separate development and consideration by Cascade – it is integral to the supply relationship between Cascade and the City, and should be incorporated into the Membership Agreement.

CASCADE WATER ALLIANCE
JOINT MUNICIPAL UTILITY SERVICES AGREEMENT

March 28, 2012

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Article 1. Agreement

Effective upon approval by 65% Dual Majority Vote of the Board (as ratified within one hundred and twenty (120) days of such Dual Majority Vote by 65% Dual Majority of the Members' legislative authorities) the Interlocal Contract is hereby amended and restated as provided herein under the authority of the Act and shall be known as the Cascade Water Alliance Joint Municipal Utility Services Agreement. [Res. 2012-06 § 1; Res. 2004-18 § 1].

Article 2. Definitions

"Act" means the Joint Municipal Utilities Services Act, codified as Chapter 39.106 RCW, or as hereafter amended.

"Agreement" means this Joint Municipal Utilities Services Agreement.

"Asset Transfer Agreement" means an agreement between Cascade and a Member by which the Member transfers title to Water Supply Assets to Cascade, with or without monetary consideration, to be operated and maintained as part of the Cascade Water Supply System.

"Authority" means a joint municipal utility services authority formed under the Act and the successor in interest to Cascade as an interlocal agency.

"Authorized Issuer" means either: (a) Cascade (or a successor entity); or (b) a Member or other entity authorized to issue Bonds for the benefit of Cascade approved by Resolution of the Board.

"Board" means the Board of Directors of Cascade.

“Bonds” means short-term or long-term bonds, notes, warrants, certificates of indebtedness, or other obligations issued by, or on behalf of Cascade.

“ByLaws” means the ByLaws of Cascade, as adopted and amended by the Board.

“Cascade” means Cascade Water Alliance, a joint municipal utilities services authority.

“Cascade ERUs” (“CERUs”) means equivalent residential units, calculated according to the Regional Capital Facilities Charge Methodology.

“Cascade Supply Date” means the date, established by a Resolution of the Board for each Member upon which Cascade undertakes a Supply Commitment.

“Demand Share” means either a Member’s current share of water provided through the Supply System, or estimated share of water to be provided through the Supply System, whether Full Supply or Interruptible Supply, expressed in millions of gallons per day. Demand Share is calculated according to the Rate Calculation Methodology.

“Dual Majority Vote” means Board approval of a proposal on the basis of a simple majority of all Members, allowing one vote per Member, together with a simple majority of all Members on the basis of each Member’s Weighted Vote. A “simple majority” means a majority of all Members of Cascade, not just the Members present and voting.

“65% Dual Majority Vote” means Board approval of a proposal on the basis of a 65% supermajority of all Members, allowing one vote per Member, together with 65% supermajority of all Members on the basis of each Member’s Weighted Vote. A “supermajority” means 65% of all Members of Cascade, not just the Members present and voting.

“Gross Cascade Revenue” means all of the earnings and revenues received by Cascade from any source whatsoever including but not limited to: (a) Member Charges; (b) revenues from the sale, lease or furnishing of commodities, services, properties or facilities; (c) the receipt of earnings from the investment of money in any maintenance fund or similar fund; and (d) withdrawals from any rate reserve or rate stabilization fund or account.

However, Gross Cascade Revenue shall not include: (a) principal proceeds of Bonds or any other borrowings, or earnings or proceeds from any investments in a trust, defeasance or escrow fund created to defease or refund obligations relating to the Water Supply System (until commingled with other earnings and revenues included in Gross Cascade Revenue) or held in a special account for the purpose of paying a rebate to the United States Government under the Code; (b) taxes and other

income and revenue which may not legally be pledged for revenue bond debt service; (c) improvement district assessments; (d) federal or state grants allocated to capital projects; (e) payments under Bond Insurance or other credit enhancement policy or device; (f) insurance or condemnation proceeds used for the replacement of capital projects or equipment; (g) earnings in any construction fund or bond redemption fund; (h) deposits to any rate reserve or rate stabilization fund or account; or (i) any revenues generated by any Independent Supply except those amounts that are payable to Cascade pursuant to this Agreement or another agreement.

“Independent Supply” or “Independent Supplies” means a Member’s Water Supply Assets that are not part of the Supply System.

“Joint Municipal Utilities Services Act” or “Act” means Chapter 39.106 RCW, or as hereafter amended.

“Member” or “Members” means one or more member agencies of Cascade.

“Member Charges” means all payments that Cascade Members are required by this Agreement to make to Cascade, including but not limited to all Rates and Charges, RCFCs, dues, assessments and other payments from Members.

“Net Cascade Revenue” means Gross Cascade Revenue less Operations and Maintenance Costs.

“Non-Member” means any person or agency that is not a party to this Agreement.

“Operations and Maintenance Costs” or “O&M Costs” means all expenses incurred by Cascade to operate and maintain the Supply System in good repair, working order and condition, including without limitation, payments made to any other public or private entity for water or other utility service. Except as approved by the Board, Operations and Maintenance Costs shall not include any depreciation, capital additions or capital replacements to the Supply System.

“Rates and Charges” means the rates and charges (not including RCFCs) chargeable to each Member using the Rate Calculation Methodology plus any late payment or other charge that may be due.

“Rate Calculation Methodology” means the method of setting Rates and Charges adopted by the Board in accordance with Section 7.5.

“Regional Capital Facilities Charges” (“RCFCs”) means the charges to each Member for new CERUs connected to that Member’s water distribution system.

“Regional Capital Facilities Charge Methodology” (“RCFC Methodology”) means the method of determining the RCFCs adopted by the Board in accordance with Section 5.5.

“Satellite Systems” means water supply facilities identified as such by the Board, including but not limited to facilities that serve a portion of a Member’s customers but that are not part of the Member’s main water system.

“Shortage Management Plan” means the plan adopted by the Board in accordance with Section 7.3.1.

“Supply Commitment” means the obligation undertaken by Cascade, established by Resolution of the Board to supply water to a Member. With respect to Members, that obligation shall be characterized as “Full Supply Commitment,” or an “Interruptible Supply Commitment” defined as follows:

“Full Supply Commitment” or “Full Supply” for any or all of a Member’s water needs means that those needs, as projected in the Cascade Water Supply Plan and as agreed to by that Member, shall be met from the Supply System, net of Independent Supply and subject to the other limitations established in this Agreement, on an equal parity with all other Full Supply Commitments, and with a guaranteed priority no lower than for any other Supply Commitment made by Cascade; provided that no Member is guaranteed any given amount of supply or capacity.

“Interruptible Supply Commitment” or “Interruptible Supply” means a supply of all or part of a Member’s water needs from the Supply System on an as-available basis on a lower priority than any Full Supply Commitment.

The Supply Commitment for a Member shall be defined by this Agreement, the terms and conditions of membership, and the Supply Commitment resolution.

“Supply System” or “Water Supply System” means the Water Supply Assets owned or controlled by Cascade.

“Water Supply Assets” means tangible and intangible assets usable in connection with the provision of water supply, including without limitation, real property, physical facilities (e.g., dams, wells, treatment plants, pump stations, reservoirs, and transmission lines), water rights, capacity and/or contractual rights in facilities or resources owned by other entities, and investments in conservation programs and facilities.

“Watershed Management Plan” means any Watershed Management Plan that existed on the effective date of the Authority which shall be considered a plan of the Authority.

“Water Supply Plan” or “Cascade’s Water Supply Plan” means the Cascade’s Regional Water Supply Plan adopted by the Board as provided in Section 8.1.

“Weighted Vote” means a vote in which each Member’s vote is counted according to the Member’s Demand Share, but no Member shall have a Weighted Vote of less than one. [Res. 2012-06 § 1; Res. 2004-18 § 1].

Article 3. Formation of Entity – Purpose and Powers

3.1 Formation.

Effective on the date of filing of this Agreement with the Washington state secretary of state, Cascade shall be a joint municipal utility services authority formed under the Act; and is the successor for all purposes to the former Cascade created under the Interlocal Contract as an intergovernmental entity existing under the laws of Chapter 39.34 RCW; and is no longer functioning as a watershed management partnership. All rights and obligations of the former intergovernmental entity are transferred to Cascade, the new Authority, which obligations shall be treated as having been incurred, entered into, or issued by Cascade, the successor, and those obligations (including without limitation, outstanding Bonds issued by the former Cascade) shall remain in full force and effect and shall continue to be enforceable in accordance with their terms.

Cascade Water Alliance, as a joint municipal utility services authority, is a municipal corporation. [Res. 2012-06 § 1; Res. 2004-18 § 1].

3.2 Membership.

Subject to restrictions on future Cascade water rights, or to limitations upon place of use of water supply imposed by contract or permit, any city, town, county, water-sewer district, public utility district, other special purpose district, municipal corporation, or other unit of local government of this or another state that provides utility services, and any Indian tribe recognized as such by the United States government (or as may be allowed by amendments to the Act) may be admitted as a member of Cascade. The decision to admit new Members rests with the sole discretion of the Board, which shall determine whether to extend a membership offer taking into consideration the audit findings (as described in this Section 3.2), Cascade water resources, and any other factors the Board deems advisable.

When an entity that is eligible for membership under the Act, applies for membership, Cascade shall conduct a water supply audit according to the methodology and within the period determined by the Board. Audit results shall be provided to the Board and to the applicant.

If a membership offer is extended, it shall address the nature of the Water Supply Assets being transferred or retained and the “value” of those assets in terms of the calculation of an applicant’s Demand Share, RCFCs and other matters relating to the rights and obligations of the applicant and Cascade, which must be recorded in the form that the Board determines and which will constitute, along with this Agreement, the conditions under which an applicant becomes a Member of Cascade. An applicant for membership shall be admitted by adoption of a Resolution of the Board accepting the application for membership and incorporating the terms and conditions of membership.

Each membership application must be accompanied by a nonrefundable application fee based on the estimated cost of the audit and other costs related to the admission of a new Member or a request for new supply. The Board shall set the application fee for each applicant based on the estimated cost of processing the application, including the cost of the audit.

As a condition of membership, each new Member admitted to Cascade shall, in addition to any other applicable fees, rates, charges or assessments, pay to Cascade the membership fee, as established by the Board.

If an applicant’s planning process or plans are materially out of compliance with the requirements of applicable state law, the Board may condition an offer of membership upon the applicant’s compliance with that state law. [Res. 2012-06 § 1; Res. 2004-18 § 1].

3.3 Purposes.
Cascade’s purposes include those related to water resources, or any other utility service as allowed under the Act, as authorized by a unanimous vote of the Board, and do not include the provision of other general services to the public, and are to:

a. Provide a safe, reliable and high quality drinking water supply to meet the current and projected demands of Cascade Members, and for non-Members as determined by Cascade, and to carry out this task in a coordinated, cost-effective, and environmentally sensitive manner;

b. Develop, contract for, manage, acquire, own, maintain and operate Water Supply Assets, including without limitation, surface water supplies, groundwater supplies, reclaimed water supplies, and other water supply resources as determined by the Board;

c. Purchase and provide water supply, transmission services, treatment facilities and other related services;

d. Provide conservation programs to promote the wise and efficient use of resources;

e. Carry out emergency water supply and shortage management programs for its Members when demands exceed available supply;

f. Coordinate and plan cooperatively with other regional or local water utilities and other entities to maximize supply availability and to minimize system costs;

g. Develop a Water Supply Plan addressing the needs of Cascade and its Members and Cascade itself and develop a regional water supply plan with other water providers as Cascade may find convenient or necessary to meet regional, state and federal planning requirements, and to take a leadership role in developing and coordinating those supply plans;

h. Share costs and risks among Members commensurate with benefits received; and

i. Carry out, or to further other water supply purposes that the Members determine, consistent with the provisions of this Agreement. [Res. 2012-06 § 1; Res. 2004-18 § 1. Formerly 3.4].

3.4 Powers.

To further its purposes, Cascade has the full power and authority to exercise all powers authorized or permitted under the Act and any other laws that are now, or in the future may be, applicable or available to Cascade and to engage in all activities incidental or conducive to fulfill the purposes set forth in Section 3.3 of this Agreement, including but not limited to the authority to:

a. Acquire, construct, receive, own, manage, lease and sell real property, personal property, intangible property and other Water Supply Assets;

b. Operate and maintain facilities;

c. Enter into contracts;

d. Administer personnel matters in a manner generally consistent with the laws applicable to a code city (population over 20,000), to the extent applicable and with discretion left to the Authority, to the fullest extent otherwise permitted by law, related to the appointment, removal and/or compensation of officers, the establishment and/or administration of employee health and welfare benefit programs, and/or the establishment and/or administration of civil service/merit systems, retirement benefits/systems, and/or pension benefits/systems;

e. Sue and be sued;

f. Exercise all powers of eminent domain granted under Chapter 8.12 RCW and other applicable statutes (e.g. Chapter 8.25), now or as hereafter amended;

g. Impose, alter, regulate, control and collect rates, charges, and assessments;

h. Purchase and sell water and services within and outside the geographical boundaries of its Members;

i. Borrow money (through its Members or other entities at their individual discretion or as authorized by the Act and this Agreement now or as hereafter amended), or enter into other financing arrangements;

j. Lend money or provide services or facilities to any Member, other governmental water utilities, or governmental service providers;

k. Invest its funds;

l. Establish policies, guidelines, rules or regulations by either ByLaws or resolution to carry out its powers and responsibilities;

m. Purchase insurance, including participation in pooled insurance and self-insurance programs, and indemnify its Members, its Board of Directors and Alternate Board Members, officers and employees in accordance with law;

n. Exercise all other powers within the authority of, and that may be exercised individually by all of its Members with respect to water supply, conservation, reuse, treatment and transmission, or any of the other purposes set forth in Section 3.3;

o. Exercise, without limitation, all other corporate powers that Cascade may exercise under the law relating to its formation and that are not inconsistent with this Agreement or the Act or other applicable law;

p. For the purposes of contracting and public works, exercise all powers of a code city (population over 20,000) under RCW 35A.40.200 – 35A.40.210, now or as hereafter amended;

q. For disposal of surplus property, exercise all powers granted under RCW 35A.11.010, now or as hereafter amended, to code cities;

r. In the event Cascade charges connection charges or Rates and Charges for services supplied or available to its customers' property on a retail basis, exercise all powers granted under RCW 57.08.081, now or as hereafter amended, for the establishment of liens; and

s. For purposes of a Cascade code of ethics, exercise all powers of a municipal corporation and observe the requirements under Chapter 42.23 RCW, now or as hereafter amended. [Res. 2012-06 § 1; Res. 2004-18 § 1. Formerly 3.5].

Article 4. Organization Structure – Board

4.1 Composition, bylaws and meetings.
Cascade is governed by a Board of Directors consisting of one individual representative appointed by Resolution by each of the Member's legislative authority. Members may similarly appoint Alternate Board Members. Each Board Member and each Alternate Board Member must be an elected official of the Member.

The Board shall adopt ByLaws consistent with this Agreement that specify, among other matters, the month of Cascade's Annual Meeting, Board powers and duties and those of the Executive Committee, Standing Committees, Officers and employees.

The Board shall meet as required by the ByLaws, but not less than quarterly. [Res. 2012-06 § 1; Res. 2004-18 § 1].

4.2 Powers of the board.
The Board has the power to take all actions on Cascade's behalf in accordance with voting provisions set forth in Section 4.3. The Board may delegate or assign to the Executive Committee or to specific Cascade Officers or employees any action that is not expressly reserved to the Board under this Agreement. [Res. 2012-06 § 1; Res. 2004-18 § 1].

4.3 Voting.
All Board actions must be approved by Dual Majority Vote of all Members, except where this Agreement requires either a 65% Dual Majority Vote, as provided in Sections 4.7, 5.5, 7.3, and 7.5; or ratification by the Members' legislative authority, as provided in Sections 9.3 and 9.4 and Article 10. The Board may act by voice votes, as set forth in the ByLaws. Any Member may require a recorded tabulation of votes either before or immediately after a voice vote is taken. Although voting is, in part, based on Weighted Vote, the Members expressly agree that there is only one class of voting membership, and voting occurs within that single class.

Any Member that has been declared to be in default of its obligations under this Agreement by the Board shall lose its right to vote until the Board has declared the default to be cured. [Res. 2012-06 § 1; Res. 2004-18 § 1].

4.4 Officers and committees.
Cascade Officers shall include a Chair, a Vice Chair, a Secretary, and a Treasurer. The Chair serves as the chair of the Board (and may be known as the “President,” if the ByLaws so designate) and performs those duties set forth in the ByLaws.

The Vice Chair shall perform the duties of the Chair in the Chair’s absence and shall perform other duties as set forth in the ByLaws. The Secretary shall be responsible for Cascade records and perform other duties as set forth in the ByLaws. The Treasurer shall be responsible for Cascade accounts and financial records and perform other duties as set forth in the ByLaws.

Consistent with the provisions of this Agreement, the Board may, in the ByLaws, establish additional Officers and set forth their duties.

The Board may create and appoint Members to Standing Committees and special committees as it deems appropriate. Committee Members need not be elected officials or employees of Members, but Standing Committee Chairs must be Board Members or Alternate Board Members. [Res. 2012-06 § 1; Res. 2004-18 § 1].

4.5 Executive committee.
The Chair, Vice Chair, Secretary, and Treasurer shall constitute Cascade’s Executive Committee. The Chair (or acting Chair) shall vote on matters before the Executive Committee only if necessary to break a tie. The Executive Committee’s duties and responsibilities are set forth in the ByLaws. The Executive Committee shall not have the power to:

a. Approve any contract for a term longer than three (3) years;

b. Approve any contract involving expenditure by, or revenue to Cascade in excess of such amounts and under such circumstances as set forth in the ByLaws;

c. Retain or dismiss the chief executive officer or determine the chief executive officer’s compensation; or

d. Take any actions expressly reserved to the Board by this Agreement or the ByLaws.

The Executive Committee shall have the authority, if necessary, to avoid default on any Bond, to withdraw from any capital reserve fund or rate stabilization fund, an amount equal to the amount necessary to avoid a default and to authorize payment of that amount to avoid default. [Res. 2012-06 § 1; Res. 2004-18 § 1].

4.6 Staff, consultants and contractors.
Cascade staff shall consist of a chief executive officer and other positions established by resolution of the Board. The Board shall appoint, designate the title of, and establish the compensation range of the chief executive officer. The Board shall hire auditors for Cascade. The chief executive officer may hire all other staff and consultants, and those appointments may be subject to ratification by the Board or the Executive Committee if the ByLaws so provide. The Board may also provide that administrative, professional or technical services be performed by contract. [Res. 2012-06 § 1; Res. 2004-18 § 1].

4.7 Budget – Dues – Financial management.
The Board shall approve a budget for each fiscal year, determining Cascade's revenues and expenditures no later than sixty (60) days before the beginning of the fiscal year in which that budget will be in effect. The budget shall be developed and approved according to a schedule established by the ByLaws. The budget must identify the levels of Member Charges on which revenue projections are based. The Board may amend the budget.

Each Member shall pay dues to defray part or all of Cascade's administrative costs based on the number of CERUs served by its water system, regardless of water usage or capacity, and regardless of whether those units are served by the Supply System or by Independent Supply. Total administrative dues collected from all Members may not exceed nine percent (9%) of Cascade's revenue requirement. This limit may be amended in the budget by a 65% Dual Majority Vote of the Board. The Board may establish minimum dues per Member and may provide that less than all of a Member's CERUs be taken into account in establishing dues.

All Cascade books and records shall be open to inspection by the Washington State Auditor.

The Board shall approve, by Resolution, the treasurer of Cascade, which may be the treasurer or chief finance officer of any Member, or the treasurer of any Washington county in which any Member is located; or, if the total number of utility customers of all of the Members of Cascade is greater than two thousand five hundred (2,500), the treasurer may be an officer or employee of Cascade (or as may be allowed by amendments to the Act). [Res. 2012-06 § 1; Res. 2004-18 § 1].

Article 5. Asset Development and Supply Commitment

5.1 Property acquisition, ownership and disposition.
Cascade may construct, purchase, rent, lease, manage, contract for, or otherwise acquire and dispose of Water Supply Assets and other assets. Cascade may control and manage both the assets it owns and the assets that are owned by Members that have transferred control and management of those

assets to Cascade. This Agreement does not vest in Cascade any authority with respect to Members' other facilities or assets, such as Water Supply Assets retained by Members as Independent Supply.

Subject to Cascade's agreement, a Member may transfer to Cascade its title to, or operational control and management of Water Supply Assets. Water Supply Assets may also be fully retained by Members as Independent Supply, subject to the provisions of Article 6. At the discretion of the Board, Cascade may accept title to, or operational control and management of Water Supply Assets offered by Members or accept supply assets that constitute all or part of a Member's Satellite System(s). The Board may accept supply assets subject to the terms and conditions arranged between Cascade and the Member, based on the result of the audit process and mutual needs.

Cascade may enter into Asset Transfer Agreements which shall provide for the terms and conditions of: (a) Cascade's operation of the transferred Water Supply Asset with respect to the Member transferring the asset; (b) Cascade's operation, maintenance and replacement of the Water Supply Asset as part of the Supply System; (c) return or disposition of the Water Supply Asset if Cascade terminates its existence or the Member withdraws; (d) continuation of service (if appropriate) to Members or former Members by the Member receiving the Water Supply Asset at reasonable rates and charges or payment to Cascade of the cost of replacing the Water Supply Asset; and (e) such other conditions as the Board and the Member agree upon.

Subject to Cascade's agreement, a Member that transfers title or operation, control and/or management to Cascade of any Water Supply Asset shall be deemed to also transfer, assign and/or convey the franchises, if any, associated with that Water Supply Asset.

Members shall not be deemed to hold legal ownership rights in any Water Supply Assets owned by Cascade whether those Water Supply Assets have been developed by, purchased by, or transferred to Cascade, and regardless of the accounting treatment of RCFC payments and other payments made to Cascade. [Res. 2012-06 § 1; Res. 2004-18 § 1].

5.2 Supply commitment.

A. Commitment to Members. Beginning on the Cascade Supply Date, Cascade shall provide a Supply Commitment to each Member. Cascade shall provide a Full Supply Commitment to a Member that joins with Water Supply Assets sufficient to provide for its needs during the following fifteen (15) years (whether or not those Water Supply Assets are transferred to Cascade or retained as Independent Supply.)

Any Full Supply Commitment shall be subject to water shortages, to Cascade's ability to implement the Water Supply Plan, and to the portion of the Member's needs that can be served by the audited

capacity of its Independent Supply. If the needed supply is not available, the shortage shall be shared by all the Members in accordance with Cascade's Shortage Management Plan, except as otherwise provided in Section 5.5. Cascade shall be obligated to provide water supply to the entire service area of each Member (as that service area is defined in terms under which the Member is admitted or as in the Member's adopted and approved Water System Plan as of the Effective Date of this Agreement), whether or not some of that service area is within the Member's current jurisdictional boundaries and/or within the current urban growth boundary. Cascade is not obligated to provide water supply to service area expansions in or outside the urban growth boundary, unless Cascade agrees to such expanded service area. Cascade is not obligated to provide increased water supply to any Member if it is determined that the Member's planning process or plans are materially out of compliance with the requirements of applicable state law.

A Member that joins with Water Supply Assets insufficient to provide for its needs for fifteen (15) years receives the Full Supply it desires only if, when, and to the extent it is available within reliability standards determined by Cascade's system reliability methodology. If sufficient Full Supply is not available within reliability standards determined by Cascade's system reliability methodology, the Member receives partial Full or Interruptible Supply, and Full Supply must be provided within fifteen (15) years. Cascade shall then undertake to include in Cascade's Water Supply Plan, and to acquire the facilities or other assets necessary in the Board's determination to provide for the identified deficit. If Cascade fails to develop sufficient assets to timely provide the increased Full Supply, the commitment becomes a Full Supply Commitment at the end of that fifteen (15) year period, and any shortage shall be shared by all Members in accordance with Cascade's Shortage Management Plan.

If multiple Members request new Full Supply, requests must be honored in the order received (i.e., in the order in which application is made accompanied by the application fee). With respect to new Members, requests for Full Supply "vest" no earlier than the date that membership is effective. In cases of conflict or ambiguity, the Board may determine the order of requests.

B. Additional Rules for Members Retaining Independent Supply. Members are not required to share shortages resulting from the loss of all or part of Independent Supply, although Cascade may make Interruptible Supply available to a Member that loses Independent Supply at prices that are consistent with the price of Interruptible Supply being made available to others at that time. Cascade may at any time and at its cost and expense carry out audits of a Member's Independent Supply.

A Member requesting an additional Full Supply Commitment due to loss of Independent Supply shall make that request by Resolution of the requesting Member's legislative authority. When and as determined by the Board, the Member shall pay an amount equal to the RCFCs allocable to the number of CERUs that can be served by the replacement supply provided or to be provided by

Cascade. Cascade shall then include the supply in its Water Supply Plan, and provide the supply when it becomes available, but in any event within fifteen (15) years. If, within fifteen (15) years the supply is not available, Cascade's commitment becomes a Full Supply Commitment and any shortage with respect to that supply must be shared by all the Members in accordance with the Shortage Management Plan, except as otherwise provided in Section 7.3. [Res. 2012-06 § 1; Res. 2004-18 § 1].

5.3 Financing of assets.

The acquisition of new capital facilities and other Water Supply Assets may be financed using RCFCs, transfers or Water Supply Assets, Rates and Charges, the issuance of revenue Bonds and such other sources as the Board may deem appropriate.

A. Issuance of Bonds. An Authorized Issuer may issue Bonds payable from and secured solely by all or a portion of Net Cascade Revenue, evidencing indebtedness up to an amount approved by Resolution for the Board in order to provide financing or refinancing to acquire, construct, receive, own, manage, lease or sell real property, personal property, intangible property and other Water Supply Assets, to establish debt service reserves, to provide for capitalized interest and to pay the costs of issuance of, and other costs related to the issuance of the Bonds. Such Bonds shall be payable solely from all or a portion of the Net Cascade Revenue or (if the Authorized Issuer is other than Cascade) from payments to be made by Cascade out of all or a portion of Net Cascade Revenue, and such Bonds shall not pledge the full faith and credit or taxing power or, except as expressly provided by contract, the revenue, assets or funds of any Member.

Members serving as Authorized Issuers may conduct the financing through "separate systems" permitted by their applicable bond resolutions, or in some other appropriate manner, and Cascade may compensate those Members for all costs associated with the financing. Bond-related documents of Authorized Issuers other than Cascade must expressly permit the Bonds to be refunded or prepaid without penalty prior to their stated maturity, on and after such dates as are approved by the Authorized Issuer and the Board, to allow for a transfer of the obligation to Cascade or to Cascade's successor entity, including without limitation, a joint operating agency or similar entity, as may be permitted by law.

B. Pledge of Revenues. For as long as any Bonds payable from Net Cascade Revenue (or any portion thereof) are outstanding, Cascade irrevocably pledges to establish, maintain and collect all Member Charges in amounts sufficient to pay when due the principal of and interest on the Bonds (and, if the Authorized Issuer is other than Cascade, in addition to the foregoing pledge, to pledge to make timely payments to that Authorized Issuer for the payment of principal of and interest on the Bonds), together with amounts sufficient to satisfy all debt service reserve requirements, debt service coverage requirements, and other covenants with respect to the Bonds.

Each Member hereby irrevocably covenants that it shall establish, maintain and collect rates, fees or other charges for water and other services, facilities and commodities related to the water supply it receives from Cascade and/or its water utility at levels adequate to provide revenues sufficient to enable the Member to: (a) make the payment required to be made under this Agreement; and (b) pay or provide for payment of all other charges and obligations payable from or constituting a charge or lien upon such revenues. Each Member hereby acknowledges that this covenant and its covenant in Section 7.9 of this Agreement may be relied upon by Bond owners, consistent with this Agreement.

Each Member shall pay the Member Charges imposed on it whether or not the Water Supply Assets to be financed through the issuance of Bonds are completed, operable or operating, and notwithstanding the suspension, interruption, interference, reduction or curtailment in the operation of any Water Supply Assets for any reason whatsoever, in whole or in part. Member Charges shall not be subject to any reduction, whether by offset or otherwise, and shall not be conditioned upon the performance or nonperformance of any Member, or of any entity under this or any other agreement or instrument. However, credits against future RCFCs and Rates and Charges described in Sections 5.5 and 7.5, respectively, for development or addition of excess capacity that is either transferred to Cascade or retained as Independent Supply, shall not be considered “offsets” or “reductions” for the purposes of this Section.

If, in connection with the issuance of obligations, any Member establishes a new lien position on revenues relating to its water utility, that Member shall covenant in the relevant documents that the amounts to be paid to Cascade as Member Charges shall be treated either: (a) as part of that Member’s internal operation and maintenance costs payable prior to debt service on those obligations; and/or (b) for any portion of those Member Charges that is allocable to capital costs, as a contract resource obligation payable prior to debt service on those obligations. If any Member has existing outstanding revenue obligations relating to its water utility, it shall include substantially similar “springing covenants” in the documents relating to any new parity obligations.

C. Continuing Disclosure. To meet the requirements of United States Securities and Exchange Commission (“SEC”) Rule 15c2-12(b)(5) (the “Rule”) as applicable to a participating underwriter for any Bonds and any obligation of each Member as an “Obligated Person” under the Rule, Cascade and each Member agree to make an appropriate written undertaking, respectively, for the benefit of holders of the Bonds consistent with the requirements of the Rule.

D. Preservation of Tax Exemption for Interest on the Bonds. Each Member covenants that it will take all actions necessary to prevent interest on tax-exempt Bonds from being included in gross income for federal income tax purposes, and it will neither take any action nor make or permit any use of proceeds of tax-exempt Bonds or other funds treated as proceeds of those Bonds at any time during

the term of those Bonds that will cause interest on those Bonds to be included in gross income for federal income tax purposes.

E. Additional Certificates. Each Member further agrees to provide such certificates or verifications as are reasonably requested by an Authorized Issuer in connection with the issuance of Bonds under this Section. [Res. 2012-06 § 1; Res. 2004-18 § 1].

5.4 Supply system – Development.

Cascade must provide for Supply System development to meet the needs of additional water customers of Members, subject to consistency with applicable state law, Cascade's Water Supply Plan, orderly asset development, reasonable cost and financing capacity. The Board shall establish a water supply development process, including criteria governing the evaluation of new projects, and that process must promote equality of costs and services (other than direct local services), regardless of geographic location. The results of the water supply planning process must be reflected in Cascade's Water Supply Plan. The Board shall have the authority to undertake new projects identified in Cascade's Water Supply Plan for the expansion of Water Supply Assets and regional transmission system extensions to meet Members' projected needs. To reduce costs, Cascade may, to the extent that the Board deems advisable, enter into agreements with Members to wheel water through their existing systems. When facilities are constructed that are used partially by Cascade for wheeling water and partially by Members or other entities for their purposes, the Board may determine an appropriate Cascade contribution to the cost of those facilities. Existing arrangements among Members (and between Members and Non-Members), in place when a Member joins Cascade, remain unaffected except as otherwise agreed between Cascade and the other entities concerned. [Res. 2012-06 § 1; Res. 2004-18 § 1].

5.5 Regional capital facilities charges.

To allocate growth costs to those Members that require capacity increases, each Member shall pay to Cascade an RCFC for each new CERU connected to its water distribution system. Growth in water usage by existing CERUs is not subject to RCFCs unless that growth constitutes a CERU increase as provided in the RCFC Methodology. Members with a supply deficit must pay an RCFC commensurate with that deficit. To the extent that a Member transfers to Cascade or retains an Independent Supply water supply in excess of its needs, it receives a corresponding credit against future RCFCs.

A new Member with adequate supply shall commence paying RCFCs fifteen (15) years prior to the date that its Water Supply Assets are projected to be insufficient to provide for its needs as determined by the Board (taking into consideration the results of the Water Supply Audit).

A Member that joins with Water Supply Assets that are projected to be insufficient to provide for its needs for fifteen (15) years shall immediately pay RCFCs for the number of CERUs representing the deficit as determined by the Board.

RCFCs shall be calculated according to the RCFC Methodology, which shall define the analytical steps required to calculate the RCFCs according to the average unit cost of past construction of the existing system plus the Supply System improvements planned at the time of the calculation. The methodology shall provide for an annual escalator, recalculation and update not less frequently than every fifth year, and a methodology for determining CERUs. The RCFCs shall be imposed on the Member for each new CERU of that Member in accordance with the terms of this Agreement. Amendments to the RCFC Methodology shall require a 65% Dual Majority Vote.

If a Member owns Water Supply Assets or transfers Water Supply Assets to Cascade under Section 5.1, to the extent the audited capacity of those assets exceeds the Member's needs, that Member shall receive a credit against future RCFCs. If a Member seeks to transfer assets substantially in excess of its foreseeable needs, Cascade may negotiate appropriate compensation arrangements for the transfer.

Members that develop new Independent Supply that is approved by the Board in accordance with Article 6, similarly receive a credit effective when the Independent Supply is placed in service as determined by the Board.

A Member that accepts ownership of a Satellite System that Cascade agrees to serve shall pay an RCFC for the amount of supply needed to serve that system in excess of its rated capacity.

Members that experience a net reduction in the number of CERUs served shall receive a CERU-for-CERU credit against future RCFCs.

RCFC credits may not be transferred among Members without Board approval.

Members shall not be required to pass RCFCs to their customers as capital facilities charges, but may provide for the payment of RCFCs in whatever manner they deem appropriate.

For Members joining with an unmet net supply need, Cascade may, under circumstances determined by the Board, require the prepayment of RCFCs allocable to the full amount of the requested supply, e.g., when funds are needed to begin the construction of facilities immediately. [Res. 2012-06 § 1; Res. 2004-18 § 1].

5.6 Transfer upon mergers, consolidations and assumptions.

If: (a) two or more Members merge or consolidate; (b) a Member or a Non-Member assumes jurisdiction of part or all of a Member; or (c) a Member assumes jurisdiction of part or all of a Non-Member, the jurisdictions' water supply rights from and obligations to Cascade shall be transferred or assumed under applicable law and consistent with the requirements of this Agreement and the obligations of Cascade. [Res. 2012-06 § 1; Res. 2004-18 § 1].

Article 6. New Independent Supply

Members may not bring new Water Supply Assets on-line as Independent Supply without Board approval. That approval may be granted or denied following an evaluation process, based on whether the Board determines that development of the proposed Independent Supply will benefit or be adverse to the interests of the Members as a whole. Recognizing that in certain circumstances the acquisition of additional Independent Supply might benefit (or cause no material harm to) the Members, new supplies under one (1) MGD may be approved by the Board regardless of the provisions of the Water Supply Plan and without a formal evaluation process. New supplies in amounts greater than one (1) MGD must be described in and be consistent with the Water Supply Plan.

Members that have invested in the development of new Independent Supply assets may offer to sell their interest in such assets to Cascade. Cascade may, in its sole discretion and subject to mutually agreeable terms and conditions, purchase the Member's interest in such Independent Supply asset by reimbursing or otherwise compensating the Member for its investment in the project to the extent that investment has been capitalized. Once Cascade has purchased a Member's interest in a project, the project will be considered a Water Supply Asset of Cascade

and will be incorporated into the Water Supply Plan. [Res. 2012-06 § 1; Res. 2004-18 § 1].

Article 7. Asset Management

7.1 Supply system management.

Cascade is responsible for managing, on behalf of all Members, the Supply System. Cascade is not responsible for managing Independent Supply unless it has expressly agreed to do so. Supply System management responsibilities shall be governed by Cascade's system management plan adopted by the Board. Cascade's system management plan concerns, without limitation, matters such as daily system operations and maintenance, interface with other supply providers, contractual obligations, water quality, billing, management and administration. Cascade may delegate and/or contract out its Supply System responsibilities.

Cascade must manage the Supply System in compliance with applicable laws, regulation, and Cascade's minimum service standards. [Res. 2012-06 § 1; Res. 2004-18 § 1].

7.2 Conservation.

Cascade shall develop and carry out, and Members must participate in, water conservation programs that are uniform among Members. The Board shall develop and implement a Cascade conservation management plan that provides a mandatory base conservation program that functions to reduce both average and peak demands and may establish a charge or assessment to fund development and implementation of the program. Members may implement additional conservation programs. The Board may adopt wholesale charges in addition to normal Demand Share charges to encourage resource conservation. The Board may also provide or contribute to additional local conservation programs that are not offered to all Members, and these local programs may be locally funded or funded by Cascade. Members that fail to comply with base programs as set forth in Cascade's conservation management plan may be required to assume a disproportionate reduction in water supply or to pay penalty charges, or both. [Res. 2012-06 § 1; Res. 2004-18 § 1].

7.3 Shortages and emergency.

A. Shortages. Members must respond to water shortages in a collective, shared fashion under a Cascade Shortage Management Plan adopted by the Board. Resources must be shared in a manner that reduces the risk of severe shortages to each Member. Cascade's Shortage Management Plan may include without limitation, a definition and classification of shortages, a shortage contingency plan including mandatory programmatic actions among all Members in the event of shortages, allocation of authority for determining and responding to shortages, and a communications and outreach program

for the public. Members shall not be required to implement Cascade's Shortage Management Plan in areas not served by the Supply System.

In the event of shortages, Cascade shall reduce or halt Interruptible Supply before invoking the Shortage Management Plan with respect to all Members with a Full Supply Commitment. However, the Board may, by 65% Dual Majority Vote, continue service in the amounts it deems appropriate to one or more Members receiving Interruptible Supply.

The Board may require that Members failing to comply with mandatory shortage management programs implemented under Cascade's Shortage Management Plan assume a disproportionate reduction in supply or pay penalty charges, or both.

In the event of a Cascade-wide water shortage, Members with Independent Supply may, without penalty, decline to participate in the shortage management program for that shortage by foregoing all supply from Cascade for the duration of the emergency or shortage.

To avoid shortages resulting from emergencies or the inability to develop sufficient supplies, the Board may, by 65% Dual Majority Vote, establish moratoria on connections or additional commitments for future water services by the Members. A moratorium may be discontinued by a Dual Majority Vote of the Board.

B. Emergency. The Board shall include in Cascade's Shortage Management Plan policies and procedures for addressing short-term disruptions of water supply, transmission or water quality, and it may delegate to the chief executive officer authority to address such disruptions according to such policies and procedures. [Res. 2012-06 § 1; Res. 2004-18 § 1].

7.4 Water quality.

In addition to agreements under Section 5.1 of this Agreement, Cascade shall be responsible for water quality that meets or exceeds all federal or state requirements at the point of delivery from Cascade to the Member, consistent with applicable laws and regulations. Cascade assumes source water quality responsibility and liability with respect to Water Supply Assets under its ownership or control (including water wheeled to a Member through another Member's facilities). Cascade is also responsible for preparing and carrying out water quality activities compatible with the water quality requirements of regional water suppliers integrated with Cascade's system (e.g., Tacoma, Everett, and Seattle).

Cascade may, in its sole discretion, determine and adjust the appropriate method and level of treatment of water that it supplies, so long as that water meets applicable state and federal requirements. If water that it supplies meets those requirements, Cascade shall not be obligated to adjust the method or level of treatment so that the water can be more readily blended with a Member's

Independent Supply or more readily transmitted through a Member's internal system. Each Member shall remain responsible for water quality within its respective distribution system, assuming that adequate water supply quality is provided by Cascade at the point of delivery from Cascade.

Each Member shall be responsible for all costs related to making water supplied by Cascade compatible with that Member's internal system, including but not limited to, costs of additional treatment. [Res. 2012-06 § 1; Res. 2004-18 § 1].

7.5 Water supply rates and charges.

The Board shall set Rates and Charges according to a Rate Calculation Methodology adopted from time to time by the Board. The Rate Calculation Methodology for Members' Supply Commitment shall provide for the definition and calculation of Demand Shares and for a uniform pricing structure with a commodity charge and fixed charges allocated by Demand Share.

Cascade may sell water to a Non-Member under terms and conditions established by a 65% Dual Majority Vote of the Board. Revenue received from the sale of water to Non-Members shall be used to offset or reduce Rates and Charges to Members to the extent practicable, except that such revenue need not be treated as reducing or offsetting those amounts that are necessary for the payment of debt service on Bonds and for the provision of reserve and coverage requirements for the Bonds.

A Member shall be assigned a Demand Share based on the Board's best estimate of capacity to be used by that Member. The Demand Share shall be established based on an audit of that Member's past three (3) years of water use. After three (3) years as a Member, the baseline demand and capacity obligation for that Member shall be fixed based on actual experience as a Member. A specific Demand Share may be set by the Board to account for circumstances, such as (by way of example and not by limitation) costs of extending the Supply System to a Member, or when Independent Supplies affect regional demand patterns. When water supply from Cascade is wheeled through a Member to another Member, Cascade may presume that the first Member receiving the water is the "User" for calculation of Demand Shares unless the Members concerned instruct Cascade to use a different allocation. Rate credits for Water Supply Asset transfers are not deducted in the calculation of Demand Shares but are applied to reduce what a Member would otherwise pay.

The Board must set Member Charges at levels it determines to be sufficient, together with other available revenue sources, to provide adequately for Operation and Maintenance Costs, Bond debt service, coverage and other covenants, replacement and renewal of facilities, reserve, and other costs that the Board deems appropriate. The Board may provide that a Member's failure to participate in the planning process may result in penalty charges.

A Member that has transferred Water Supply Assets shall receive a credit, determined when those assets are audited and transferred, based on the useful life of those facilities and on the Member's use of the water produced by those assets or an amount of water equivalent to the amount of supply from them.

The Board may implement wholesale charges (additional to Demand Share-based charges and variable commodity charges) to reduce extreme peak use (e.g., "peaking-off of the pipe").

Water Rates and Charges must be the same for all Members receiving the same class of service (subject to credits, surcharges and penalty charges). [Res. 2012-06 § 1; Res. 2004-18 § 1].

7.6 Franchises and easements.

Except to the extent otherwise required by state law, each Member shall provide franchises and rights of way on, under or across that Member's streets or other property, to Cascade and to other Members for Water Supply Assets, without charging any fees, rent or charges other than the customary and usual right-of-way permit and inspection fees. [Res. 2012-06 § 1; Res. 2004-18 § 1. Formerly 7.7].

7.7 Sales of water to nonmembers.

Unless approved by the Board, a Member shall not sell water supplied by Cascade, nor shall a Member sell Independent Supply offset by water supplied by Cascade to a Non-Member. Notwithstanding the foregoing, any Member may sell water supplied by Cascade to a Non-Member to the extent required by a contract in effect as of the date the Member joins Cascade. [Res. 2012-06 § 1; Res. 2004-18 § 1. Formerly 7.8].

7.8 Payment procedures – Default – Step-up provisions.

A. Invoice and Payment.

1. Cascade shall provide each Member with periodic invoices showing the Member Charges payable by that Member for the billing period and the due date. Invoices shall be provided monthly or on other such periodic schedule as determined by the Board, but no more frequently than monthly nor less frequently than once every six months. The Board will determine a due date for all invoices.

2. Payment of any and all invoices shall be due and payable on or before the due date, and shall be made by wire transfer or such other means as are agreed to by Cascade and the Member. If a treasurer, trustee, fiscal agent or escrow agent is appointed in connection with the issuance of Bonds, Cascade may require, and specify on the invoice, that certain amounts be provided directly to that person or entity, and the Member shall pay those amounts in the manner and to the person so specified.

3. If full payment of any invoice is not received on or before the due date, such payment shall be considered past due and a late payment charge shall accrue for each day that the invoice remains unpaid. The late payment charge shall equal the product of the unpaid amount and an interest rate established by the Board. Late payment charges shall continue to accumulate until the unpaid amount of the invoice and all late payment charges are paid in full. Further, if an invoice or any portion thereof remains unpaid for more than sixty (60) days after the due date, Cascade may pursue any legally available remedy at law or equity for the unpaid amount, including without limitation, specific performance and collection of the late payment charge. Cascade's right to enforce payments in this regard may be assigned to a treasurer, trustee, credit enhancement provider or other entity. Furthermore, upon written notice, Cascade may reduce or suspend delivery of water until the invoice and late payment charges are paid.

4. If any Member disputes all or any portion of an invoice, it shall notify Cascade immediately upon receipt. If Cascade does not concur, the Member shall remit payment of the invoice in full, accompanied by written notice to Cascade indicating the portions of the invoice that the Member disputes and the reasons for the dispute. The Member and Cascade shall make a good faith effort to resolve such dispute. If the Member fails to remit payment of the invoice in full pending resolution of the dispute, the prevailing party in an action relating to the collection of that invoice shall be entitled to reasonable attorney fees and costs.

B. Default and Step-Up.

1. If any Member fails to make any payment in full for more than fifty (50) days past the due date, Cascade shall make written demand upon that Member to make payment in full within ten (10) days of the date that the written demand is sent by Cascade. If the failure to pay is not cured within the ten (10) day period, the Member shall be deemed to be in default.

2. Upon an event of default as described in subsection (B)(1) of this section, the other Members shall pay Cascade (in addition to Member Charges otherwise due) the defaulting Member's Member Charges in proportion to each remaining Members' Demand Share in accordance with a schedule established by Resolution of the Board.

3. The payment of a proportionate share of the existing defaulted Member's Member Charges by Members shall not relieve the defaulting Member of its liability for those payments. Cascade shall have a right of recovery from the defaulting Member on behalf of each Member. Cascade may commence such suits, actions or proceedings at law or in equity, including but not limited to, suits for specific performance, as may be necessary or appropriate to enforce the obligations of this Agreement against any defaulting Member. Cascade's right to enforce payments in this regard

may be assigned to a treasurer, trustee, credit enhancement provider or other entity. Amounts recovered by Cascade as payment of amounts due shall be passed through to each Member in proportion to the share that each assumed, in cash or in credit, against future Member Charges as the Board shall determine.

4. The prevailing party in any such suit, action or proceeding, shall be entitled to recover its reasonable attorney fees and costs. [Res. 2012-06 § 1; Res. 2004-18 § 1. Formerly 7.9].

Article 8. Planning

8.1 Water supply plan.
Cascade must plan for its Members' water supply needs. That planning shall be compatible with the equivalent planning responsibilities of other wholesale water providers and with state, county and city planning responsibilities under state law. The Board must adopt, and may from time to time amend, a Water Supply Plan that must be based on no less than a twenty (20) year planning horizon. Cascade shall coordinate its planning effort with local and regional utilities and other appropriate agencies and work to encourage cooperative region-wide planning and coordination.

Each Member shall actively participate in Cascade's water supply planning and shall provide to Cascade accurate data regarding its facilities and operations together with good faith estimates of future needs and a description of any involvement in the development of new Independent Supplies. Each Member's water comprehensive or system plan shall be consistent with any plans adopted by Cascade, and shall be consistent with applicable requirements of state law and comprehensive plans. [Res. 2012-06 § 1; Res. 2004-18 § 1].

8.2 Watershed management plan.
Upon the effective date of formation of the Authority under Article 3 of this Agreement, Cascade will no longer be a Watershed Partnership under RCW 39.34; and any Watershed Management Plans existing on the effective date shall become the plans of the Authority. Nothing herein shall limit Cascade's powers to adopt Watershed Management Plans or to enter into interlocal agreements thereafter. [Res. 2012-06 § 1; Res. 2004-18 § 1].

8.3 System reliability methodology.
Cascade shall develop and adopt a system reliability methodology for planning, operation, and management purposes. [Res. 2012-06 § 1; Res. 2004-18 § 1].

Article 9. Duration and Dissolution – Withdrawal

9.1 Duration.

Except as provided in Section 9.3, Cascade shall remain in existence for the longer of the following: (a) the period it holds any assets; (b) the period during which Bonds are outstanding; or (c) the period it continues to include Members. [Res. 2012-06 § 1; Res. 2004-18 § 1. Formerly 10.1].

9.2 Withdrawals.

A Member may notify Cascade of its intent to withdraw by delivery to Cascade of a Resolution of its legislative authority expressing such intent. Upon receipt of such Resolution, the Member shall lose its right to vote and the Board shall determine (a) the withdrawing Member's allocable share of the cost of the then-existing obligations of Cascade; and (b) the withdrawing Member's obligations to Cascade. "Then-existing obligations of Cascade" means obligations or costs incurred by Cascade as of the date the Member's withdrawal notice is received, including but not limited to, Bond obligations, contract obligations, and cash financed capital projects; provided that a withdrawing Member's allocable share shall in no event include an obligation for future expenses for which Cascade has not incurred a legal obligation; and provided further, that to the extent the Member's obligation (with respect to such costs) is re-paid over time, the Member shall be entitled to a credit for supply abandoned by the Member and is otherwise used by Cascade. A "withdrawing Member's obligation to Cascade" includes but is not limited to, the Member's share of fixed operating costs, any other expenses contained in Cascade's adopted budget for that year, and any assessments or other similar charges lawfully imposed by Cascade. For purposes of the preceding sentence, "fixed operating costs" shall be determined in the year of withdrawal, and the Member's obligation with respect to such costs shall be limited only to that amount required to pay for supply abandoned by the Member and not otherwise used by Cascade.

The allocable share of cost or obligations shall be determined by the Board, taking into consideration as deemed applicable by the Board: (a) the ratio of the Member's Demand Share to total Member demand; (b) the ratio of the Member's contribution to Cascade revenue to total Cascade revenue including RCFCs; (c) the cost or a portion of the cost of capital projects or facilities specially benefiting the Member; and (d) and any other factor the Board deems appropriate to consider. The Member's withdrawal shall be effective on payment of such allocable share or provision for arrangements to pay such allocable share that are satisfactory to the Board. Until the effective date of withdrawal, the Member shall continue to comply with all applicable provisions of this Agreement.

Upon withdrawal, except as provided in an Asset Transfer Agreement, the withdrawing Member shall have no right to, or interest in any Water Supply Assets owned by Cascade. The withdrawing Member shall be deemed to have abandoned any and all rights to service, to the use of Cascade Water Supply Assets or other rights with respect to Cascade (except as otherwise expressly provided in this Agreement).

Notwithstanding the provisions of this Section 9.2, Cascade will, upon the withdrawal of a Member that has transferred operational control and management of (but not title to) an Independent Supply Asset to Cascade under Section 5.1, return operational control of such asset to the withdrawing Member. Return of operational control and management will be subject to: (a) continued use by Cascade, to the extent and for such time as the Board deems such use necessary for Cascade to continue providing service to its Members; and (b) payment or provision for payment of any Cascade costs, including but not limited to, those associated with the withdrawing Member's Independent Supply Asset.

The Board may establish additional generally applicable conditions and requirements for withdrawal. [Res. 2012-06 § 1; Res. 2004-18 § 1. Formerly 10.2].

9.3 Disincorporation.

Cascade may vote by a 65% Dual Majority Vote (as ratified within one hundred and twenty (120) days of such Dual Majority Vote by 65% Dual Majority of the Members' legislative authorities), to disincorporate. Upon disincorporation except as provided in an Asset Transfer Agreement, Cascade's assets initially shall be held by its then current Members as tenants in common. Each Member's ownership interest must be based on that Member's Demand Share as of the time of the dissolution. Cascade's liabilities (including Bonds and other contractual obligations) initially shall be distributed based on Members Demand Shares as of the time of the disincorporation. Assets and liabilities must be distributed in accordance with agreement or contract, under a voluntary mediation process, or by a court of law. A court may appoint an arbitrator or special master. Distribution shall be based on the best interests of efficient and economic water supply in the entire area served by the Members, subject to a rebuttable presumption that Water Supply Assets will be returned to the Member that originally transferred them to Cascade. That presumption may be overcome by a showing that another asset distribution is in the best interests of efficient and economic water supply. The proceeds of any sale of assets must be distributed among the then current Members based on the Demand Shares at the time of disincorporation. [Res. 2012-06 § 1; Res. 2004-18 § 1. Formerly 10.3].

9.4 Successor entity.

Notwithstanding the provisions of Section 9.3, upon a 65% Dual Majority Vote of the Board (as ratified within one hundred and twenty (120) days of such Dual Majority Vote by 65% Dual Majority of the Members' legislative authorities), all assets, liabilities, and obligations of Cascade may be transferred to any successor entity (including without limitation, a joint operating agency or other municipal corporation, as permitted under state law), and all obligations of Members and parties contracting with Cascade become obligations to the successor entity. [Res. 2012-06 § 1; Res. 2004-18 § 1. Formerly 10.4].

Article 10. Amendments

Amendments to this Agreement shall be effective upon approval by 65% Dual Majority Vote of the Board (as ratified within one hundred and twenty (120) days by 65% Dual Majority of the Members' legislative authorities). [Res. 2012-06 § 1; Res. 2004-18 § 1. Formerly Art. 11].

Article 11. Applicable Law and Venue

This Agreement is governed by the laws of the state of Washington. The venue for any legal action arising from a dispute under this Agreement is the Superior Court for King County. [Res. 2012-06 § 1; Res. 2004-18 § 1. Formerly Art. 12].

Article 12. No Third Party Beneficiaries

There are no third party beneficiaries to this Agreement except for the rights of Bond owners as provided in Section 5.3.2, no person or entity other than an agency signatory to this Agreement shall have any rights hereunder or any authority to enforce its provisions, and any such rights or enforcement must be consistent with and subject to the terms of this Agreement. [Res. 2012-06 § 1; Res. 2004-18 § 1. Formerly Art. 13].

Article 13. Severability

If any provision of this Agreement or its application is held by a court of competent jurisdiction to be illegal, invalid, or void, the validity of the remaining provisions of this Agreement or its application to other entities or circumstances shall not be affected. The remaining provisions continue in full force and effect, and the parties' rights and obligations must be construed and enforced as if the Agreement did not contain the particular invalid provision. But if the invalid provision or its application is found by a court of competent jurisdiction to be substantive and to render performance of the remaining provisions unworkable and infeasible, is found to seriously affect the consideration, and is inseparably connected to the remainder of the Agreement, the entire Agreement is deemed void. [Res. 2012-06 § 1; Res. 2004-18 § 1. Formerly Art. 14].

Article 14. Entire Agreement

This Agreement constitutes the entire and exclusive agreement between the parties relating to the specific matters covered in this Agreement. All prior or contemporaneous verbal or written agreements, understandings, representations or practices relative to the foregoing are superseded, revoked and rendered ineffective for any purpose. This Agreement may be altered, amended or revoked only as set forth in Article 10. No verbal agreement or implied covenant may be held to vary

the terms of this Agreement, any statute, law, or custom to the contrary notwithstanding. [Res. 2012-06 § 1; Res. 2004-18 § 1. Formerly Art. 15].

* Code reviser's note: Recitals to Res. 2012-06 follow at the request of the Cascade Water Alliance:

A. WHEREAS, the Members of Cascade Water Alliance ("Cascade") entered into an Interlocal Contract ("Interlocal Contract"), effective April 1, 1999, and amended and restated on December 15, 2004, and on October 26, 2011. Under the Interlocal Contract, Cascade was created as a public body and an instrumentality of its Members, which exercised essential governmental functions on its Members' behalf as authorized by the Interlocal Cooperation Act (Chapter 39.34 RCW), and has been functioning as a watershed management partnership, as authorized by RCW 39.34.200. Cascade was incorporated as a public nonprofit corporation in the manner set forth in the Nonprofit Miscellaneous and Mutual Corporations Act (Chapter 24.06 RCW).

B. WHEREAS, Section 3.3 of the Interlocal Contract provides that Cascade may be converted into a separate municipal corporation if and as permitted by law, and that upon the creation of such a separate municipal corporation, all Cascade rights and obligations and all Member rights and obligations shall transfer to that new municipal corporation. Section 10.4 of the Interlocal Contact provides that "upon a 65 percent Dual Majority Vote (ratified within 120 days by 65 percent), as measured by Dual Majority Vote of the Members' legislative authorities, all assets, liabilities, and obligations of Cascade may be transferred to any successor entity (including, without limitation, a joint operating agency or other municipal corporation, as permitted under state law), and all obligations of Members and parties contracting with Cascade become obligations to the successor entity." Cascade's Board resolutions also reserved Cascade's right to convert into a municipal corporation.

C. WHEREAS, the Washington Legislature enacted the Joint Municipal Utilities Services Act, (Chapter 258, Laws of 2011), codified as Chapter 39.106 RCW ("the Act"), which provides in RCW 39.106.080 for the conversion of existing an intergovernmental entity formed under the Interlocal Cooperation Act (Chapter 39.34 RCW) into a joint municipal utility services authority under the Act, if:

• The public agencies that are parties to an existing interlocal agreement would otherwise be eligible to form an authority to provide the relevant utility services;

• Those public agencies amend, restate, or replace that interlocal agreement so that it materially complies with the requirements of RCW 39.106.050;

• The amended, restated, or replacement agreement is filed with the Washington state secretary of state consistent with RCW 39.106.030; and

• The amended, restated, or replacement agreement expressly provides that all rights and obligations of the entity formerly existing under Chapter 39.34 RCW or other applicable law will thereafter be the obligations of the new authority created under Chapter 39.106 RCW.

D. WHEREAS, under the Act, upon compliance with the requirements set forth in Recital C above, the new joint municipal utility services authority shall be a successor of the former intergovernmental entity for all purposes, and all rights and obligations of the former entity shall transfer to the new joint municipal utility services authority. Those obligations shall be treated as having been incurred, entered into, or issued by the new joint municipal utility services authority, and those obligations shall remain in full force and effect and shall continue to be enforceable in accordance with their terms.

E. WHEREAS, in accordance with Sections 3.3 and 10.4 of the Interlocal Contract, Cascade's Members (who are all public agencies that are parties to an existing interlocal agreement) are otherwise eligible to form a joint municipal utility services authority under the Act to provide the relevant utility services.

F. WHEREAS, Cascade's Members intend to amend and restate the Interlocal Contract in compliance with the Act in order to convert Cascade into a joint municipal utility services authority.

G. WHEREAS, Cascade's Members intend to transfer all Cascade rights, assets, liabilities, and obligations to the joint municipal utility services authority, to be created as provided herein.

H. WHEREAS, Cascade's Members intend that, as a joint municipal utility services authority, it will constitute a municipal corporation and will no longer function as a watershed management partnership.

The Cascade Water Alliance Code is current through Resolution 2023-11, passed May 24, 2023.

Disclaimer: The Cascade Water Alliance has the official version of the Cascade Water Alliance Code. Users should contact the Cascade Water Alliance for ordinances passed subsequent to the ordinance cited above.

Alliance Website: https://www.cascadewater.org/
Alliance Telephone: (425) 453-0930

Code Publishing Company

AMENDMENT TO THE ADDENDUM TO THE INTERLOCAL AGREEMENT BETWEEN REDMOND AND WOODINVILLE WATER DISTRICT

WATER SERVICE TO AN AREA BETWEEN 177TH AVENUE N.E. AND 184TH AVENUE N.E.

WHEREAS, the City of Redmond, Washington ("Redmond") and the Woodinville Water District, ("District") are parties to that certain Interlocal Agreement dated July 13, 1988, which designates the common service area boundary between the District and Redmond, and

WHEREAS, Redmond and the District entered into an addendum dated October 1, 1992, providing for water service to an area between 177th Avenue N.E. and 184th Avenue N.E., and

WHEREAS, "Redmond" and the "District" desire to modify Exhibits B and C to the addendum,

NOW THEREFORE, IT IS HEREBY AGREED AS FOLLOWS:

1) Exhibit B is a map of the service area showing the proposed improvements and is hereby superseded and replaced by a new Exhibit B which is attached to this agreement.

2) Exhibit C is a narrative describing the water system improvements and is hereby superseded and replaced by a new Exhibit C which is attached to this agreement.

3) Remainder of Agreement of Change
Except as stated above the interlocal agreement between Redmond and the District and the addendum to the interlocal agreement shall remain unchanged and in full force and effective.

DATED this 19th day of September, 1994.

CITY OF REDMOND
By Rosemarie Ives
Its Mayor

APPROVED AS TO FORM:
OFFICE OF THE CITY ATTORNEY
By

WOODINVILLE WATER DISTRICT
By
Its President

By Joann Mayfield
It Secretary

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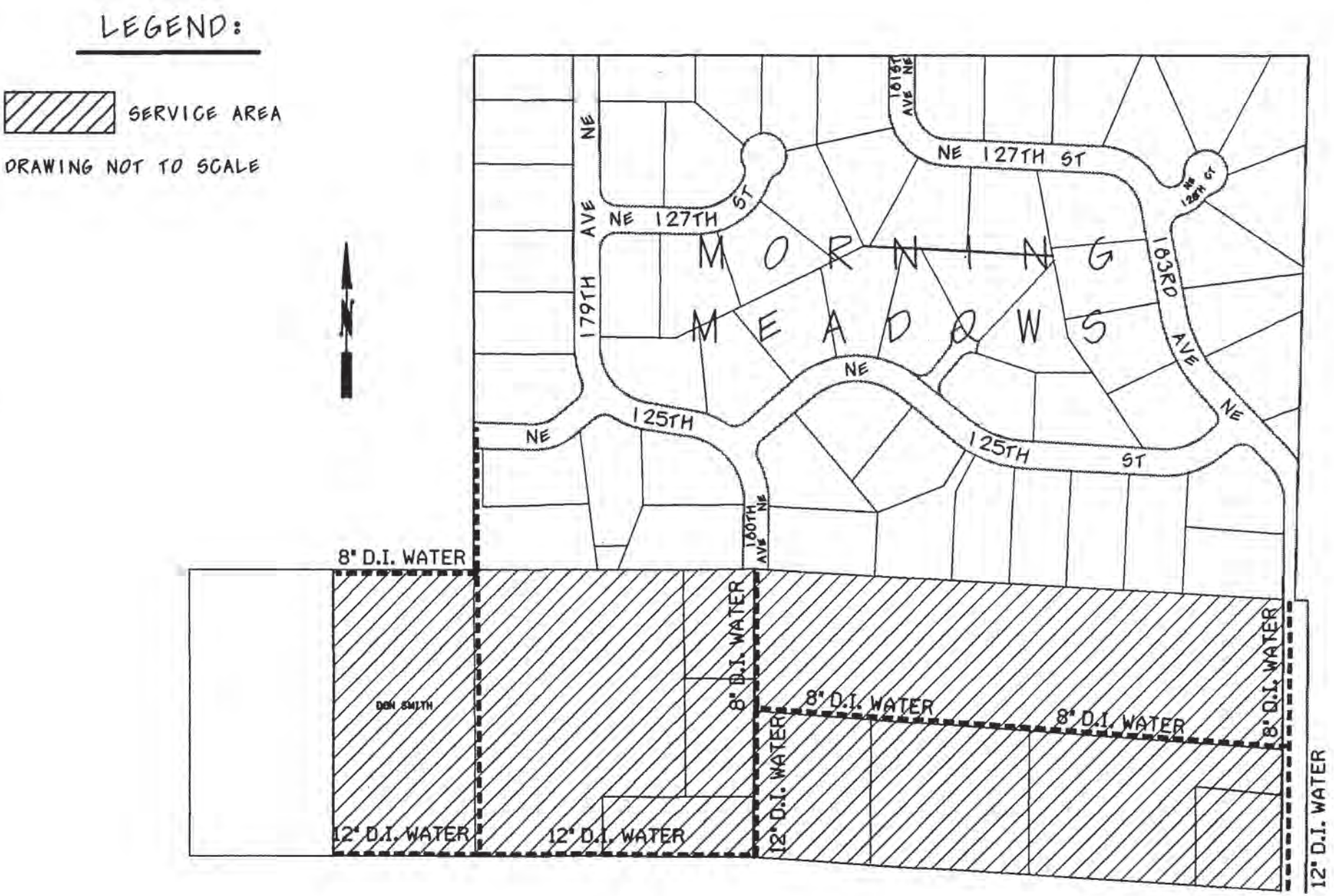

LEGEND:
SERVICE AREA
DRAWING NOT TO SCALE
N
MORNING MEADOWS
NE 127TH ST
179TH AVE NE
181ST AVE NE
NE 128TH CT
183RD AVE NE
NE 125TH ST
NE 125TH
160TH AVE NE
8" D.I. WATER
12" D.I. WATER
DON SMITH

EXHIBIT "C"

Subsequent to any future development or request for service each property shall construct that portion of the following improvements which is located on or adjacent to the property:

Connect to the existing main between Lots 1 and 2, English Hill Estates. Extend an 8-inch main to the west property line of Don A. Smith's east lot. Extend an 8-inch main east to 178th Avenue N.E. (extended). Extend an 8-inch main to the south property line of Lot 4, S.P. 478183. Connect to this main at N.E. 122nd Street (extended) and extend a 12-inch main to the west property line of Don A. Smith's east lot. Connect to the 8-inch main at the southwest corner of Lot 4, S.P. 478183 and extend a 12-inch main to 180th Avenue N.E. Connect to the 12-inch main in 180th Avenue N.E. and extend an 8-inch main to N.E. 123rd Street (extended) then easterly in N.E. 123rd Street (extended) to the right-of-way of 184th Avenue N.E. Extend the 8-inch main south in 184th Avenue N.E. to the southerly property line of Lot 19. Connect to the 8-inch main in 184th Avenue N.E. and extend an 8-inch main north to the existing Woodinville main. Connect to the 8-inch main located northwest of Lot 1, S.P. 385081, and extend an 8-inch main north to the existing main located in 180th Avenue N.E. Provide all appropriate easements and right-of-way dedications to contain the waterline improvements.

Redmond recognizes that Woodinville currently provides water service to Lots 1, 2 and 3 of S.P. 478183 and Lots 1, 2, and 3 of S.P. 385081 through extended service agreement and that service will continue without construction of these improvement until such time as the extended service agreements are terminated. Water service may be provided to the existing home on Tax Lot 110 (Smith) and the existing home on Lot 4 S.P. 478183 (Hussey) by constructing an 8-inch main from English Hill Estates to 10 feet south of the north property line of the parcels with a fire hydrant. The mains in N.E. 124th Street (extended) and N.E. 122nd Street (extended) fronting these parcels and the main in 178th Avenue N.E. (extended) shall be constructed prior to any additional development or subdivision of the properties and an agreement between Redmond, Woodinville, and the property owners shall be recorded which established this covenant.

AGREEMENT FOR WATER SYSTEM INTERTIE (187TH AVENUE NORTHEAST, STATE HIGHWAY 202)

This agreement made and entered into between Northeast Sammamish Sewer and Water District of King County, Washington, a municipal corporation ("District") and the City of Redmond, a Washington municipal corporation of Redmond, Washington ("City").

WITNESSETH:

WHEREAS, City is a municipality formed pursuant to RCW Title 35A and owns and operates a water system within its corporate boundaries; and District is a sewer district pursuant to RCW Title 56, and is authorized to operate a water system within its boundaries, which abut the southerly boundaries of the City; and a developer, Bay Ridge Properties ("Developer") as part of its approved apartment development on the north side of State Highway 202, constructed a 16-inch water main in the northeasterly shoulder of State Highway 202 (also known as the Fall City Road) up to the intersection of 187th Avenue Northeast, and the District has constructed a 12-inch water system crossing under State Highway 202 to the most northwesterly quadrant of the intersection ("Section One") at a cost to the District of Thirty Eight Thousand One Hundred Thirty-Eight and 23/100 Dollars ($38,138.23), which, with the construction of one additional section described below and a meter station, will provide a connection between the City's water system and the District water system; and such connection (hereinafter collectively referred to as the "Intertie") will provide each party an emergency source, and the parties mutually desire to construct said Intertie pursuant to the terms and conditions set forth below

NOW, THEREFORE, the parties do hereby agree as follows

1.0 Purpose. The purpose of the Intertie shall be to provide the water system of each party with an emergency water source. For purposes of this agreement, "emergency" is defined as an unforeseen circumstance of short duration resulting from a failure of equipment or piping which necessitates transfer of water from one of the parties to the other to meet life safety demands and satisfy minimum levels of service for customers. An emergency shall not be construed to exist as a result of the inability of a party to meet higher than anticipated demands by customers as a result of weather, new connections to the respective systems or other causes not related directly to a failure of equipment or piping.

2.0 Description of Intertie. The Intertie shall consist of Sections One, Two and Three, which are depicted on the diagram attached hereto as Exhibit A, and the meter station, including vault and associated valves. Sections One and Three have been constructed; Section Two will be constructed within two years of execution of this agreement by or for the City; the meter station will be constructed by the District.

3.0 Construction. The plans and specifications for all construction shall meet or exceed the construction standards of the party constructing the same and shall be subject to review and approval of the other party. Each party shall have the right to inspect all work of the other at all reasonable times to assure conformance with agreed plans and specifications.

3.1 Section Two. Section Two shall be constructed by or for the City within two years of execution of this agreement from the end of the crossing of State Highway 202 and run along the north side of 187th Avenue Northeast to a point 50 feet +/- east of the intersection of Northeast 55th Street where said line shall connect to Section Three.

3.2 Meter Station. The meter station shall be constructed by the District within two years of execution of this agreement at the northeast corner of the intersection of 187th Avenue Northeast and Northeast 55th Street.

4.0 Intertie Costs. The term "cost" as used in this section shall include, without limitation, all actual costs of labor, materials, equipment, engineering, inspection, right-

of-way, legal costs, publication, SEPA compliance and any costs customarily incurred in such projects. The costs for the Intertie shall be allocated as follows:

4.1 Section One. The cost of Section One shall be borne by both parties equally. The total agreed cost is Thirty Eight Thousand One Hundred Thirty-Eight and 23/100 Dollars ($38,138.23) which has been paid by the District. The City shall pay the District the sum of Nineteen Thousand Sixty-Nine and 11/100 Dollars ($19,069.11) representing its share of the cost within thirty (30) days of the execution of this agreement.

4.2 Section Two. The cost of Section Two, which has yet to be constructed, shall be paid in full by the City of Redmond, either directly or as contributed capital as a result of development.

4.3 Section Three. The cost of Section Three shall be paid in full by the District.

4.4 Meter Station. The cost of the meter station, which has yet to be constructed, shall be shared by the City and the District. The City shall pay the District one half of the cost or $4000, whichever is less, subsequent to completion of construction and acceptance by the District. Payment shall be made within thirty (30) days of presentation of an invoice from the District with documentation supporting calculation of the City's share. The District shall pay the balance of the cost.

5.0 Ownership. Upon payment of the City's share of Section One to the District, the ownership of Section One shall vest in the City. Ownership of Sections Two and Three shall be vested in the City and the District, respectively. Ownership of the meter station shall vest in the District.

6.0 Maintenance. Each party shall maintain their respective sections in good working order in accordance with sound maintenance procedures, good engineering practices and applicable laws, rules and regulations such that each party will receive and enjoy the continuous uninterrupted use of the Intertie as provided in this agreement.

7.0 Replacement. In the event of total loss or destruction of a section of the Intertie, the owner shall rebuild that section at its sole cost and expense.

8.0 Notification, Use, and Payment.

8.1 Notification. Prior to use of the Intertie to deliver water from one party to the other, the receiving party shall notify the delivering party of the nature of the emergency, and its expected duration. (In the event the emergency requires immediate operation to protect lives or property, notification should occur as soon as possible.) Within ten days of use of the Intertie to deliver water from the City to the District, the City and the District will provide a report of its use to Seattle Water Department, stating the nature of the emergency, the dates and time of use, and the quantity of water used.

8.2 Use. Operations personnel from both parties will participate in activating and deactivating the Intertie to preclude unanticipated impacts within respective systems. (In the event the emergency requires immediate operation to protect lives or property, either party may operate the Intertie, with notification to occur as soon as possible.)

8.3 Payment for Water Delivered. Water sold for emergency purposes shall be priced at the City of Seattle's wholesale rate in effect at the time of sale.

9.0 General. The parties acknowledge and agree that the use of said Intertie is essential to the operations of each party in providing water service to its customers under emergency conditions; that each party will rely upon the continued existence of the Intertie and rights of usage granted hereunder in its long range planning and issuing bonds, notes and other financing documents. Thus, each party covenants and agrees with the other not to interfere with the other's rights granted hereunder; not to violate applicable laws, rules and regulations of agencies with regulatory jurisdiction over the parties; and not to take any action inconsistent with this agreement.

9.1 Not a Partnership. The terms and conditions of this agreement shall not constitute a partnership or a joint venture.

9.2 Compliance with Laws and Regulations. Each party shall, with respect to its duties, responsibilities and operations hereunder, comply with all applicable laws, rules and regulations governing the same.

9.3 Specific Performance. In addition to all other remedies available to a party hereunder, whether in law or equity, each party to this agreement shall have the right to seek and obtain specific performance of the terms hereof. The parties agree that damage occurring by reason of the breach hereof is difficult, if not impossible, to ascertain and that remedies of law are inadequate.

9.4 Assignment. Neither party shall have the right in whole or in part to assign this agreement or its rights and obligations hereunder or its interest in the Intertie without prior written consent of the other party, which shall not be unreasonable withheld.

9.5 Authority. City enters into this agreement pursuant to the authority contained in RCW 35A.21.150 and 35.67.300. District enters into this agreement pursuant to RCW Title 56.

9.6 Attorney's Fees. If either party is required to use the service of an attorney to enforce this agreement, the prevailing party, whether or not suit is instituted, shall be entitled to recover its reasonable attorneys' fees and cost from the non-prevailing party.

9.7 Non waiver. No waiver by either party of any term or condition of this agreement shall be deemed or construed as a waiver of any other term or condition or of any breach hereof, whether pertaining to the same or a difference provision of this agreement.

10.0 Execution of Documents. Each party agrees to execute any and all documents, instruments and resolutions necessary to give effect to and carry out the terms of this agreement and to obtain the necessary approval of the same by government agencies as required by law.

11.0 Effective Date. This agreement shall be effective upon execution and approval of the legislative bodies of both parties

Entered into this 6 day of June, 1996.

NORTHEAST SAMMAMISH SEWER &
WATER DISTRICT, a municipal corporation

By Joseph M. Faulstich
President and Commissioner

By James L. Bragg
Secretary and Commissioner

Entered into this 6 day of June, 1996.

CITY OF REDMOND, a municipal corporation

By Rosemarie Ives
Mayor

APPROVED AS TO FORM:

By:
City Attorney

By: Bonnie Mattson
City Clerk

o:\utility\neszwd2.doc

VICINITY MAP - WATER SYSTEM INTERTIE
CITY OF REDMOND - NORTHEAST SAMMAMISH SEWER & WATER DISTRICT

Interlocal Agreement: NESSWD
Exhibit A

ORIGINAL

FILED NO. 24972
CITY OF BELLEVUE
DATE 10/13/97
M-Rose
CITY CLERK'S OFFICE

INTERLOCAL OPERATION AND MAINTENANCE AGREEMENT

This Agreement is made by and between the Cities of Kirkland ("Kirkland"), Redmond, ("Redmond"), and Bellevue, ("Bellevue"), municipal corporations in King County, Washington, collectively referred to as the "Cities" for the purposes set forth herein.

RECITALS

A. The Cities have previously approved an Assumption Agreement whereby the Cities have assumed the assets, liabilities and operations of the Rose Hill Water District, a municipal corporation in King County, Washington ("District").

B. Prior to the assumption of the District by the Cities, Kirkland and Bellevue maintained jointly owned water facilities with the District pursuant to various interlocal agreements providing for such. In addition, Redmond entered into certain interlocal agreements with the District regarding water system operation and water supply. Upon the effective date of the assumption of the District by the Cities, the Cities have assumed ownership and responsibility for the District's water supply facilities within the Cities' respective service areas. However, certain District facilities will continue to be jointly owned and operated by the Cities in accordance with the terms of the Assumption Agreement and their respective undivided ownership interests in such facilities.

C. The purpose of this Agreement is to provide for the respective responsibilities and obligations of the Cities to provide for the ongoing operation and maintenance of water supply facilities ("joint facilities") within the common service areas as further described in this Agreement.

D. The Cities are authorized by Chapter 39.34 RCW, the Interlocal Cooperation Act, to enter into interlocal agreements for the joint action referenced herein.

NOW, THEREFORE, in consideration of the terms and conditions contained herein, the parties agree as follows:

1. Modification of Assumption Agreement. Exhibit C to the Assumption Agreement describes the jointly owned facilities and the distribution of ownership believed appropriate at the time the Assumption Agreement was executed. After additional evaluation it has been determined that modifications to the designation of jointly owned facilities and the distribution of ownership are necessary. Therefore, Attachment "A" to this Interlocal Operation and Maintenance Agreement supersedes Exhibit C to the Assumption Agreement.

2. Service Areas. Each City shall be the direct provider of water service within its service area. For purposes of this Agreement, "service area" means that portion of the City's incorporated area that overlays a portion of the previous District area together with adjacent unincorporated areas as more generally described as follows:

a. The service area for Bellevue shall be that area existing within the Bellevue city limits as of the effective date of this Agreement.

b. The service area for Kirkland shall be that area existing within the Kirkland city limits as of the effective date of this Agreement and any District service areas that are in unincorporated King County lying west of 132nd Avenue NE and its northerly extension.

c. The service area for Redmond shall be that area existing within the Redmond city limits as of the effective date of this Agreement and any District service areas that are in unincorporated King County lying east of 132nd Avenue NE and its northerly extension.

d. Any unincorporated area previously within the Rose Hill Water District Boundaries which is subsequently annexed into a City shall remain in or be transferred to the service area of the annexing City.

3. Meter Areas. Within each City's service area there are hereby established "direct read meter areas" and "master meter areas."

a. Direct read meter areas are within the previous District service area between the Seattle meters in place as of the effective date of the Assumption Agreement and the points at which City master meters exist or are installed in the future. Direct read meter areas indicate retail water usage within that area.

b. Master meter areas are those areas previously served by the District outside of the previous District service area boundary and downstream from City master meters.

4. City Master Meters are those existing or future meters that meter water to master meter areas.

5. Water Supply.

a. Kirkland shall purchase water from The City of Seattle for supply to the service areas of Kirkland, Redmond and Bellevue and shall sell water to Redmond and Bellevue.

b. Where Bellevue's direct service area lies within a portion of Redmond's master meter area, Redmond shall sell water to Bellevue to serve such area.

c. In the event The City of Seattle chooses to modify the purveyor contract with Kirkland to limit the quantity of supply to Kirkland, Kirkland shall continue to supply the service areas of Redmond and Bellevue. The quantity to be supplied to Redmond and Bellevue shall then be the amount of supply allocated to Kirkland from Seattle divided amongst the three cities in proportion to the percent ownership in the joint facilities as stated in Section 4 of Attachment A. Bellevue customers served by Redmond or Kirkland shall continue to receive their allocation based upon the average of the demand for the previous three years limited in the same proportion as are Kirkland and Redmond customers. Kirkland shall not be obligated to supply water to Redmond and Bellevue in excess of the respective City's proportionate amount supplied by The City of Seattle.

d. In the event Seattle chooses to not renew its purveyor contract with Kirkland, Kirkland shall not be obligated to supply water to Redmond and Bellevue. In the event that the supply from the City of Seattle is limited or eliminated by Seattle, the Joint Board shall evaluate and make recommendations to the Councils of the three cities on the alternatives to be considered and pursued for additional or alternate source(s) of supply.

e. In the event a regional water supply authority or water supply other than The City of Seattle is formed, the Councils of Redmond and Kirkland shall determine if Kirkland, or Kirkland and Redmond should jointly contract for supply from the new authority and whether to amend or terminate the City of Seattle contract ("Purveyor Contract") and/or this Agreement.

6. Water Usage. The water usage within the direct read meter areas shall be referred to as "retail water" and the water usage through master meters shall be referred to as "wholesale water." The water loss within the direct read meter areas to uses including but not limited to flushing, construction, leakage and firefighting shall be referred to as "unaccounted water." The usage of each City shall be computed for retail water, wholesale water and unaccounted water separately. Unaccounted water usage shall be determined by subtracting the wholesale water usage and retail water usage for each of the three Cities from the quantity of water purchased from The City of Seattle. The unaccounted water shall then be allocated to each of the Cities in proportion to the amount of retail water used within each City's direct read meter areas.

7. Operation and Maintenance. Kirkland and Redmond shall be jointly responsible for performing the operation and maintenance of any facilities jointly owned by the Cities. Redmond shall operate, maintain and repair any jointly owned water lines within the Redmond service area. Kirkland shall operate, maintain and repair all other jointly owned facilities.

Kirkland, Redmond and Bellevue each agree to not operate their facilities which are not joint-use facilities in any way which would be detrimental to the operations of any city. If a situation arises between the cities, the Joint Board shall determine how the water system shall be operated and maintained to the benefit of all cities.

8. Establishment of a Joint Board. The Cities hereby establish a Joint Board which shall provide oversight for the planning and performance of operations, maintenance, extraordinary maintenance, repair, and replacement of the joint facilities. The Joint Board shall be authorized to negotiate and execute leases of joint facilities. The Joint Board shall meet at least annually and shall be comprised of the Public Works Director (or equivalent department head) of each City or his/her designee. Should the Public Works Director or equivalent department head of any city appoint an alternate representative to the Joint Board, such appointment shall be in writing to the other cities by the Public Works Director or equivalent department head.

A quorum at any meeting of the Joint Board shall consist of a simple majority of the Joint Board's membership. All Joint Board members shall have one equal vote and, except as provided otherwise herein, all actions required to be authorized by vote of the Joint Board shall require approval of a majority of those present; provided however, that if the proposed action directly pertains to the operations, maintenance, extraordinary maintenance, repair or replacement of a particular jointly-owned facility, then the Joint Board action shall be by weighted majority vote based on the percentage of ownership interest of each City in the particular jointly owned facility to be operated, maintained, repaired or replaced.

9. Water Supply, Operation and Maintenance Costs. Costs for water supply and water system operation, maintenance, extraordinary maintenance, repair and replacement as further defined herein, shall be shared by the Cities and shall consist of the following components:

a. Water Charges: The water rates for wholesale water, retail water and unaccounted water shall be the commodity rates charged by the City of Seattle for the type of water (old, new) and for the period consumed (summer, winter). This rate shall also include but not be limited to emergency surcharges and applicable commodity or other charges or surcharges established by the City of Seattle.

b. Meter Charges: The meter charges for the City of Seattle meters shall initially be allocated to each City as follows:

Kirkland:	65%
Redmond:	35%
Bellevue:	0%

The percentage allocation of meter charges to the Cities shall be reviewed annually by the Joint Board on or about January 1 and shall be adjusted, if deemed necessary by the Joint Board, based upon the total quantity of water usage by each City in proportion to the total quantity of water purchased through the Seattle meters for the previous year.

There shall be no charges for any City-operated master meter. Costs associated with the operation and maintenance of master meters shall be borne by the City served by the master meter. City operated master meters will be tested and calibrated in even numbered years by the City served by the master meter.

c. Operation Charges. Kirkland shall assess Redmond and Bellevue for their proportionate shares of labor and costs incurred in the daily operation of the joint facilities based on water usage. Operation of the joint facilities shall include but not be limited to the operation of the instrumentation/control systems for such joint facilities, and for controlling the rate of flow from the Seattle supply facilities. The operation charges shall be actual expenses incurred including overhead. These expenses shall be subject to periodic review by the Joint Board at least every two (2) years.

d. Maintenance Charges: Kirkland shall assess Redmond and Bellevue, and Redmond shall assess Kirkland and Bellevue, based on their respective ownership interests in the joint facilities, for providing routine maintenance of and repairs to the joint facilities for which Kirkland or Redmond is responsible based upon service area location. These maintenance and repair activities include but are not limited to maintenance and repair of the instrumentation/control system for the joint facilities, maintenance and repair of the reservoirs, jointly owned pipelines, pumping facilities, reservoir control facilities, landscape maintenance and groundskeeping for the various joint facilities, and other activities of a similar nature. Redmond shall make similar assessments for routine maintenance of joint pipeline facilities within its service area. The Cities' ownership interests in the joint facilities are identified in Attachment A to this Agreement.

The maintenance charges from Kirkland to Redmond and Bellevue shall be actual expenses incurred including overhead. The maintenance charges from Redmond to Kirkland and Bellevue shall be actual expenses incurred including overhead. These expenses shall be subject to periodic review by the Joint Board at least every two (2) years.

e. Administration Charges: Kirkland shall assess Redmond and Bellevue based on water usage for their proportionate shares of the administrative costs incurred by Kirkland to provide administrative activities and duties for this Agreement and operation and maintenance of the joint facilities for which Kirkland is responsible. These administrative activities include but are not limited to coordination with the City of Seattle, financial and accounting services, record keeping, and billing.

The administrative charges shall be actual costs incurred including overhead. These charges shall be subject to periodic review by the Joint Board at least every two (2) years.

f. Insurance: The Joint Board shall determine the nature and amount of hazard and liability insurance to be provided for the joint facilities and their operation. Each City may but shall not be required to maintain casualty insurance for all risks of direct physical loss from external cause on the jointly-owned facilities to the extent of their interest at the current replacement cost of such improvements, which costs shall be updated annually. The Cities may agree that one of the Cities may obtain such insurance

naming the other Cities as named insureds and for the sharing of the costs of such insurance based upon the percentage of ownership of the joint facilities by each respective City.

g. Special Assessments.

1) Special Assessments for Emergency Items. Special assessments shall be made for emergency maintenance, repair, and replacement activities of the joint facilities. Emergency maintenance, repair, or replacement activities shall be defined as maintenance, repair, or replacement of joint use facilities requiring immediate attention and, without such attention, could cause a disruption to water supply or quality. The Joint Board shall have the authority to approve and assess such special assessments based on actual costs of such emergency maintenance, repair, or replacement activities as demonstrated by an accounting of time and materials; provided, however, any such special assessment approved by the Joint Board, to the extent it exceeds ~~$50,000.00~~ for any City, shall not obligate such City until and unless approved by that City, unless that City delegates by appropriate legislative action the authority to its representative on the Joint Board to approve a larger special assessment on its behalf. This amount may be adjusted every five (5) years by the Joint Board by an amount not to exceed increased costs due to inflation. In calculating such adjustments, the Joint Board may rely on consumer price indices for the Seattle-Metropolitan area and similar locally available indices. Time and materials shall include labor, benefits, overhead, materials, taxes and contract amounts. Each City shall be assessed such special assessment based on its respective ownership interest in the joint facility under emergency maintenance or repair.

$25,000.00

9.29.97

2) Special Assessments for Extraordinary Items. Special assessments may also be made for extraordinary maintenance, repair and replacement activities of the joint facilities or joint capital improvement project for new or existing joint facilities. Extraordinary maintenance, repair and replacement activities may include but are not limited to coating, replacement, and structural repairs of the water storage facilities, and replacement of joint facilities (pipelines, pumps, motors, valves, vaults, supply meters and structures).

3) Destroyed or Damaged Facilities. In the event any of the joint facilities are destroyed or irreparably damaged by any cause, the facility so destroyed or damaged shall be promptly replaced by the Cities and the cost thereof shall be paid in the same proportion as the ownership of the facility. The Cities may, by unanimous agreement, determine that such facilities need not be replaced or reconstructed if the Joint Board finds the facilities are no longer necessary to the efficient provision of water supply.

h. Charges Between Cities. All charges assessed by one City against either of the other Cities for operation, maintenance, administration or special assessment shall include supporting documentation justifying said charges.

i. Demand Metering. Kirkland shall be responsible for demand metering as required in it's Purveyor Contract with the City of Seattle. During the demand metering period of June 1 through August 31, Redmond and Bellevue must notify Kirkland of their planned withdrawal rates by 8:00 a.m. daily to allow Kirkland sufficient time to set flow rates from the Seattle meters. The Joint Board will determine how to distribute the cost of a surcharge between the Cities.

j. Response to Emergencies. Costs of emergency response or repair activities to a joint facility by either City shall be allocated between the Cities based upon the percentage of ownership in the joint facility(s) involved.

10. Water Supply, Operation and Maintenance Payments.

a. Meter Reading. The Cities shall read their master meters and direct read meters as follows:

1) Redmond: Kirkland shall read Redmond's master meters at least monthly. Redmond shall read its direct read meters monthly or bimonthly in accordance with Redmond's policies and procedures. Redmond shall report to Kirkland the retail usage and the meter read dates within thirty (30) days of meter reading.

2) Bellevue: Kirkland shall read Bellevue's master meters at least monthly. Bellevue shall read its direct read meters monthly or bimonthly in accordance with Bellevue policies and procedures. Bellevue shall report to Kirkland the retail usage and meter read dates within thirty (30) days of meter reading.

3) Kirkland: Kirkland shall read its master meters at least monthly and shall read its direct read meters monthly or bimonthly in accordance with Kirkland policies and procedures.

b. Supply and Consumption Reports. Kirkland shall prepare a supply and consumption report for each month of the year within ninety (90) days of the end of each such month. The report shall indicate the total purchased supply, the wholesale usage and retail water usage reported by each City, and the unaccounted water usage calculated for each City. This report shall correlate the total purchased supply and reported usages to actual calendar periods of use as may be determined based on the varying meter read dates and frequency of meter readings. This report shall indicate the type of water used (old, new) and the period of use (summer, winter).

c. Billings and Payments. Kirkland shall invoice Redmond and Bellevue monthly for estimated water usage or any other charges as set forth herein. Estimated water usage shall be established from prior years' actual consumption records for retail water usage. Actual Master meter readings shall be used for the wholesale meter usage. With each monthly supply and consumption report an invoice shall be prepared based on actual usage.

d. Delinquent Payments. All payments between any of the Cities pursuant to the terms of this Agreement shall be made within 45 days of receipt of invoice. Payments not made within 45 days will be subject to 1% (one percent) per month interest charges on the outstanding balance.

11. Seattle Water Purveyor Contract. The parties acknowledge that the District has assigned its water purveyor contract with the City of Seattle to Kirkland pursuant to the Assumption Agreement and that Kirkland is a purveyor of water to Redmond and Bellevue. As set forth in the Assumption Agreement, Kirkland agrees to apportion its purveyor committee weighted votes between Kirkland and Redmond as allowed and provided by the Seattle Purveyors Committee By-laws. Kirkland further agrees to allocate between the Cities the flushing allowance provided for in the water purveyor contract in proportion to the total water used by each city as supplied by Kirkland in the previous year.

The water purveyor contract also provides in section III F therein for a purveyor facilities account. That section provides for identification and compensation for certain facilities that have been allocated to and paid for by the purveyors. Any allocation or credit to Kirkland under the purveyor contract in the event of the application of Section III F shall be reallocated by Kirkland to the three Cities based upon water purchased by each City in those years the allocation is made.

12. Status of Parties. This Agreement shall not be construed to establish a partnership, joint venture or any other legal relationship between the parties hereto except as common owners of the jointly owned facilities.

13. Successors. This agreement and its terms and conditions shall be binding upon the successors and assigns of the parties hereto.

14. Change in Proportion of Use or Ownership. The Cities may agree to adjust the use and/or ownership of the joint facilities identified in this Agreement and exhibits hereto as either a permanent amendment to this Agreement or as a temporary arrangement, and may agree that one party will pay the other party on an agreed basis for such permanent or temporary use of all or part of the other parties' contract share of the joint facilities.

15. Term and Termination. The term of this Agreement shall commence upon approval by the three cities. This Agreement shall remain in effect until terminated by mutual agreement of the three Cities. Upon termination of this Agreement, the disposition of the jointly owned facilities shall be in accordance with the ownership interests identified in Attachment A hereto; and all other property acquired during the life of this Agreement shall be distributed to the contributing City or Cities to the extent of such City's or Cities' contribution(s).

16. Emergencies, Notice and Response. In the event of an emergency condition occurring in the water system within the service areas of any of the Cities which affects the operation of the joint facilities, the City experiencing the emergency condition shall, upon learning of the condition, endeavor to immediately notify the other Cities. The Joint Board shall establish procedures for such notification providing as a minimum, a priority of names and telephone numbers for notification. The parties so notified shall, if requested and to the extent practicable, render emergency assistance to the other party and modify their system operations and control to the extent practicable as reasonably necessary to meet the emergency. In the event of such emergency, the party experiencing the emergency shall reimburse the other parties for the reasonable cost of any assistance provided.

17. Records. Kirkland shall maintain records indicating all operation and maintenance and administrative costs and charges and maintenance schedules for the joint facilities for which Kirkland is responsible and identifying actual maintenance performed.

18. Indemnification. Each City agrees to defend, indemnify, and hold the other Cities harmless from any and all losses, claims, demands, payments, suits, liabilities, or judgments of every nature and description brought or recovered against the other Cities for damages suffered, or alleged to be suffered by persons or property caused by or resulting from the operation or maintenance of the joint facility as described herein, except to the extent such damages resulted from the negligence of the other Cities.

19. Notice and Communications. All notices and other formal communications to be given or any documents to be delivered by any party to any other party shall be delivered in person or mailed by certified mail and addressed to the respective parties at the following addresses:

To Kirkland at: Director of Public Works
City of Kirkland
123 Fifth Avenue
Kirkland, Washington 98033

To Redmond at: Director of Public Works
City of Redmond
15670 NE 85th Street
Redmond, Washington 98052

To Bellevue at: Utility Director
City of Bellevue
PO Box 90012
Bellevue, WA 98009-9012

20. Modification of Agreement. This Agreement may be amended, modified or added to only by written instrument properly signed by all parties hereto.

~~THIS NEXT PARAGRAPH WILL REMAIN HERE, FOR NOW, AS WE MAY PUT IT BACK INTO DOCUMENT.~~

AEP 9-29-97 JRW

21. Superseding Agreement. Several agreements and contracts have been approved and / or adopted by the District over the years. The following listed agreements and contracts constitute the entire list of agreements and contracts that were known to be in existance at the time of the signing of this Interlocal Operations and Maintenance Agreement.

In the event that this Interlocal Operations and Maintenance Agreement conflicts with the provisions of any other District agreement or contract presently in effect but not listed below, this Interlocal Operations and Maintenance Agreement shall govern. The Joint Board shall be responsible to consider any such agreements and contracts on an individual basis to nullify, modify or amend any such agreements or contracts and shall do so by amendment to this Interlocal Operations and Maintenance Agreement .

The following listed agreements and contracts are hereby null and void in their entirities:

RESOLUTION OF BOARD OF COMMISSIONERS OF ROSE HILL WATER DISTRICT ADOPTING INTERLOCAL GOVERNMENTAL AGREEMENT FOR CONSTRUCTION OF 14.3 MILLION GALLON RESERVOIR. (Resolution No. 737)

RESOLUTION OF THE BOARD OF COMMISSIONERS OF ROSE HILL WATER DISTRICT EXTENDING CONTRACT FOR WATER SALES TO THE CITY OF REDMOND. (Resolution No. 679)

A RESOLUTION OF THE BOARD OF COMMISSIONERS OF ROSE HILL WATER AND SEWER DISTRICT APPROVING AGREEMENT WITH CITY OF REDMOND FOR WATER DISTRIBUTION SYSTEM. (Resolution No. 648)

RESOLUTION OF THE BOARD OF COMMISSIONERS OF ROSE HILL WATER AND SEWER DISTRICT APPROVING CONTRACT FOR SALE OF WATER TO THE CITY OF REDMOND. (Resolution No. 547)

RESOLUTION OF THE BOARD OF COMMISSIONERS OF KING COUNTY WATER DISTRICT NO. 81 APPROVING AMENDMENT TO JOINT WATER STORAGE AND DISTRIBUTION PROJECT AGREEMENTS. (Resolution No. 457)

A RESOLUTION OF THE BOARD OF COMMISSIONERS OF KING COUNTY WATER DISTRICT NO. 81 REQUESTING THE ESTABLISHMENT OF A JOINT MAINTENANCE FUND. (Resolution No. 257)

A RESOLUTION OF THE BOARD OF COMMISSIONERS OF KING COUNTY WATER DISTRICT NO. 81 ACCEPTING JOINT FACILITIES RESERVOIR CONSTRUCTION. (Resolution No. 250)

A RESOLUTION OF THE BOARD OF COMMISSIONERS OF KING COUNTY WATER DISTRICT NO. 81 APPROVING THE EXECUTION OF A CONTRACT FOR TELEMETERING SERVICE FOR THE JOINT FACILITIES PROJECT. (Resolution No. 248)

A RESOLUTION OF THE BOARD OF COMMISSIONERS OF KING COUNTY WATER DISTRICT NO. 81 ACCEPTING JOINT FACILITIES WATER MAIN CONSTRUCTION. (Resolution No. 246)

A RESOLUTION OF THE BOARD OF COMMISSIONERS OF KING COUNTY WATER DISTRICT NO. 81 APPROVING AN AGREEMENT FOR JOINT CONSTRUCTION OF WATER STORAGE AND DISTRIBUTION FACILITIES. (Resolution No. 233)

A RESOLUTION OF THE BOARD OF COMMISSIONERS OF KING COUNTY WATER DISTRICT NO. 81 APPROVING AN AGREEMENT FOR EXCHANGE OF WATER UTILITY FACILITIES WITH THE CITY OF KIRKLAND. (Resolution No. 232)

A RESOLUTION OF THE BOARD OF COMMISSIONERS OF KING COUNTY WATER DISTRICT NO. 81 APPROVING A CONTRACT WITH THE CITY OF KIRKLAND. (Resolution No. 118)

A RESOLUTION OF THE BOARD OF COMMISSIONERS OF KING COUNTY WATER DISTRICT NO. 81 APPROVING AN AGREEMENT WITH THE CITY OF KIRKLAND. (Resolution No. 180)

A RESOLUTION OF THE COMMISSIONERS OF KING COUNTY WATER DISTRICT NO. 81 AUTHORIZING THE CREATION OF A CONTRACT WITH THE CITY OF KIRKLAND FOR THE SUPPLY OF WATER AND THE SERVICING OF A WATER DISTRIBUTION SYSTEM. (Resolution No. 9)

22. Severability. The invalidity of any clause, sentence, paragraph, subdivision, section or portion of this Agreement shall not affect the validity of the remainder of the Agreement.

23. Counterparts. This Agreement may be signed in counterparts and, if so signed, shall be deemed one integrated document.

24. Filing and Effective Date. This Agreement shall be filed with the King County Department of Records and Elections and the Secretary of State of the State of Washington and shall take effect upon approval and signature by each City.

CITY OF KIRKLAND

By Anne Stefling
Its City Manager
Dated 9-29-97

Approved as to Form:
OFFICE OF THE KIRKLAND
CITY ATTORNEY

By Gail Howard
Its City Attorney
Dated 9-29-97

CITY OF REDMOND

By
Its EXEC ASST
Dated 9/25/97

Approved as to Form:
OFFICE OF THE REDMOND
CITY ATTORNEY

By Robert J. McGill
Its Assistant City Attorney
Dated 9/4/97

CITY OF BELLEVUE

By Glenda M. Barton
Its Deputy City Manager
Dated 10/9/97

Approved as to Form:
OFFICE OF THE BELLEVUE
CITY ATTORNEY

By
Its Asst City Atty
Dated 10/6/97

3city94\operagre\rjp:nmw
4/21/94

DUPLICATE ORIGINAL
PROJECT FILE RECORDS

ADDENDUM TO INTERLOCAL AGREEMENT BETWEEN REDMOND AND WOODINVILLE WATER DISTRICT BLAKELY RIDGE (TRILOGY)

WHEREAS, the City of Redmond, Washington ("Redmond") and the Woodinville Water District ("the District") are parties to that certain interlocal agreement ("the interlocal agreement") dated July 13, 1988, which designates the common service area boundary between the District and Redmond, and

WHEREAS, paragraph 12 of the agreement provides that future developments that straddle the common boundary line shall be approved by an addendum on a case-by-case basis and

WHEREAS, the Blakely Ridge Urban Planned Development, also known as Trilogy ("Trilogy") straddles the common boundary line and

WHEREAS, Redmond and Woodinville wish to identify a new common boundary line in this area

NOW, THEREFORE, IT IS AGREED AS FOLLOWS:

1) Sewer Service Boundary for Trilogy
The entire Trilogy development as shown on Exhibit A shall be in the sewer service area of the City of Redmond.

2) Water Service Boundary for Trilogy
The Trilogy development south of the north lines of the South half of the Southwest quarter and the South half of the Southeast quarter of Section 22 shall be in the water service area of Redmond. The Trilogy development north of this line shall be in the water service area of the District. (See Exhibit A).

3) Future Boundary Revision

Should Redmond or Woodinville wish to revise the above boundaries, the party desiring the change shall make a proposal to the other party with reasons for the change. The boundary may be revised as approved by a written amendment to this agreement.

4) Remainder of Agreement Unchanged

Except as stated above, the interlocal agreement between the District and Redmond shall remain unchanged and in full force and effect.

DATED this 12th day of February, 2002.

City Of Redmond

By _____

Its MAYOR

Approved As To Form:
Office Of The City Attorney

By _____

Woodinville Water District

By _____
Its President

By _____
Its Secretary

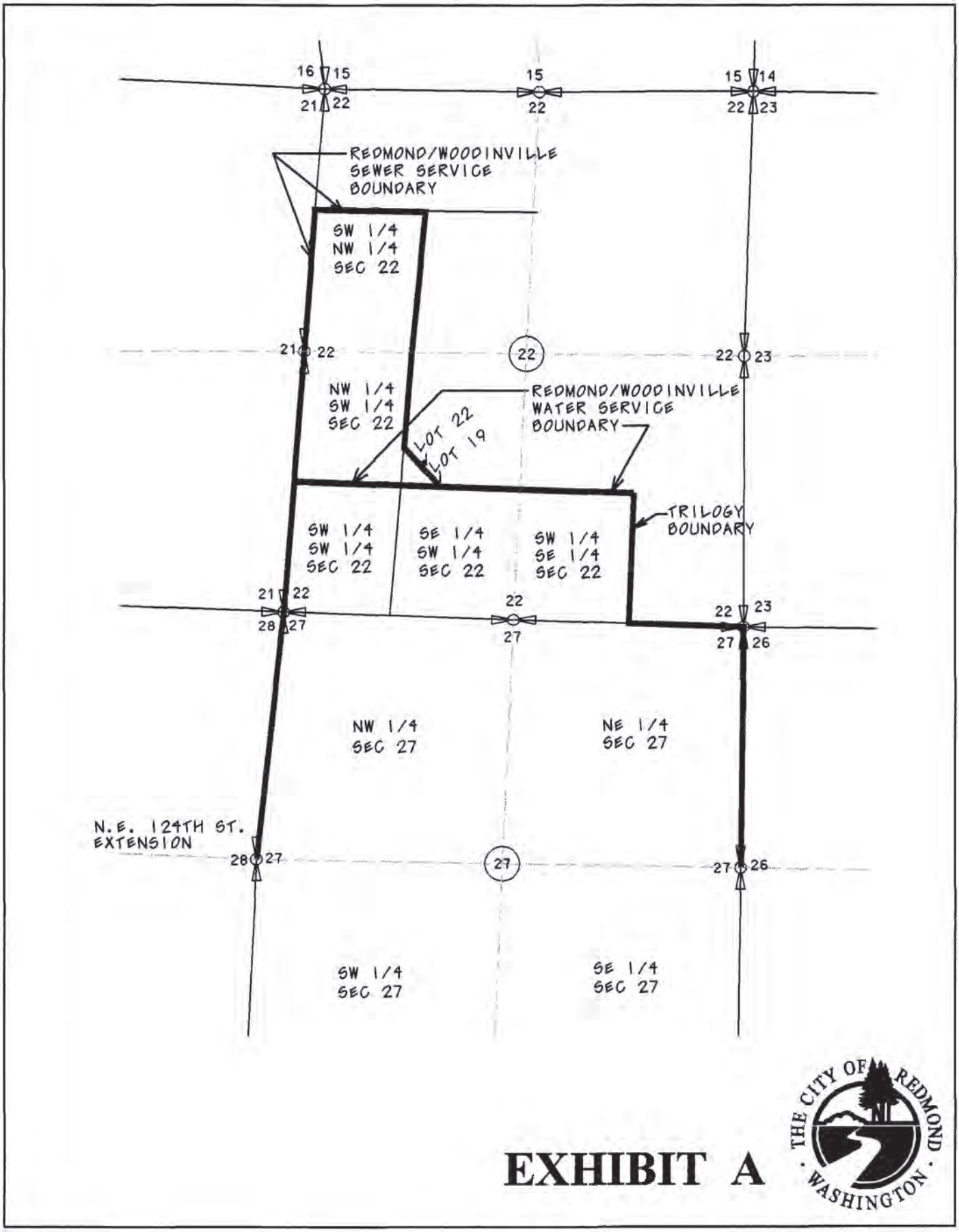

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REDMOND/WOODINVILLE
WATER SERVICE
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TRILOGY
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THE CITY OF REDMOND
WASHINGTON

EXHIBIT A

COPY

AGREEMENT FOR WATER SYSTEM INTERTIES
(TRILOGY AT REDMOND RIDGE DEVELOPMENT)

This Agreement made and entered into between Woodinville Water District ("District"), a non-profit corporation, and the City of Redmond ("City"), a municipal corporation of the State of Washington.

W I T N E S S E T H:

WHEREAS, the City is a non-charter, optional municipal code city organized and operating pursuant to Chapter 35A RCW; and

WHEREAS, the City owns and operates a water system which is being extended east of the City to service the Trilogy at Redmond Ridge development; and

WHEREAS, the District is organized and operating pursuant to Title 57 RCW and is authorized to operate a water system within its boundaries; and

WHEREAS, the District and City entered into an Interlocal Agreement dated July 13, 1988 and its subsequent Addendum dated February 12, 2002, which provides for the District to serve the northern portion of the Trilogy at Redmond Ridge development as shown in Exhibit A;

WHEREAS, the District's existing water system has water mains in several locations adjacent to where the City water system is being constructed within the Trilogy at Redmond Ridge development; and

WHEREAS, connections between the District's water system and the City's water system (i.e., "Interties") are physically convenient in such locations; and

WHEREAS, such Interties would provide each party with an emergency source of additional water, and the parties mutually desire to construct said emergency Interties pursuant to the terms and conditions set forth below;

NOW, THEREFORE, the parties do hereby agree as follows:

1.0 **Purpose.** The purpose of this Agreement is to provide Interties of the water system of each party with an emergency water source.

2.0 **Definitions.** For purposes of this Agreement, "emergency" shall mean an unforeseen circumstance of "short" duration resulting from a failure or repair and maintenance of either parties' water system equipment or piping which necessitates transfer of water from one of the parties' to the other to meet life safety demands and satisfy minimum levels of service for customers. A "short" duration is defined as a period of time not to exceed five (5) days unless the District's General Manager and the City's Public Works Director, or their designees, agree to a longer period in writing. An emergency shall not be construed to exist as a result of the inability of a party to meet higher than anticipated demands by customers as a result of weather, new connections to the respective system or other causes not related directly to a failure or repair and maintenance of equipment or piping.

3.0 **Description of Interties.** Two Interties shall be constructed and operated under the terms of this Agreement and are shown on the map attached hereto as Exhibit A. The Interties are to be as follows:

1) NE 133rd Street Intertie. This is to be constructed within or adjacent to the King County right-of-way of NE 133rd Street near the northwestern edge of the Trilogy at Redmond Ridge development.

2) 232nd Avenue NE Intertie. This is to be constructed within or adjacent to the King County right-of-way of 232nd Avenue NE at the northern edge of the City's service area boundary in the Trilogy at Redmond Ridge development.

4.0 Construction.

4.1 The District shall be responsible for construction of the NE 133rd Street Intertie, and the City shall be responsible for the construction of the 232nd Avenue NE Intertie. Construction responsibility shall include but not be limited to design, permitting, project administration, right-of-way acquisition, construction, and construction inspection of the Intertie.

4.2 The plans and specification for all construction shall meet or exceed the construction standards of the party which is to own the same and shall be subject to review and approval of the other party. Each party shall have the right to inspect all work of the other at all reasonable times to assure conformance with agreed plans and specifications.

5.0 Construction Schedule. The NE 133rd Street Intertie shall be operationally complete prior to the portions of Parcel "Z-6" of the Trilogy at Redmond Ridge Division 3 Plat (Recording Number 20021001001700) that are West of Trilogy Parkway N. E. and South of N. E. 133rd Street being platted. The 232nd Avenue NE Intertie shall be operationally complete prior to Parcel "Z-3" and the portions of Parcel "Z-1" of the Trilogy at Redmond Ridge Plat (Recording Number 20011204001049) that are East and/or North of Tract "GC–16" being platted.

6.0 Intertie Project Costs. The term "cost" as used in this section shall include, without limitation, all actual costs of labor, materials, equipment, engineering, inspection, right-of-way, legal costs, publication, SEPA compliance and any costs customarily incurred in such projects. The costs for the Intertie shall be allocated as follows:

6.1 City Costs. The cost of the 232nd Avenue NE Intertie shall be paid in full by the City, either directly or as contributed capital as a result of development.

6.2 **District Costs.** The cost of the NE 133rd Street Intertie shall be paid in full by the District, either directly or as contributed capital as a result of development.

7.0 **Ownership.** Upon completion of construction, ownership of the 232nd Avenue NE Intertie shall vest with the City because water will predominately flow from the District's 670 Zone to the City's 625 Zone. Ownership of the NE 133rd Street Intertie shall vest with the District since water will predominately flow from the City's 625 Zone to the District's 570 Zone.

8.0 **Maintenance.** Each party shall maintain their respective Interties in good working order in accordance with sound maintenance procedures, good engineering practices and applicable laws, rules and regulations such that each party will receive and enjoy the continuous uninterrupted use of the Interties as provided in this Agreement. Maintenance shall include meter calibration, to be performed no less frequently than every 10 years from the date of installation.

9.0 **Replacement.** In the event of total loss or destruction of an Intertie, or a portion thereof, the owner shall rebuild that section at its sole cost and expense.

10.0 **Notification, Use, and Payment.**

10.1 **Notification.** Prior to use of any Intertie to deliver water from one party to the other, the receiving party shall notify the delivering party of the nature of the emergency, and its expected duration. In the event the emergency requires immediate operation to protect lives or property, notification should occur as soon as practicable under the circumstances. Notice shall be provided by first contacting the City's or District's offices, and then by using on-call or emergency phone numbers or calling known employees at home until all reasonable efforts of notification have been exhausted.

10.2 Use. Operations personnel from both parties will participate in activating and deactivating the Interties to preclude unanticipated impacts within respective systems. In the event the emergency requires immediate operation to protect lives or property, either party may operate the Interties, with notification to occur as soon as practicable under the circumstances, but not later than 24 hours following such incident.

10.3 Payment for Water Delivered. Water sold for emergency purposes shall be priced at the wholesale rate of the regional water provider in effect at the time of sale and shall be billed in accordance with the seller's routine billing provisions including rules regarding late payments.

11.0 General.

11.1 Duration. The parties acknowledge and agree: (1) that the use of said Interties is essential to the operations of each party in providing water service to its customers under emergency conditions; and, (2) that each party will rely upon the continued existence of the Interties and rights of usage granted hereunder in its long range planning and issuing bonds, notes and other financing documents. Thus, each party covenants and agrees with the other not to interfere with the other's rights granted hereunder; not to violate applicable laws, rules and regulations of agencies with regulatory jurisdiction over the parties; and not to take any action inconsistent with this Agreement. This Agreement may be terminated only through the mutual written Agreement of both parties.

11.2 Not a Partnership. This Agreement shall not constitute or create a partnership or a joint venture.

11.3 Compliance with Laws and Regulations. Each party shall, with respect to its duties, responsibilities and operations hereunder, comply with all applicable laws, rules and regulations governing the same. Each party shall

submit construction drawings for their own Intertie to the Department of Health for approval and comply with the "Intertie Statute", section 90.03.383 RCW.

11.4 Specific Performance. In addition to all other remedies available to a party hereunder, whether in law or equity, each party to this Agreement shall have the right to seek and obtain specific performance of the terms hereof. The parties agree that damage occurring by reason of the breach hereof is difficult, if not impossible, to ascertain and that remedies of law are inadequate.

11.5 Assignment. Neither party shall have the right in whole or in part to assign this agreement or its rights and obligations hereunder or its interest in the Intertie without prior written consent of the other party, which shall not be unreasonably withheld, delayed, or conditioned.

11.6 Authority. This Agreement is entered into by the parties hereto pursuant to the authority contained in RCW 35.67.300 and Title 57 RCW.

11.7 Attorney's Fees. If a suit or other action is instituted in connection with any controversy arising out of this Agreement, the prevailing party shall be entitled to recover all of its costs and expenses including such sum as the court may judge reasonable for attorneys fees, including fees upon appear of any judgement or ruling.

11.8 Non Waiver. No waiver by either party of any term or condition of this Agreement shall be deemed or construed as a waiver of any other term or condition or of any breach hereof, whether pertaining to the same or a different provision of this Agreement.

11.9 Severability. If any section, subsection, sentence, clause, phrase, or other portion of this Agreement is, for any reason, declared invalid, in whole or in part of any court or agency of competent jurisdiction, said decision shall not affect the validity of the remaining portions hereof.

11.10 Indemnity. Each party agrees to indemnify, defend and hold harmless the other party, its officers, agents, and employees, from and against any and all claims, losses, or liability, for injuries, sickness or death of persons, or damage to property, arising out of any willful misconduct or negligent act, error, or omission of the indemnifying party, its officers, agents, subcontractors or employees, in connection with actions taken pursuant to this Agreement. Provided, however, that the indemnifying party's obligations to indemnify, defend and hold harmless for injuries, sickness, death or damage caused by or resulting from the concurrent negligence or willful misconduct of the indemnitee and the indemnifying party, or of the indemnifying party and a third party other than an officer, agent, subcontractor or employee of the indemnifying party, shall apply only to the extent of the negligence or willful misconduct of the indemnifying party.

11.11 Approval by City of Seattle. Pursuant to the Water Purveyor contracts that the City and the District have with the City of Seattle, this agreement is subject to approval by the City of Seattle.

12.0 Execution of Documents. Each party agrees to execute any and all documents and instruments necessary to give effect to and carry out the terms of this Agreement and to obtain the necessary approval of the same by government agencies as required by law.

13.0 Effective Date. This agreement shall be effective upon execution and approval of the legislative bodies of both parties.

WOODINVILLE WATER DISTRICT

BY _____

President

Date 3/18/03

CITY OF REDMOND

BY _____

Rosemarie Ives, Mayor

Date 3/27/03

ATTEST:

BY _____

Secretary

Date 3/18/03

ATTEST:

BY _____

Bonnie Matson, City Clerk

Date 3/28/03

APPROVED AS TO FORM:

BY _____

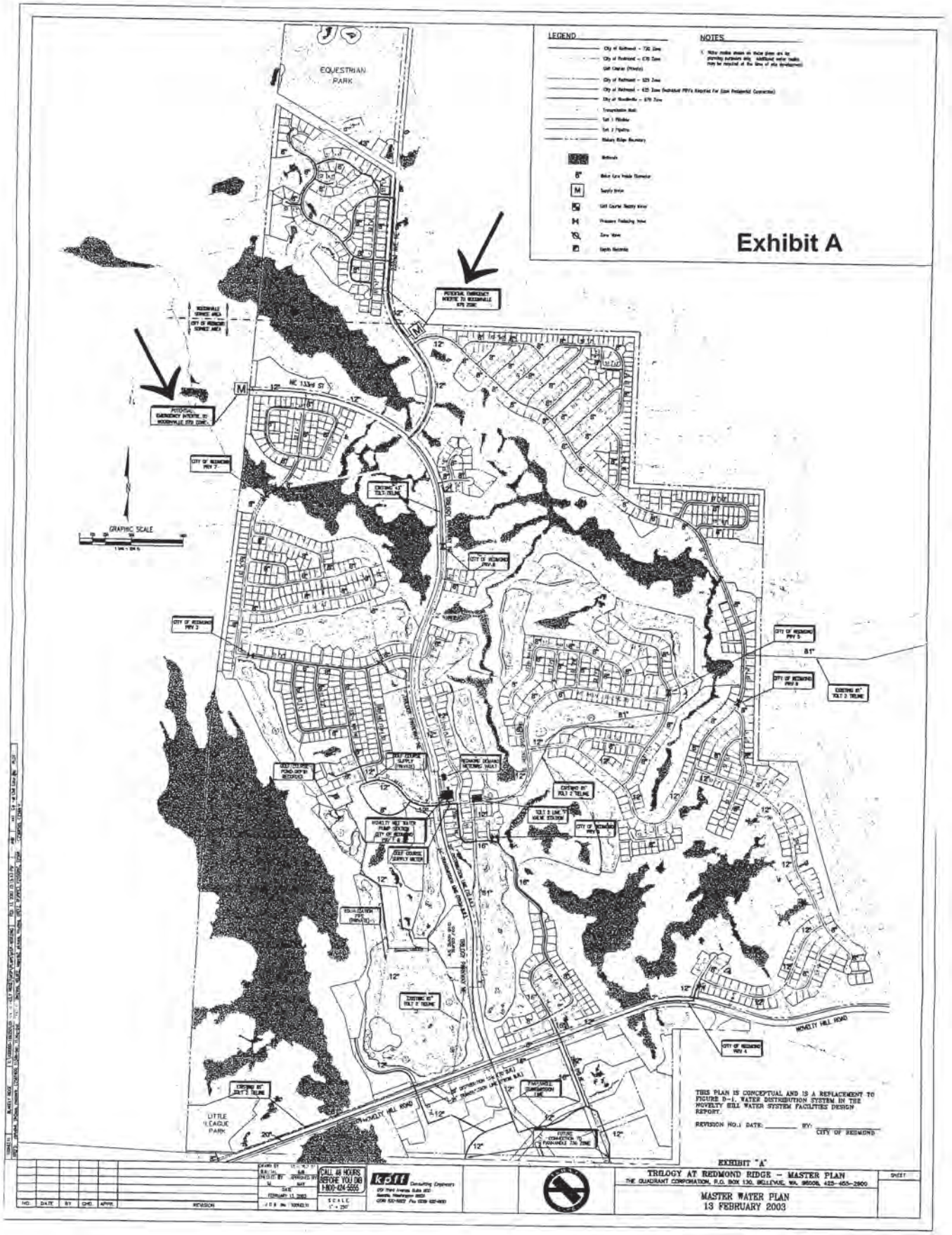
Date 3/18/2003

APPROVED AS TO FORM:

BY _____

Date 3/27/03

o:\Utility\Agreements\Woodinville-Redmond Intertie.doc


Exhibit A
LEGEND
NOTES
EQUESTRIAN PARK
NE 133rd ST
GRAPHIC SCALE
NOVELTY HILL ROAD
LITTLE LEAGUE PARK
THIS PLAN IS CONCEPTUAL AND IS A REPLACEMENT TO FIGURE D-1, WATER DISTRIBUTION SYSTEM IN THE NOVELTY HILL WATER SYSTEM FACILITIES DESIGN REPORT.
REVISION NO.: DATE: BY: CITY OF REDMOND
EXHIBIT "A"
TRILOGY AT REDMOND RIDGE – MASTER PLAN
THE QUADRANT CORPORATION, P.O. BOX 130, HELLEVUE, WA. 98009, 425-455-2900
MASTER WATER PLAN
13 FEBRUARY 2003
CALL 48 HOURS BEFORE YOU DIG 1-800-424-5555

ADDENDUM TO INTERLOCAL AGREEMENT BETWEEN CITY OF REDMOND AND WOODINVILLE WATER DISTRICT TO PROVIDE WATER AND SEWER SERVICE TO A PORTION OF REDMOND ASSEMBLY PLAT

WHEREAS, the City of Redmond, Washington ("Redmond") and the Woodinville Water District ("the District") are parties to that certain interlocal agreement ("the interlocal agreement") dated July 13, 1988, which designates the common service area boundary between the District and Redmond, and

WHEREAS, paragraph 12 of said interlocal agreement provides that property straddling the common boundary line shall be approved by an addendum on a case by case basis, and

WHEREAS, Redmond and the District desire to supplement said agreement pursuant to paragraph 12 thereof to enable the City to provide water and sewer service to that portion of the plat of Redmond Assembly located within Redmond's city limits and north of NE 124th Street, the common service area boundary,

NOW, THEREFORE, IT IS HEREBY COVENANTED AND AGREED AS FOLLOWS:

1) Description of Service Area Boundary
The City of Redmond and the District agree that Redmond shall provide water and sewer service to the property as shown in Exhibit "A", attached hereto.

2) Consent to Service by District
The District hereby consents to allow Redmond to provide water and sewer service to the area in Exhibit "A" that is included within the District's water and sewer service area boundary.

3) Remainder of Agreement Unchanged
Except as stated above, the remainder of the Interlocal Agreement between the District and Redmond shall remain unchanged and in full force and effect.

DATED this 15 day of MARCH, 2007.

City of Redmond

By _____

Woodinville Water District

By _____
Its President

By _____
Its Secretary

Approved As To Form:
Office of the City Attorney

By _____

STATE Of WASHINGTON)
)ss:
COUNTY OF King)

I certify that I know or have satisfactory evidence that Rosemarie Ives signed this instrument and acknowledged it to be (his/her) free and voluntary act for the purposes mentioned in this instrument.

DATED this 15 day of March, 2007.

Notary Public

My commission expires: 4/15/2009

MALISA W. FILES NOTARY PUBLIC STATE OF WASHINGTON COMMISSION EXPIRES APRIL 15, 2009

STATE Of WASHINGTON)
)ss:
COUNTY OF King)

I certify that I know or have satisfactory evidence that KAREN STEEB/ TIM MATSON signed this instrument and acknowledged it to be (his/her) free and voluntary act for the purposes mentioned in this instrument.

DATED this 4th day of April, 2007.

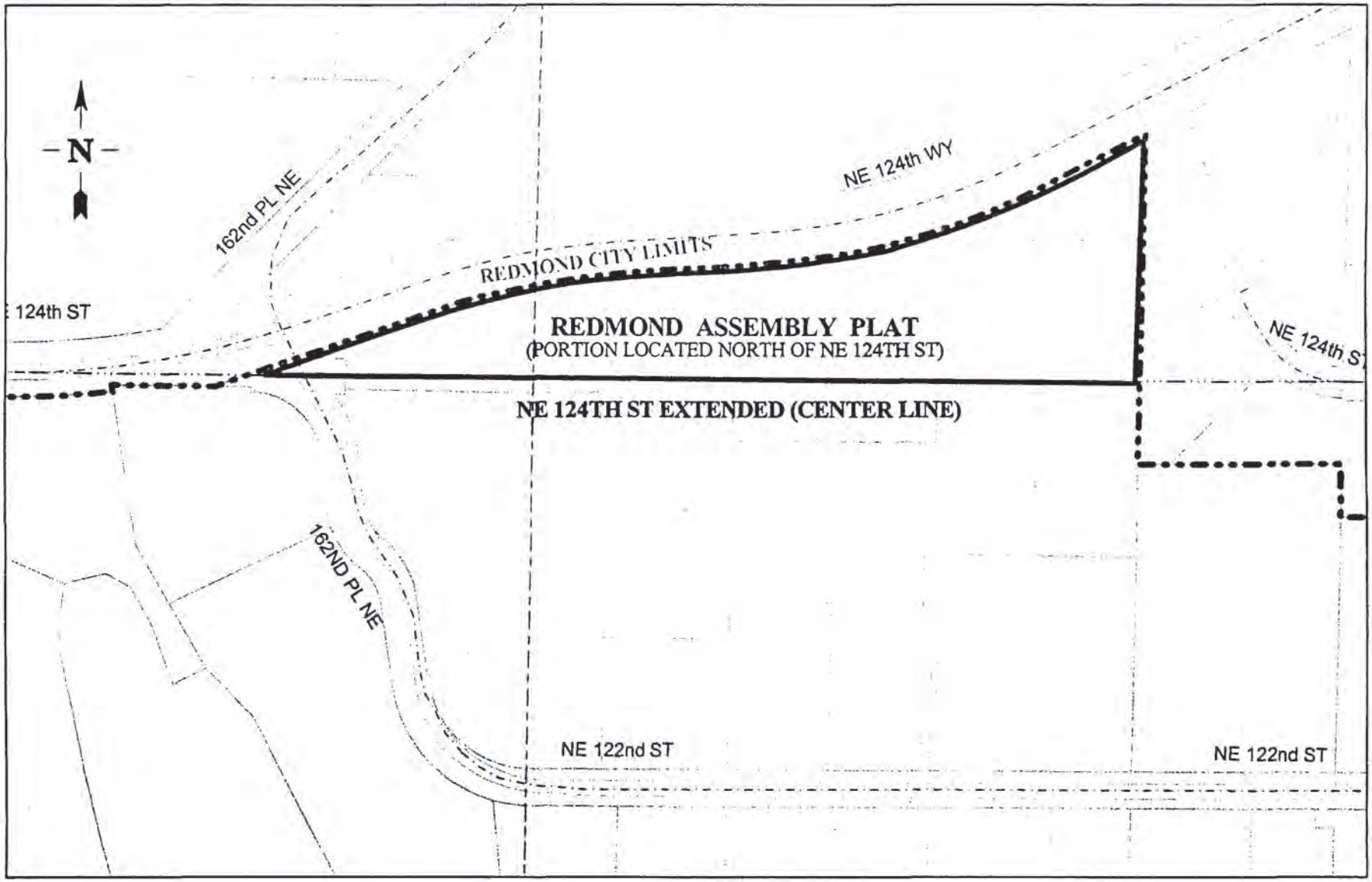
Cecilia M F Yngier
Notary Public

My commission expires: 10/29/09

CECILIA M F YNGER NOTARY PUBLIC STATE OF WASHINGTON

EXHIBIT A

ADDENDUM TO INTERLOCAL AGREEMENT BETWEEN CITY OF REDMOND AND WOODINVILLE WATER DISTRICT TO PROVIDE WATER AND SEWER SERVICE TO A PORTION OF THE PLAT OF REDMOND ASSEMBLY



0653r 07/13/

ADDENDUM TO INTERLOCAL AGREEMENT BETWEEN
REDMOND AND WOODINVILLE WATER DISTRICT
WATER SERVICE TO SHADOWBROOK, PHASE II

WHEREAS, the City of Redmond, Washington ("Redmond") and the Woodinville Water District ("the District") are parties to that certain interlocal agreement ("the interlocal agreement") dated July 13, 1988, which designates the common service area boundary between the District and Redmond, and

WHEREAS, Redmond and the District desire to supplement such agreement pursuant to paragraph 12 thereof to provide for water service to proposed residential development straddling the common boundary line known as Shadowbrook Phase II to enable the District to provide water service to the portion of such development south of the common service area boundary,

NOW, THEREFORE, IT IS HEREBY COVENANTED AND AGREED AS FOLLOWS:

1. Description of Service Area Boundary

Redmond and the District agree that for the property within the plat known as Shadowbrook Phase II, the water and sewer service area boundary between Redmond and the District shall be as described in Exhibit 'A', attached hereto.

2. Consent to Service by District

The City of Redmond hereby consents to allow the District to provide water service to those properties included within Redmond's water and sewer service area boundary per the method described in Section 2(b) of the July 13, 1988 Interlocal Agreement.

3. Service Extension, Approval of Plans and Specs.

Service to Shadowbrook Phase II, shall be subject to the terms of a developer's extension application and agreement between the District and the owner/developer of Shadowbrook Phase II, in the form attached hereto as Exhibit 'B'. Redmond and the District agree that the water improvements described in paragraph 2 - General Description of Improvements, shall be designed and constructed in accordance with

CITY ORIGINAL
CITY CLERK RECORDS

the standards of Redmond or the District, whichever is more stringent. The District shall submit plans and specifications for facilities which will be used to provide such service to the Redmond Utility Department and shall obtain approval from the Redmond Public Works Director. Approval or rejection of the plans and specifications shall be based upon compliance with Redmond water service, fire flow and construction standards.

4. Property Owner Agreements

Prior to making any commitment to extend facilities or provide service within Redmond's service area, the District shall procure and provide to Redmond written agreements signed by each owner of property within the Redmond service area which will be served pursuant to this agreement in the form attached hereto as Exhibit 'C'. The original of such agreements shall be filed with the King County Department of Records and Elections, and a copy of the recorded document provided to the Redmond City Clerk and Public Works Director. The cost of recording shall be paid by the property owners.

5. Assumption of Service Area & Ownership of Facilities

a. Upon annexation of all or a portion of the Shadowbrook Phase II development to the City of Redmond, or upon extension of Redmond's utility facilities which will enable connection of Redmond's facilities to the water facilities serving the development, Redmond, at its option, may elect to assume the rights and responsibilities of providing water service to that portion of the development within Redmond's service area boundary. This option may be exercised by giving written notice of such election to the District no less than 90 days prior to the proposed effective date of assumption of water service by Redmond. Upon agreement with the District, Redmond may purchase water from the District required to service such portion of the development at the then current District wholesale rate, which is defined in the Interlocal Agreement.

b. Upon the effective date of the transfer of rights and responsibility to provide water

service to the City of Redmond pursuant to this section, the District shall quit claim and transfer to Redmond all of its rights in and title to all water mains, transmission and service lines, hydrants and other facilities located in Redmond's service area. Appropriate bills of sale and all other conveyances necessary to effectuate complete transfer of the District's interest shall be provided by the District to Redmond.

c. The District shall cooperate in making a physical connection to the Redmond facilities and in performing such minor alterations to its facilities as may be required in order to complete the connection with Redmond facilities at Redmond's sole expense. The District shall also cooperate in the transfer of all customer and billing information reasonably required for Redmond to assume and perform utility billing functions.

d. No connection fee or other charge shall be assessed by Redmond upon those customers receiving service at the time of transfer of responsibility for water service from the District to Redmond.

6. Remainder of Agreement Unchanged

Except as stated above, the interlocal agreement between the District and Redmond shall remain unchanged and in full force and effect.

DATED this 22nd day of JANUARY, 1990.

CITY OF REDMOND

By Mary Lawrence
Its Finance Assistant

APPROVED AS TO FORM:
OFFICE OF THE CITY ATTORNEY

By Jay C Kuntz

WOODINVILLE WATER DISTRICT

By _____
Its President

By _____
Its Secretary

8911-6458

8911-640

Exhibit 'A' to Addendum
to Interlocal Agreement

y 89 HB

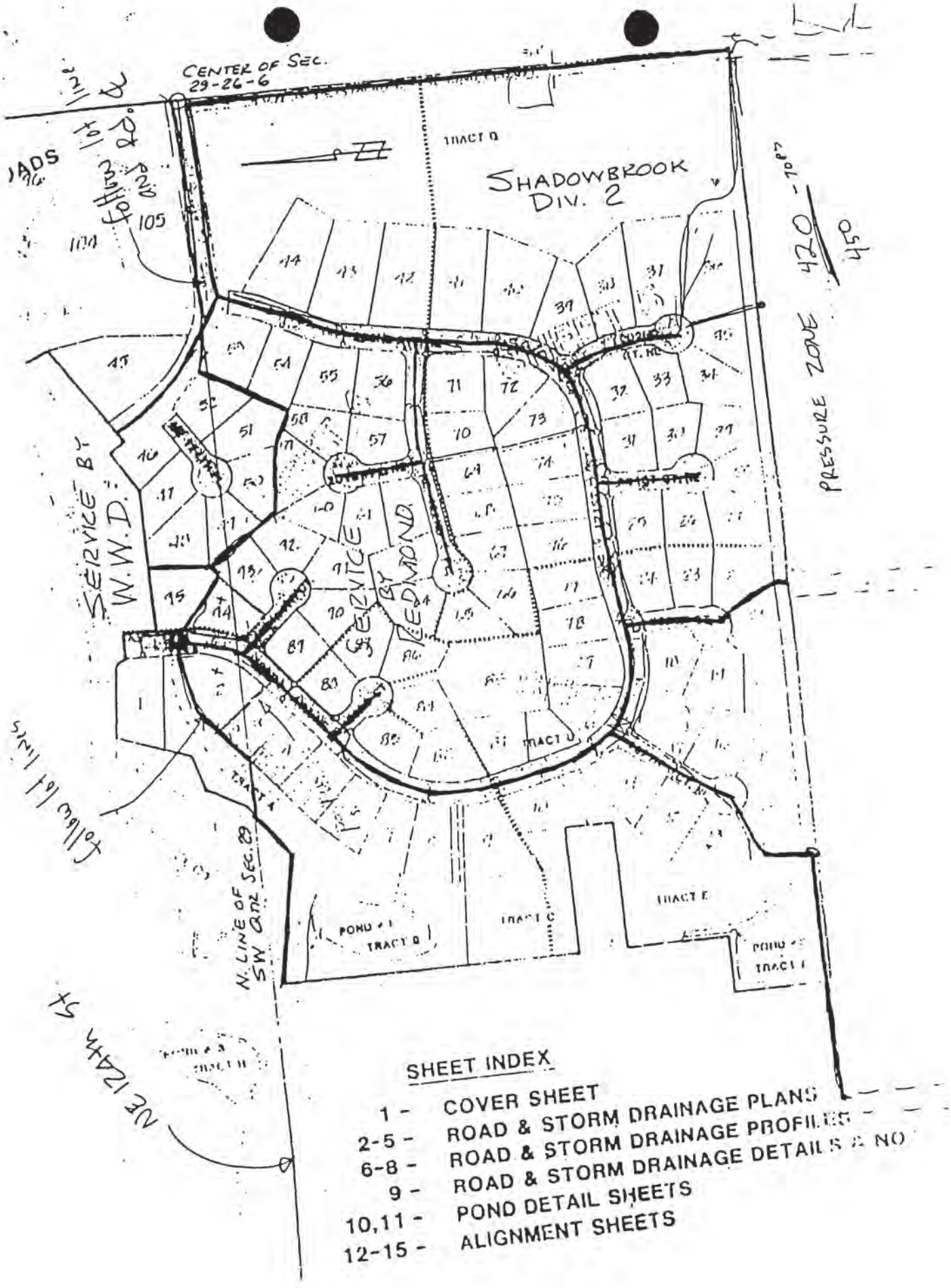
SHADOWBROOK
Revised legal description of WWD-Redmond service area line.

The City of Redmond is to serve the portions of the plat of Shadowbrook, Division 2, which lie South of the following line:

Beginning at the Center of Section 29, Township 26 North, Range 6 East, W.M., in King County, Washington, from which the South quarter corner of said Section bears South 03° 09' 26" West; thence South 89° 56' 06" West 452.47 feet to a point of curvature; thence westerly on a curve to the right, tangent to the preceding course, having a radius of 325.00 feet, an arc distance of 225.70 feet; thence leaving said curve South 32° 43' 01" West 271.78 feet; thence North 61° 53' 46" West 90.00 feet; thence North 79° 51' 01" West 171.20 feet; thence North 29° 57' 15" West 205.00 feet; thence South 50° 02' 10" West 25.00 feet; thence North 49° 54' 49" West 159.15 feet; thence North 86° 23' 56" West 30.00 feet; thence North 03° 36' 04" East 15.00 feet; thence North 86° 23' 56" West 30.00 feet; thence South 80° 56' 00" West 140.23 feet; thence South 53° 06' 04" West 81.00 feet; thence South 53° 06' 04" West 92.34 feet; thence North 87° 22' 18" West 140.47 feet; thence South 56° 29' 48" West 142.82 feet; thence North 77° 34' 18" West 318.23 feet; thence North 03° 07' 30" East and parallel with the West line of the Southwest quarter of said Section 29, 30.05 feet to a terminus on the North line of said Southwest quarter which lies 435.62 feet easterly of the Northwest corner thereof.

Draft HHB
Check BMV
Date 5-8-89




CENTER OF SEC.
29-26-6
SHADOWBROOK
DIV. 2
TRACT D
SERVICE BY
W.W.D.
SERVICE BY
REDMOND
PRESSURE ZONE 420 - 704
TRACT U
TRACT E
POND #1
TRACT D
TRACT C
POND #2
TRACT B
N. LINE OF
SW QTR SEC. 29
NE 124th St
SHEET INDEX
1 - COVER SHEET
2-5 - ROAD & STORM DRAINAGE PLANS
6-8 - ROAD & STORM DRAINAGE PROFILES
9 - ROAD & STORM DRAINAGE DETAILS & NO
10,11 - POND DETAIL SHEETS
12-15 - ALIGNMENT SHEETS

ADDENDUM TO INTERLOCAL AGREEMENT BETWEEN REDMOND AND WOODINVILLE WATER DISTRICT WATER SERVICE TO AN AREA BETWEEN 167TH AVENUE N.E. AND 172ND AVENUE N.E.

WHEREAS, the City of Redmond, Washington ("Redmond") and the Woodinville Water District ("the District") are parties to that certain interlocal agreement ("the interlocal agreement") dated July 13, 1988, which designates the common service area boundary between the District and Redmond, and

WHEREAS, Redmond and the District desire to supplement such agreement pursuant to Paragraph 12 thereof to enable the District to provide water service to a portion of residential development south of the common service area boundary,

NOW, THEREFORE, IT IS HEREBY COVENANTED AND AGREED AS FOLLOWS:

1) Description of Service Area Boundary

Redmond and the District agree that the District may provide water service to the properties described in Exhibit "A", attached hereto.

2) Consent to Service by District

The City of Redmond hereby consents to allow the District to provide water service to those properties included within Redmond's water and sewer service area boundary per the method described in Section 2(b) of the July 13, 1988 Interlocal Agreement. Consent for service is only to serve existing single-family homes on the properties and is not for service for additional subdivision of the properties.

3) Service Extension, Approval of Plans and Specifications.

Water service to said properties shall be subject to the terms of the form attached hereto as Exhibit "C" and depicted in Exhibit "B". Redmond and the District agree that the water improvements shall be designed and constructed in accordance with the standards of Redmond or the District, whichever is more stringent. The District shall submit plans and specifications for facilities which will be used to provide such service to the Redmond Utility Engineer for approval. Approval or

rejection of the plans and specifications shall be based upon compliance with Redmond water service, fire flow, and construction standards.

4) Property Owner Agreement

Prior to making any commitment to extend facilities or provide service within Redmond's service area, the District shall procure and provide to Redmond written agreements signed by each owner of property within the Redmond service area which will be served pursuant to this agreement in the form attached hereto as Exhibit "D". The original of such agreements shall be provided to Redmond and Redmond shall record the agreement with the King County Department of Records and Elections.

5) Assumption of Service Area and Ownership of Facilities

a. Upon annexation of all or a portion of the subject properties to the City of Redmond, or upon extension of Redmond's water facilities which will enable connection of the water facilities serving the properties to Redmond's facilities. Redmond, at its option, may elect to assume the rights and responsibilities of providing water service to any or all of the subject properties. This option may be exercised by giving written notice of such election to the District no less than 90 days prior to the proposed effective date of assumption of water service by Redmond. Upon agreement with the District, Redmond may purchase water from the District required to serve such portion of the development at the then current District wholesale rate, which is defined in the Interlocal Agreement.

b. Upon the effective date of the transfer of rights and responsibility to provide water service to the City of Redmond pursuant to this section, the District shall quit claim and transfer to Redmond all of its rights in and title to all watermains, transmission and service lines, hydrants and other facilities located in Redmond's service area. Appropriate bills of sale and all other conveyances necessary to effectuate complete transfer of the District's interest shall be provided by the District to Redmond.

c. The District shall cooperate in making a physical connection to the Redmond facilities and in performing such minor alterations to its facilities

as may be required in order to complete the connection with Redmond facilities at Redmond's sole expense. The District shall also cooperate in the transfer of all customer and billing information reasonably required for Redmond to assume and perform utility billing functions.

d. No connection fee or other charge shall be assessed by Redmond upon those customers receiving service at the time of transfer of responsibility for water service from the District to Redmond.

6. Remainder of Agreement Unchanged

Except as stated above, the interlocal agreement between the District and Redmond shall remain unchanged and in full force and effect.

DATED this 14th day of September, 1993.

CITY OF REDMOND

By Rosemarie Ives

Its Mayor 9-14-93

APPROVED AS TO FORM:

OFFICE OF THE CITY ATTORNEY

BY

WOODINVILLE WATER DISTRICT

By_____

Its President

By_____

Its Secretary

C:\SHARON\INTRLCL.DOC

as may be required in order to complete the connection with Redmond facilities at Redmond's sole expense. The District shall also cooperate in the transfer of all customer and billing information reasonably required for Redmond to assume and perform utility billing functions.

d. No connection fee or other charge shall be assessed by Redmond upon those customers receiving service at the time of transfer of responsibility for water service from the District to Redmond.

6. Remainder of Agreement Unchanged

Except as stated above, the interlocal agreement between the District and Redmond shall remain unchanged and in full force and effect.

DATED this _____ day of _____, 19_____.

CITY OF REDMOND

By_____

Its_____

APPROVED AS TO FORM:

OFFICE OF THE CITY ATTORNEY

BY_____

WOODINVILLE WATER DISTRICT

By Owen Mayfield

Its President

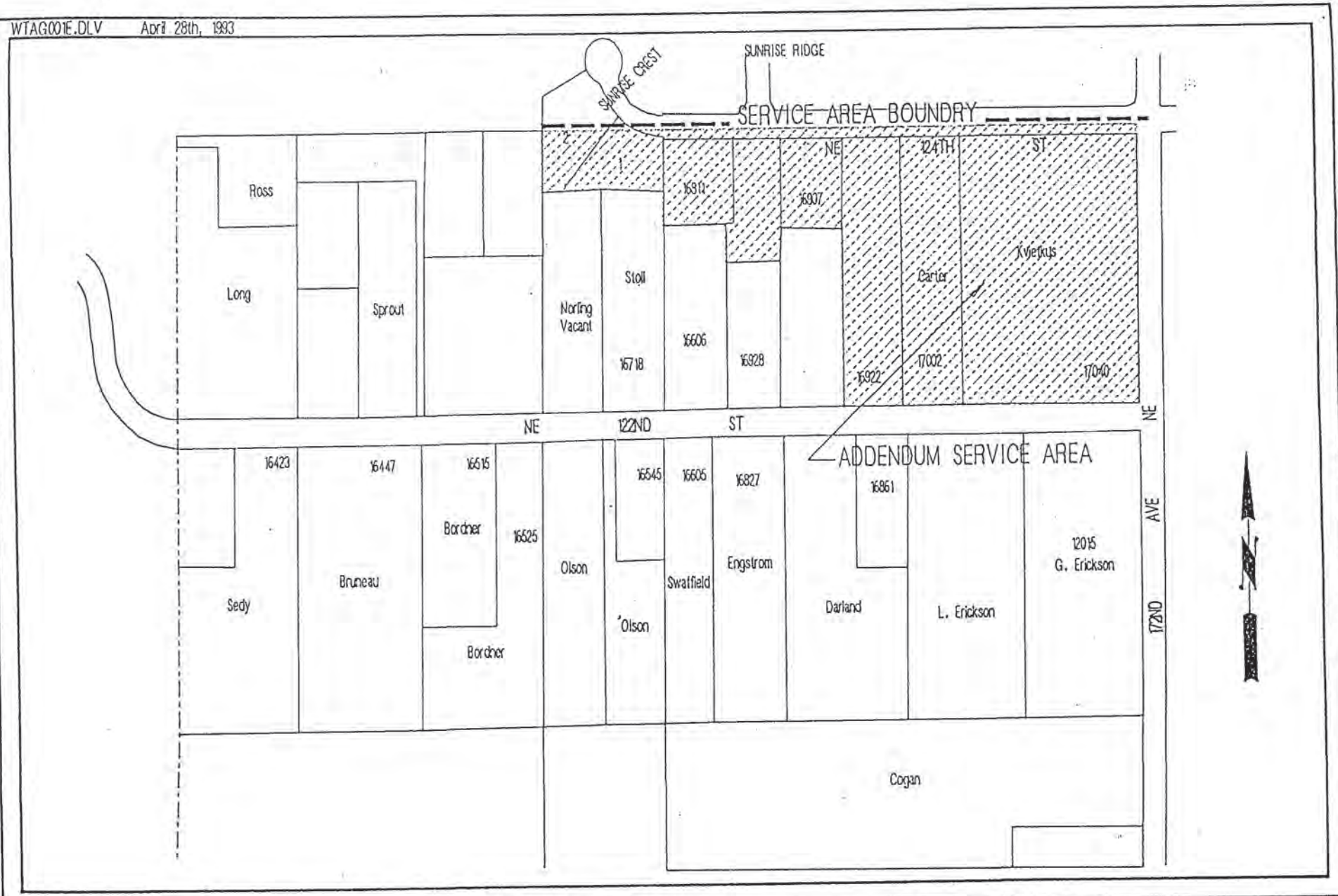
By Janet C. Bowers

Its Secretary

C:\SHARON\INTRLCL.DOC

EXHIBIT "A"

1. Lot 1, Sunrise Crest
2. Lot 2, Sunrise Crest
3. Lot 2, King County Short Plat 677151
4. Lot 3, King County Short Plat 677151
5. Lot 2, King County Short Plat 986019
6. Tax Lot 9 - Section 25, Township 26N, Range 5E, WM
7. Tax Lot 119 - Section 25, Township 26N, Range 5E, WM
8. Tax Lot 59 - Section 25 , Township 26n, Range 5e, WM



REDMOND-WOODINVILLE INTERLOCAL AGREEMENT 93-001

WATER SERVICE TO AN AREA BETWEEN 167TH AVE NE AND 172ND AVE NE

THE CITY OF REDMOND WASHINGTON

LEGEND:

NOT TO SCALE

EXHIBIT "B"

EXHIBIT "C"

Redmond recognizes that Woodinville currently provides water service to Lots 1, and 2 of Sunrise Crest, Lot 2 of King County short plat 677151 and Lot 2 of King County Short plat 986019 and that service will continue to these four lots. Water service may be provided to the existing homes on Lot 3, KCSP 677151, tax lot 9, tax lot 119, and tax lot 59, by connecting to the existing Woodinville watermain in N.E. 124th Street.

Water service for additional subdivision of the properties is not provided for in this agreement and will be provided directly from Redmond or by addendum to the interlocal agreement.

EXHIBIT "D' TO ADDENDUM
TO INTERLOCAL AGREEMENT

AGREEMENT CONCERNING WATER SERVICE

WHEREAS, the undersigned are the owners of certain real property located in King County, Washington within the Utility Service Area Boundaries of the City of Redmond.

WHEREAS, said owners desire to obtain water service from the Woodinville Water District, and pursuant to an interlocal agreement between the Woodinville Water District and the City of Redmond dated _____, a copy of which is attached hereto as Exhibit "A", ("the interlocal agreement") the consent of the City of Redmond is required for the District to provide water service within redmond's Utility Service Area south of N.E. 124th Street, and certain agreements on the part of the owners of property to be served relating to annexations and formation of local improvements districts or utility local improvement districts are required by the interlocal agreement, and

WHEREAS, in order to induce the City of Redmond to grant consent for the District to provide water service to that portion of the development located within Redmond's Utility Service Area and to comply with the requirements of the interlocal agreement relating to annexation and Local Improvement Districts (LID)/Utility Local Improvement Districts (ULID), the undersigned owners, on behalf of themselves, their heirs, successors and assigns, intending the City of Redmond to be a beneficiary of this agreement, hereby covenant and agree as follows:

1. Annexation to City of Redmond. The undersigned owners understand that at some future date the City of Redmond may desire to annex all or part of the property described on Exhibit "B" to the City and that annexation will result in the following consequences:
    a. King County ordinances, resolutions, rules and regulations will cease to apply to the property upon the effective date of annexation;

b. City of Redmond ordinances, resolutions, rules and regulations will begin to apply to the property upon the effective date of annexation;

c. Governmental services, such as police, fire and utility service, will be provided to the property by the City of Redmond upon the effective date of annexation;

d. The property may be required to assume all or any portion of the City of Redmond indebtedness existing at the time of annexation and property tax rates and assessments applicable to the property may be higher or lower than those applicable prior to the effective date of annexation;

e. Zoning and land use regulations applicable to the property after annexation may be different from those applicable to the property prior to annexation; and

f. All or any portion of the property may be annexed and the property may be annexed in conjunction with, or at the same time as, other property in the vicinity.

With full knowledge and understanding of these consequences of annexation and with full knowledge and understanding of owners rights to oppose annexation of the property to the City of Redmond, owners agree to sign a petition for annexation to the City of property including all or part of the property described on Exhibit "B" as provided in RCW 35.14.120, as it now exists or as it may hereafter be amended, at such time as the owners are requested by the City to do so. The owners also appoint the Mayor of the City as owners' attorney-in-fact to execute an annexation petition on owners' behalf in the event that owners shall fail or refuse to do so and agree that such signature shall constitute full authority from the owners for annexation as if owners had signed the petition themselves. Owners further agree not to litigate, challenge or in any manner contest, annexation to the City. This agreement shall be deemed to be continuing, and if owners' petitions for whatever reason, including a decision by the City not to annex, owners agree to sign any and all subsequent petitions for annexation. In the event that any property described on Exhibit "B" is subdivided into smaller lots, and/or ownership thereof is transferred, the purchaser or other transferee of each subdivided lot or other portion or the entirety of the property shall be bound by the provisions of this paragraph and by purchasing or otherwise assuming an

ownership interest designates the Mayor of Redmond as attorney-in-fact as provided above.

2. Waiver of Right to Protest Formation of LID/ULID. The undersigned owners acknowledge that the entire property legally described on Exhibit "B" would be specially benefited by the following utility improvements (specify):

1. Future storage facility to be constructed by Redmond or others to serve the property.
2. Future water supply connection by Redmond to City of Seattle Tolt Supply System.
3. Future water transmission/distribution mains which connect the site to City of Redmond water supply and storage facilities including, but not limited to water mains in the following streets, private roads or easements:
    a. N.E. 122nd Street
    b. 172nd Avenue N.E.

Or by improvements providing substantially equivalent service to the property. Owners agree to sign a petition for the formation of an LID or ULID for all or any of the specified or substantially equivalent improvements at such time as one is circulated and owners hereby appoint the Mayor of the City as their attorney-in-fact to sign such a petition in the event owners fail or refuse to do so. By purchasing or otherwise acquiring an ownership interest in all or any part of the property, all transferees thereby so designate the Mayor of the City as attorney-in-fact.

With full understanding of owners' right to protest formation of an LID or ULID to construct such improvements pursuant to RCW 35.43.180, owners agree to participate in any such LID or ULID and to waive their right to protest formation of the same. Owners shall retain the right to contest the method of calculating any assessment and the amount thereof, and shall further retain the right to appeal the decision of the City affirming the final assessment roll to the superior court. Not withstanding any other provisions of this agreement, this waiver of the right to protest shall only be valid for a period of ten (10) years from the date this agreement is signed by the owners.

STATE Of WASHINGTON)

)ss:

COUNTY OF _____)

I certify that I know or have satisfactory evidence that _____ signed this instrument and acknowledged it to be (his/her) free and voluntary act for the purposes mentioned in this instrument.

DATED this _____ day of _____, 19___.

_____

NOTARY PUBLIC

My commission expires: _____

3. Covenant Running With Land/Binding on Successors. The covenants and agreements set forth herein shall be covenants running with owners' land identified on Exhibit "B" hereto and shall be binding upon the parties, their heirs, assigns, and successors in interest. Owners acknowledge and stipulate that the agreements and covenants contained herein benefit utility and other property owned by the City by facilitating future expansion of redmond's water utility system. This agreement shall be recorded with the King county department of records and Elections.

DATED this _____ day of _____, 19___.

OWNER(S)

_____
_____
_____
_____

STATE Of WASHINGTON)
)ss:
COUNTY OF _____)

I certify that I know or have satisfactory evidence that _____ signed this instrument and acknowledged it to be (his/her) free and voluntary act for the purposes mentioned in this instrument.

DATED this _____ day of _____, 19___.

_____
NOTARY PUBLIC
My commission expires: _____

FILED FOR RECORD AT REQUEST OF
TRANSAMERICA TITLE INSURANCE CO.
320 108TH AVE. NE
P.O. BOX 1493
BELLEVUE, WA 98009

EXHIBIT "B"

AGREEMENT CONCERNING WATER SERVICE

15 sm

WHEREAS, the undersigned are the owners of certain real property located in King County, Washington within the Utility Service Area Boundaries of the City of Redmond.

WHEREAS, said owners desire to obtain water service from the Woodinville Water District, and pursuant to an interlocal agreement between the Woodinville Water District and the City of Redmond dated Dec. 23, 1993, a copy of which is attached hereto as Exhibit "A", ("the interlocal agreement") the consent of the City of Redmond is required for the District to provide water service within Redmond's Utility Service Area south of N.E. 124th Street, and certain agreements on the part of the owners of property to be served relating to annexations and formation of local improvements districts or utility local improvement districts are required by the interlocal agreement, and

WHEREAS, in order to induce the City of Redmond to grant consent for the District to provide water service to that portion of the development located within Redmond's Utility Service Area and to comply with the requirements of the interlocal agreement relating to annexation and Local Improvement Districts (LID)/Utility Local Improvement Districts (ULID), the undersigned owners, on behalf of themselves, their heirs, successors and assigns, intending the City of Redmond to be a beneficiary of this agreement, hereby covenant and agree as follows:

1. Annexation to City of Redmond. The undersigned owners understand that at some future date the City of Redmond may desire to annex all or part of Lot 29, Richland Acres, No. 3 (the Property) to the City and that annexation will result in the following consequences:
   a. King County ordinances, resolutions, rules and regulations will cease to apply to the property upon the effective date of annexation;
   b. City of Redmond ordinances, resolutions, rules and regulations will begin to apply to the property upon the effective date of annexation;

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WATER/SEWER UTILITY

c. Governmental services, such as police, fire and utility service, will be provided to the property by the City of Redmond upon the effective date of annexation;

d. The property may be required to assume all or any portion of the City of Redmond indebtedness existing at the time of annexation and property tax rates and assessments applicable to the property may be higher or lower than those applicable prior to the effective date of annexation;

e. Zoning and land use regulations applicable to the property after annexation may be different from those applicable to the property prior to annexation; and

f. All or any portion of the property may be annexed and the property may be annexed in conjunction with, or at the same time as, other property in the vicinity.

With full knowledge and understanding of these consequences of annexation and with full knowledge and understanding of owners rights to oppose annexation of the property to the City of Redmond, owners agree to sign a petition for annexation to the City of property including all or part of the Property as provided in RCW 35.14.120, as it now exists or as it may hereafter be amended, at such time as the owners are requested by the City to do so. The owners also appoint the Mayor of the City as owners' attorney-in-fact to execute an annexation petition on owners' behalf in the event that owners shall fail or refuse to do so and agree that such signature shall constitute full authority from the owners for annexation as if owners had signed the petition themselves. Owners further agree not to litigate, challenge or in any manner contest, annexation to the City. This agreement shall be deemed to be continuing, and if owners' petitions for whatever reason, including a decision by the City not to annex, owners agree to sign any and all subsequent petitions for annexation. In the event that the Property is subdivided into smaller lots, and/or ownership thereof is transferred, the purchaser or other transferee of each subdivided lot or other portion or the entirety of the property shall be bound by the provisions of this paragraph and by purchasing or otherwise assuming an ownership interest designates the Mayor of Redmond as attorney-in-fact as provided above.

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2. Waiver of Right to Protest Formation of LID/ULID. The undersigned owners acknowledge that the Property would be specially benefited by the following utility improvements (specify):

1. Future storage facility to be constructed by Redmond or others to serve the Property.
2. Future water supply connection by Redmond to City of Seattle Tolt Supply System.
3. Future water transmission/distribution mains which connect the site to City of Redmond water supply and storage facilities including, but not limited to water mains in the following streets, private roads or easements:
    a. 184th Avenue N.E.

Or by improvements providing substantially equivalent service to the property. Owners agree to sign a petition for the formation of an LID or ULID for all or any of the specified or substantially equivalent improvements at such time as one is circulated and owners hereby appoint the Mayor of the City as their attorney-in-fact to sign such a petition in the event owners fail or refuse to do so. By purchasing or otherwise acquiring an ownership interest in all or any part of the property, all transferees thereby so designate the Mayor of the City as attorney-in-fact.

With full understanding of owners' right to protest formation of an LID or ULID to construct such improvements pursuant to RCW 35.43.180, owners agree to participate in any such LID or ULID and to waive their right to protest formation of the same. Owners shall retain the right to contest the method of calculating any assessment and the amount thereof, and shall further retain the right to appeal the decision of the City affirming the final assessment roll to the superior court. Not withstanding any other provisions of this agreement, this waiver of the right to protest shall only be valid for a period of ten (10) years from the date this agreement is signed by the owners.

3. Covenant Running With Land/Binding on Successors. The covenants and agreements set forth herein shall be covenants running with the Property and shall be binding upon the parties, their heirs, assigns, and successors in interest. Owners acknowledge and stipulate that the agreements and covenants contained herein benefit utility and other property owned by the City by facilitating future expansion

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of Redmond's water utility system. This agreement shall be recorded with the King county department of records and Elections.

DATED this 10th day of January, 1994

OWNER(S)

David Bostic

STATE Of WASHINGTON)
)ss:
COUNTY OF King)

I certify that I know or have satisfactory evidence that David Bostic signed this instrument and acknowledged it to be (his/~~her~~) free and voluntary act for the purposes mentioned in this instrument.

DATED this 10th day of January, 1994.

DeAnna Gilbert
NOTARY PUBLIC
My commission expires: 1-30-96

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15670 NE 85TH ST
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EXHIBIT "C"

Water service to the subject property shall be provided by constructing a watermain in 184th Avenue N.E. generally along the entire frontage of the parcel with a connection to the Woodinville water system at N.E. 124th Street. Redmond may determine that the connection in 184th Avenue N.E. to the Woodinville system may not be required if the new main is extended and connected to the Woodinville system at 180th Avenue N.E. Water service for additional subdivision of the property is not provided for in this agreement. Any such subdivision of this property will be provided service directly from Redmond or through an additional addendum to the interlocal agreement.

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REDMOND WA 98052

WATER/SEWER UTILITY

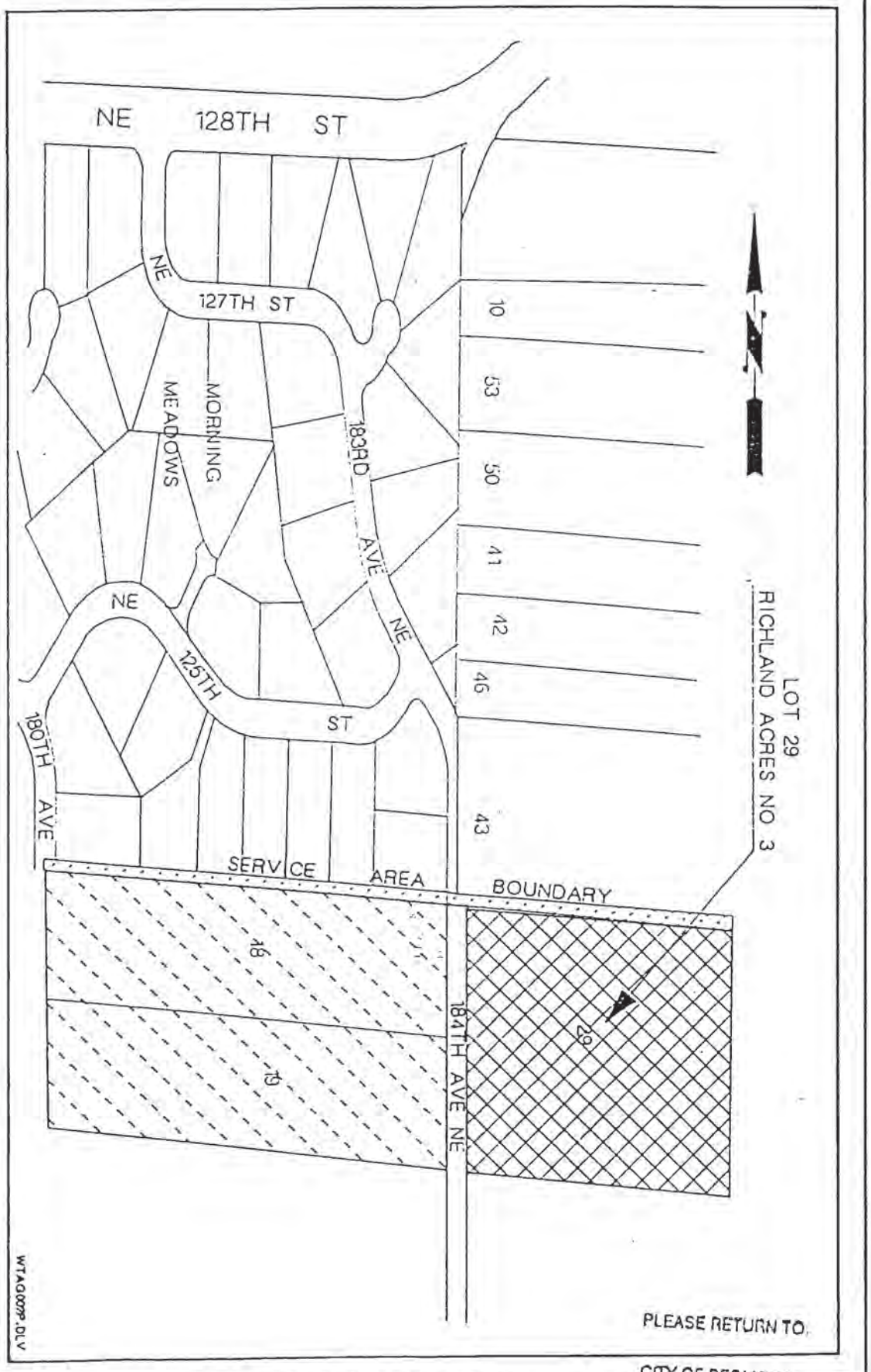
EXHIBIT A

9401111843

THE CITY OF REDMOND · WASHINGTON ·

AMENDMENT TO INTERLOCAL AGREEMENT 93-002

SERVICE WEST OF 184TH AVENUE NE



LEGEND:

SUBJECT AREA

AREA COVERED BY PREVIOUS AGREEMENT

DRAWING NOT TO SCALE

WATER/SEWER UTILITY

ADDENDUM TO INTERLOCAL AGREEMENT BETWEEN REDMOND AND WOODINVILLE WATER DISTRICT WATER SERVICE TO AN AREA EAST OF 184TH AVENUE N.E.

WHEREAS, the City of Redmond, Washington ("Redmond") and the Woodinville Water District ("the District") are parties to that certain interlocal agreement ("the interlocal agreement") dated July 13, 1988, which designates the common service area boundary between the District and Redmond, and

WHEREAS, Redmond and the District desire to supplement such agreement pursuant to Paragraph 12 thereof to enable the District to provide water service to a portion of residential development south of the common service area boundary,

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NOW, THEREFORE, IT IS HEREBY COVENANTED AND AGREED AS FOLLOWS:

1) Description of Service Area Boundary

Redmond and the District agree that the District may provide water service to the properties described and shown in Exhibit "A", attached hereto.

2) Consent to Service by District

The City of Redmond hereby consents to allow the District to provide water service to those properties included within Redmond's water and sewer service area boundary per the method described in Section 2(b) of the July 13, 1988 Interlocal Agreement. Consent for service is only to one new single-family home on the property and is not for service for additional subdivision of the property.

3) Service Extension, Approval of Plans and Specifications.

Water service to said properties shall be subject to the terms in Exhibit "B" and shall be constructed as described in Exhibit "C". Redmond and the District agree that the water improvements shall be designed and constructed in accordance with the standards of Redmond or the District, whichever is more stringent. The District shall submit plans and specifications for facilities which will be used to provide such service to the Redmond Utility Engineer for approval. Approval or rejection of the plans and specifications shall be based upon compliance with Redmond water service, fire flow, and construction standards.

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CITY OF REDMOND
15670 NE 85TH ST
REDMOND, WA 98052

4) Property Owner Agreement

Prior to making any commitment to extend facilities or provide service within Redmond's service area, the District shall procure and provide to Redmond written agreements signed by each owner of property within the Redmond service area which will be served pursuant to this agreement in the form attached hereto as Exhibit "B". The original of such agreements shall be provided to Redmond and Redmond shall record the agreement with the King County Department of Records and Elections.

5) Assumption of Service Area and Ownership of Facilities

a. Upon annexation of all or a portion of the subject properties to the City of Redmond, or upon extension of Redmond's water facilities which will enable connection of the water facilities serving the properties to Redmond's facilities. Redmond, at its option, may elect to assume the rights and responsibilities of providing water service to any or all of the subject properties. This option may be exercised by giving written notice of such election to the District no less than 90 days prior to the proposed effective date of assumption of water service by Redmond. Upon agreement with the District, Redmond may purchase water from the District required to serve such portion of the development at the then current District wholesale rate, which is defined in the Interlocal Agreement.

b. Upon the effective date of the transfer of rights and responsibility to provide water service to the City of Redmond pursuant to this section, the District shall quit claim and transfer to Redmond all of its rights in and title to all watermains, transmission and service lines, hydrants and other facilities located in Redmond's service area. Appropriate bills of sale and all other conveyances necessary to effectuate complete transfer of the District's interest shall be provided by the District to Redmond.

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c. The District shall cooperate in making a physical connection to the Redmond facilities and in performing such minor alterations to its facilities as may be required in order to complete the connection with Redmond facilities at Redmond's sole expense. The District shall also cooperate in the transfer of all customer and billing information reasonably required for Redmond to assume and perform utility billing functions.

d. No connection fee or other charge shall be assessed by Redmond upon those customers receiving service at the time of transfer of responsibility for water service from the District to Redmond.

6. Remainder of Agreement Unchanged

Except as stated above, the interlocal agreement between the District and Redmond shall remain unchanged and in full force and effect.

DATED this 29th day of December, 1993.

CITY OF REDMOND

By _____

Its MAYOR

APPROVED AS TO FORM:

OFFICE OF THE CITY ATTORNEY

BY _____

WOODINVILLE WATER DISTRICT

By _____

Its President

By _____

Its Secretary

9401111843

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WATER/SEWER UTILITY

ADDENDUM TO INTERLOCAL AGREEMENT BETWEEN REDMOND AND WOODINVILLE WATER DISTRICT WATER SERVICE TO AN AREA BETWEEN 177th Avenue N.E. AND 184TH AVENUE N.E.

WHEREAS, the City of Redmond, Washington ("Redmond") and the Woodinville Water District ("the District") are parties to that certain interlocal agreement ("the interlocal agreement") dated July 13, 1988, which designates the common service area boundary between the District and Redmond, and

WHEREAS, Redmond and the District desire to supplement such agreement pursuant to paragraph 12 thereof to enable the District to provide water service to a portion of residential development south of the common service area boundary,

NOW, THEREFORE, IT IS HEREBY COVENANTED AND AGREED AS FOLLOWS:

1) Description of Service Area Boundary

Redmond and the District agree that the District may provide water service to the properties described in Exhibit "A", attached hereto.

2) Consent to Service by District

The City of Redmond hereby consents to allow the District to provide water service to those properties included within Redmond's water and sewer service area boundary per the method described in Section 2(b) of the July 13, 1988 Interlocal Agreement.

3) Service Extension, Approval of Plans and Specs.

Water service to said properties shall be subject to the terms of the form attached hereto as Exhibit "C" and depicted in Exhibit "B". Redmond and the District agree that the water improvements shall be designed and constructed in accordance with the standards of Redmond or the District, whichever is more stringent. The District shall submit plans and specifications for facilities which will be used to provide such service to the Redmond Utility Engineer for approval. Approval or rejection of the plans and specifications shall be based upon compliance with Redmond water service, fire flow, and construction standards.

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4) Property Owner Agreement

Prior to making any commitment to extend facilities or provide service within Redmond's service area, the District shall procure and provide to Redmond written agreements signed by each owner of property within the Redmond service area which will be served pursuant to this agreement in the form attached hereto as Exhibit "D". The original of such agreements shall be provided to Redmond and Redmond shall record the agreement with the King County Department of Records and Elections.

5) Assumption of Service Area and Ownership of Facilities

a. Upon annexation of all or a portion of the subject properties to the City of Redmond, or upon extension of Redmond's water facilities which will enable connection of the water facilities serving the properties to Redmond's facilities. Redmond, at its option, may elect to assume the rights and responsibilities of providing water service to any or all of the subject properties. This option may be exercised by giving written notice of such election to the District no less than 90 days prior to the proposed effective date of assumption of water serve by Redmond. Upon agreement with the District, Redmond may purchase water from the District required to service such portion of the development at the then current District wholesale rate, which is defined in the Interlocal Agreement.

b. Upon the effective date of the transfer of rights and responsibility to provide water service to the City of Redmond pursuant to this section, the District shall quit claim and transfer to Redmond all of its rights in and title to all water mains, transmission and service lines, hydrants and other facilities located in Redmond's service area. Appropriate bills of sale and all other conveyances necessary to effectuate complete transfer of the District's interest shall be provided by the District to Redmond.

c. The District shall cooperate in making a physical connection to the Redmond facilities and in performing such minor alterations to its facilities as may be required in order to complete the connection with

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Redmond facilities at Redmond's sole expense. The District shall also cooperate in the transfer of all customer and billing information reasonably required for Redmond to assume and perform utility billing functions.

d. No connection fee or other charge shall be assessed by Redmond upon those customers receiving service at the time of transfer of responsibility for water service from the District to Redmond.

6. Remainder of Agreement Unchanged

Except as stated above, the interlocal agreement between the District and Redmond shall remain unchanged and in full force and effect.

DATED this 1st day of October, 1992.

CITY OF REDMOND
By _____
Its MAYOR

APPROVED AS TO FORM:
OFFICE OF THE CITY ATTORNEY
BY _____

WOODINVILLE WATER DISTRICT
By _____
Its President

By _____
Its Secretary

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EXHIBIT "A"

1. East 5 acre parcel owned by Don A. Smith (Tax lot 110)
2. Lot 1 of S.P. 478183
3. Lot 2 of S.P. 478183
4. Lot 3 of S.P. 478183
5. Lot 4 of S.P. 478183
6. Lot 18 Richland Acres No. 3 (unrecorded)
7. Lot 1 of S.P. 385081
8. Lot 2 of S.P. 385081
9. Lot 3 of S.P. 385081
10. Portion of Lot 19 Richland Acres No. 3 (unrecorded)

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EXHIBIT B



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EXHIBIT "C"

Subsequent to any future development or request for service each property shall construct that portion of the following improvements which is located on or adjacent to the property:

> Connect to the existing main in N.E. 125th Street and extend an 8-inch main south in 178th Avenue N.E. (extended) to the south property line of Lot 4, S.P. 478183. Connect to this main at N.E. 124th Street (extended) and N.E. 122nd Street (extended) and extend an 8-inch and 12-inch main respectively to the west property line of Don A. Smith's east lot. Connect to the 8-inch main at the southwest corner of Lot 4, S.P. 478183 and extend a 12-inch main to 180th Avenue N.E. (extended). Continue the 12-inch main in 180th Avenue N.E. to N.E. 123rd Street (extended) then easterly in N.E. 123rd (extended) to the right-of-way of 184th Avenue N.E. Extend the 12-inch main south in 184th Avenue N.E. to the southerly property line of Lot 19. Connect to the 12-inch main in 184th Avenue N.E. and extend an 8-inch main north to the existing Woodinville main. Connect to the 12-inch main located northwest of Lot 1, S.P. 385081, and extend an 8-inch main north to the existing main located in 180th Avenue N.E. Install a pressure reducing station on the 12-inch main north of Lot 3, S.P. 385081. Provide all appropriate easements and right of way dedications to contain the waterline improvements.

Redmond recognizes that Woodinville currently provides water service to Lots 1, 2, and 3 of S.P. 478183 and Lots 1, 2, and 3, of S.P. 385081 and that service will continue without construction of these improvements.

Water service may be provided to the existing home on tax lot 110 (Smith) and the proposed home on Lot 4 S.P. 478183 (Hussey) by constructing an 8-inch main from N.E. 125th Street to 10 feet south of the north property line of the parcels with a fire hydrant. The mains in N.E. 124th Street (extended) and N.E. 122nd Street (extended) fronting these parcels and the main in 178th Avenue N.E. (extended) shall be constructed prior to any additional development or subdivision of the properties and an agreement between Redmond, Woodinville, and the property owners shall be recorded which establishes this covenant.

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WOODINVILLE WATER DISTRICT

KING COUNTY, WASHINGTON

RESOLUTION NO. 2958

A RESOLUTION of the Board of Commissioners of Woodinville Water District, King County, Washington, approving and authorizing the President and Secretary of the Board of Commissioners of Woodinville Water District to execute, on behalf of the District, an addendum to the Interlocal Agreement between the City of Redmond and Woodinville Water District.

BE IT RESOLVED by the Board of Commissioners of Woodinville Water District, King County, Washington, that the President and Secretary of the Board of Commissioners of Woodinville Water District be, and they each hereby are, authorized to execute, on behalf of Woodinville Water District, an addendum to the Interlocal Agreement between the City of Redmond and Woodinville Water District in substantially the same form as that which is attached hereto as Exhibit A and incorporated herein by this reference, and that such instrument be, and hereby is, approved.

ADOPTED by the Board of Commissioners of Woodinville Water District, King County, Washington at a special meeting thereof on the 21st day of July, 1992.

President/Commissioner

Vice-President/Commissioner

Attest:

Secretary/Commissioner

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EXHIBIT "D' TO ADDENDUM
TO INTERLOCAL AGREEMENT

AGREEMENT CONCERNING WATER SERVICE

WHEREAS, the undersigned are the owners of certain real property located in King County, Washington within the Utility Service Area Boundaries of the City of Redmond.

WHEREAS, said owners desire to obtain water service from the Woodinville Water District, and pursuant to an interlocal agreement between the Woodinville Water District and the City of Redmond dated _____, a copy of which is attached hereto as Exhibit "A", ("the interlocal agreement") the consent of the City of Redmond is required for the District to provide water service within redmond's Utility Service Area south of N.E. 124th Street, and certain agreements on the part of the owners of property to be served relating to annexations and formation of local improvements districts or utility local improvement districts are required by the interlocal agreement, and

WHEREAS, in order to induce the City of Redmond to grant consent for the District to provide water service to that portion of the development located within Redmond's Utility Service Area and to comply with the requirements of the interlocal agreement relating to annexation and Local Improvement Districts (LID)/Utility Local Improvement Districts (ULID), the undersigned owners, on behalf of themselves, their heirs, successors and assigns, intending the City of Redmond to be a beneficiary of this agreement, hereby covenant and agree as follows:

1. Annexation to City of Redmond. The undersigned owners understand that at some future date the City of Redmond may desire to annex all or part of the property described on Exhibit "B" to the City and that annexation will result in the following consequences:
   a. King County ordinances, resolutions, rules and regulations will cease to apply to the property upon the effective date of annexation;

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b. City of Redmond ordinances, resolutions, rules and regulations will begin to apply to the property upon the effective date of annexation;

c. Governmental services, such as police, fire and utility service, will be provided to the property by the City of Redmond upon the effective date of annexation;

d. The property may be required to assume all or any portion of the City of Redmond indebtedness existing at the time of annexation and property tax rates and assessments applicable to the property may be higher or lower than those applicable prior to the effective date of annexation;

e. Zoning and land use regulations applicable to the property after annexation may be different from those applicable to the property prior to annexation; and

f. All or any portion of the property may be annexed and the property may be annexed in conjunction with, or at the same time as, other property in the vicinity.

With full knowledge and understanding of these consequences of annexation and with full knowledge and understanding of owners rights to oppose annexation of the property to the City of Redmond, owners agree to sign a petition for annexation to the City of property including all or part of the property described on Exhibit "B" as provided in RCW 35.14.120, as it now exists or as it may hereafter be amended, at such time as the owners are requested by the City to do so. The owners also appoint the Mayor of the City as owners' attorney-in-fact to execute an annexation petition on owners' behalf in the event that owners shall fail or refuse to do so and agree that such signature shall constitute full authority from the owners for annexation as if owners had signed the petition themselves. Owners further agree not to litigate, challenge or in any manner contest, annexation to the City. This agreement shall be deemed to be continuing, and if owners' petitions for whatever reason, including a decision by the City not to annex, owners agree to sign any and all subsequent petitions for annexation. In the event that any property described on Exhibit "B" is subdivided into smaller lots, and/or ownership thereof is transferred, the purchaser or other transferee of each subdivided lot or other portion or the entirety of the property shall be bound

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PROJECT FILE RECORDS

by the provisions of this paragraph and by purchasing or otherwise assuming an ownership interest designates the Mayor of Redmond as attorney-in-fact as provided above.

2. Waiver of Right to Protest Formation of LID/ULID. The undersigned owners acknowledge that the entire property legally described on Exhibit "B" would be specially benefited by the following utility improvements (specify):

1. Future storage facility to be constructed by Redmond or others to serve the property
2. Future water supply connection by Redmond to City of Seattle Tolt Supply System
3. Future water transmission/distribution mains which connect the site to City of Redmond water supply and storage facilities including, but not limited to water mains in the following streets, private roads or easements:
    a. 184th Avenue N.E.
    b. N.E. 124th Street extended
    c. N.E. 123rd Street extended
    d. N.E. 122nd Street extended
    e. 172nd Avenue N.E. extended
    f. 180th Avenue N.E. extended
    g. N.E. 178th Street extended

Or by improvements providing substantially equivalent service to the property. Owners agree to sign a petition for the formation of an LID or ULID for all or any of the specified or substantially equivalent improvements at such time as one is circulated and owners hereby appoint the Mayor of the City as their attorney-in-fact to sign such a petition in the event owners fail or refuse to do so. By purchasing or otherwise acquiring an ownership interest in all or any part of the property, all transferees thereby so designate the Mayor of the City as attorney-in-fact.

With full understanding of owners' right to protest formation of an LID or ULID to construct such improvements pursuant to RCW 35.43.180, owners agree to participate in any such LID or ULID and to waive their right to protest formation of the same. Owners shall retain the right to contest the method of calculating any assessment and the amount thereof, and shall

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PROJECT FILE RECORDS

further retain the right to appeal the decision of the City affirming the final assessment roll to the superior court. Not withstanding any other provisions of this agreement, this waiver of the right to protest shall only be valid for a period of ten (10) years from the date this agreement is signed by the owners.

3. Covenant Running With Land/Binding on Successors. The covenants and agreements set forth herein shall be covenants running with owners' land identified on Exhibit "B" hereto and shall be binding upon the parties, their heirs, assigns, and successors in interest. Owners acknowledge and stipulate that the agreements and covenants contained herein benefit utility and other property owned by the City by facilitating future expansion of redmond's water utility system. This agreement shall be recorded with the King county department of records and Elections.

DATED this _____ day of _____, 19___.

OWNER(S)

_____

_____

_____

_____

STATE Of WASHINGTON)
)ss:
COUNTY OF _____)

I certify that I know or have satisfactory evidence that _____ signed this instrument and acknowledged it to be (his/her) free and voluntary act for the purposes mentioned in this instrument.

DATED this _____ day of _____, 19___.

_____
NOTARY PUBLIC
My commission expires: _____

DUPLICATE ORIGINAL
PROJECT FILE RECORDS

STATE Of WASHINGTON)
)ss:
COUNTY OF _____)

I certify that I know or have satisfactory evidence that _____ signed this instrument and acknowledged it to be (his/her) free and voluntary act for the purposes mentioned in this instrument.

DATED this _____ day of _____, 19___.

_____
NOTARY PUBLIC
My commission expires: _____

DUPLICATE ORIGINAL
PROJECT FILE RECORDS

AGREEMENT FOR WATER SYSTEM INTERTIES
(REDMOND RIDGE DEVELOPMENT)

This Agreement made and entered into between Union Hill Water Association ("Association"), a non-profit corporation, and the City of Redmond ("City"), a municipal corporation of the State of Washington.

W I T N E S S E T H:

WHEREAS, the City is a non-charter, optional municipal code city organized and operating pursuant to Chapter 35A RCW; and

WHEREAS, the City owns and operates a water system which is being extended east of the City to service the Redmond Ridge development; and

WHEREAS, the Association is organized and operating pursuant to chapter 24.03 RCW and is authorized to operate a water system within its boundaries; and

WHEREAS, the Association's boundaries abut the Redmond Ridge development; and

WHEREAS, the Association's existing water system has water mains in several locations adjacent to where the City water system is being constructed within the Redmond Ridge development; and

WHEREAS, connections between the Association's water system and the City's water system (i.e., "Interties") are physically convenient in such locations; and

WHEREAS, such Interties would provide each party with an emergency source of additional water, and the parties mutually desire to construct said Interties pursuant to the terms and conditions set forth below;

NOW, THEREFORE, the parties do hereby agree as follows:

1.0 **Purpose.** The purpose of this Agreement is to provide Interties of the water system of each party with an emergency water source.

2.0 **Definitions.** For purposes of this Agreement, "emergency" shall mean an unforeseen circumstance of short duration resulting from a failure of either parties' water system equipment or piping which necessitates transfer of water from one of the parties' to the other to meet life safety demands and satisfy minimum levels of service for customers. An emergency shall not be construed to exist as a result of the inability of a party to meet higher than anticipated demands by customers as a result of weather, new connections to the respective system or other causes not related directly to a failure of equipment or piping.

3.0 **Description of Interties.** Three Interties shall be constructed and operated under the terms of this Agreement and are shown on the map attached hereto as Exhibit A. The Interties are to be as follows:

1) 224th Avenue NE Intertie. This is to be a 12" Intertie and is to be constructed within the King County right-of-way of 224th Avenue NE at Novelty Hill Road near the northern edge of the Redmond Ridge development.

2) Redmond Ridge Drive/238th Avenue NE Intertie. This is to be a 12" Intertie and is to be constructed within the King County right-of-way of Redmond Ridge Drive at the southern edge of the Redmond Ridge development adjacent to NE 80th Street.

3) NE 92nd Street Intertie. This is to be an 8" Intertie and is to be constructed within NE 92nd Street, a private roadway, immediately west of the Redmond Ridge development, near 220th Avenue NE. This intertie is to include approximately 350 feet of new 8-inch ductile iron pipe and the replacement of approximately 500 feet of 6-inch PVC pipe with 8-inch ductile iron pipe, west from Redmond Ridge. Each intertie is to include water main, meter vault, appropriately sized meters and associated valves & appurtenances.

4.0 Construction.

4.1 The City shall be responsible for construction of the Redmond Ridge Drive/238th Avenue NE and NE 92nd Street Interties. The City shall also be responsible for construction of a 12-inch waterline stub in the vicinity of the 224th Avenue intertie. This stub shall extend to the north side of the Novelty Hill Road right-of-way, beyond all street paving improvements. The Association shall be responsible for construction of the 224th Avenue NE Intertie. Construction responsibility shall include but not be limited to design, permitting, project administration, right-of-way acquisition, construction and construction inspection of the Intertie, with the exception that the Association shall be responsible for permitting, right-of-way/easement acquisition and construction inspection for the pipe portion of the NE 92ND Street intertie which lies within it's service area.

4.2 The plans and specification for all construction shall meet or exceed the construction standards of the party which is to own the same and shall be subject to review and approval of the other party. Each party shall have the right to inspect all work of the other at all reasonable times to assure conformance with agreed plans and specifications.

5.0 Construction Schedule. The 224th Avenue NE and Redmond Ridge Drive/238th Avenue NE Interties shall be operationally complete within 2 years from the date of Redmond water being available at the intertie locations as a result of the construction of the Redmond Ridge development improvements. The NE 92nd Street intertie shall be operationally complete within one year of construction of the Redmond Ridge waterlines west of the Olympic Gas Pipeline, as shown on Attachment "A".

6.0 **Intertie Project Costs.** The term "cost" as used in this section shall include, without limitation, all actual costs of labor, materials, equipment, engineering, inspection, right-of-way, legal costs, publication, SEPA compliance and any costs customarily incurred in such projects. The costs for the Intertie shall be allocated as follows:

6.1 **City Costs.** The cost of the NE 92nd Street and Redmond Ridge Drive/238th Avenue NE Interties shall be paid in full by the City, either directly or as contributed capital as a result of development.

6.2 **Association Costs.** The cost of the 224th Avenue NE Intertie shall be paid in full by the Association.

7.0 **Ownership.** Upon completion of construction, ownership of the Redmond Ridge Drive/238th Avenue NE Intertie and that portion of the NE 92nd Street Intertie which lies within the Redmond Ridge Development shall vest in the City. Ownership of the 224th Avenue NE Intertie and that portion of the NE 92nd Street Intertie piping which lies within the Association's service area shall vest in the Association.

8.0 **Maintenance.** Each party shall maintain their respective Interties in good working order in accordance with sound maintenance procedures, good engineering practices and applicable laws, rules and regulations such that each party will receive and enjoy the continuous uninterrupted use of the Interties as provided in this Agreement. Maintenance shall include meter calibration, to be performed no less frequently than every 10 years from the date of installation.

9.0 **Replacement.** In the event of total loss or destruction of an Intertie, or a portion thereof, the owner shall rebuild that section at its sole cost and expense.

10.0 Notification, Use, and Payment.

10.1 Notification. Prior to use of any Intertie to deliver water from one party to the other, the receiving party shall notify the delivering party of the nature of the emergency, and its expected duration. In the event the emergency requires immediate operation to protect lives or property, notification should occur as soon as practicable under the circumstances. Within ten days of use of the Intertie to deliver water from the City to the Association, the City and the Association will provide a report of its use to Seattle Water Department, stating the nature of the emergency, the date and time of use, and the quantity of water used.

10.2 Use. Operations personnel from both parties will participate in activating and deactivating the Interties to preclude unanticipated impacts within respective systems. In the event the emergency requires immediate operation to protect lives or property, either party may operate the Interties, with notification to occur as soon as practicable under the circumstances, but not later than 24 hours following such incident.

10.3 Payment for Water Delivered. Water sold for emergency purposes shall be priced at the wholesale rate of the regional water provider in effect at the time of sale.

11.0 General.

11.1 Duration. The parties acknowledge and agree: (1) that the use of said Interties is essential to the operations of each party in providing water service to its customers under emergency conditions; and, (2) that each party will rely upon the continued existence of the Interties and rights of usage granted hereunder in its long range planning and issuing bonds, notes and other financing documents. Thus, each party covenants and agrees with the other not to interfere with the other's rights granted hereunder; not to violate

applicable laws, rules and regulations of agencies with regulatory jurisdiction over the parties; and not to take any action inconsistent with this Agreement. This Agreement may be terminated only through the mutual written Agreement of both parties.

11.2 Not a Partnership. This Agreement shall not constitute or create a partnership or a joint venture.

11.3 Compliance with Laws and Regulations. Each party shall, with respect to its duties, responsibilities and operations hereunder, comply with all applicable laws, rules and regulations governing the same. Each party shall submit construction drawings for the Interties to the Department of Health for approval and comply with the "Intertie Statute", section 90.03.383 RCW.

11.4 Specific Performance. In addition to all other remedies available to a party hereunder, whether in law or equity, each party to this Agreement shall have the right to seek and obtain specific performance of the terms hereof. The parties agree that damage occurring by reason of the breach hereof is difficult, if not impossible, to ascertain and that remedies of law are inadequate.

11.5 Assignment. Neither party shall have the right in whole or in part to assign this agreement or its rights and obligations hereunder or its interest in the Intertie without prior written consent of the other party, which shall not be unreasonably withheld, delayed, or conditioned.

11.6 Authority. This Agreement is entered into by the parties hereto pursuant to the authority contained in RCW 35.67.300 and RCW 24.03.

11.7 Attorney's Fees. If a suit or other action is instituted in connection with any controversy arising out of this Agreement, the prevailing party shall be entitled to recover all of its costs and expenses including such sum as the court may judge reasonable for attorneys fees, including fees upon appear of any judgement or ruling.

11.8 Non Waiver. No waiver by either party of any term or condition of this Agreement shall be deemed or construed as a waiver of any other term or condition or of any breach hereof, whether pertaining to the same or a different provision of this Agreement.

11.9 Severability. If any section, subsection, sentence, clause, phrase, or other portion of this Agreement is, for any reason, declared invalid, in whole or in part of any court or agency of competent jurisdiction, said decision shall not affect the validity of the remaining portions hereof.

11.10 Indemnity. Each party agrees to indemnify, defend and hold harmless the other party, its officers, agents, and employees, from and against any and all claims, losses, or liability, for injuries, sickness or death of persons, or damage to property, arising out of any willful misconduct or negligent act, error, or omission of the indemnifying party, its officers, agents, subcontractors or employees, in connection with actions taken pursuant to this Agreement. Provided, however, that the indemnifying party's obligations to indemnify, defend and hold harmless for injuries, sickness, death or damage caused by or resulting from the concurrent negligence or willful misconduct of the indemnitee and the indemnifying party, or of the indemnifying party and a third party other than an officer, agent, subcontractor or employee of the indemnifying party, shall apply only to the extent of the negligence or willful misconduct of the indemnifying party.

12.0 **Execution of Documents.** Each party agrees to execute any and all documents and instruments necessary to give effect to and carry out the terms of this Agreement and to obtain the necessary approval of the same by government agencies as required by law.

13.0 **Effective Date.** This agreement shall be effective upon execution and approval of the legislative bodies of both parties.

UNION HILL WATER ASSOCIATION	CITY OF REDMOND
BY Frank Parchman	BY Rosemarie Ives
President	Rosemarie Ives, Mayor
Date _____	Date May 22, 2001
ATTEST:	ATTEST:
BY Laura Oliver	BY Bonnie Matson
Secretary	Bonnie Matson, City Clerk
Date _____	Date May 23, 2001
APPROVED AS TO FORM:	APPROVED AS TO FORM:
BY _____	BY [signature]
Date _____	Date 5/22/01

o:\agenda\Union Hill-Red Ridge Intertie Agrmt.doc

DUPLICATE ORIGINAL
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ADDENDUM TO INTERLOCAL AGREEMENT BETWEEN REDMOND AND WOODINVILLE WATER DISTRICT BLAKELY RIDGE (TRILOGY)

WHEREAS, the City of Redmond, Washington ("Redmond") and the Woodinville Water District ("the District") are parties to that certain interlocal agreement ("the interlocal agreement") dated July 13, 1988, which designates the common service area boundary between the District and Redmond, and

WHEREAS, paragraph 12 of the agreement provides that future developments that straddle the common boundary line shall be approved by an addendum on a case-by-case basis and

WHEREAS, the Blakely Ridge Urban Planned Development, also known as Trilogy ("Trilogy") straddles the common boundary line and

WHEREAS, Redmond and Woodinville wish to identify a new common boundary line in this area

NOW, THEREFORE, IT IS AGREED AS FOLLOWS:

1) Sewer Service Boundary for Trilogy
The entire Trilogy development as shown on Exhibit A shall be in the sewer service area of the City of Redmond.

2) Water Service Boundary for Trilogy
The Trilogy development south of the north lines of the South half of the Southwest quarter and the South half of the Southeast quarter of Section 22 shall be in the water service area of Redmond. The Trilogy development north of this line shall be in the water service area of the District. (See Exhibit A).

3) Future Boundary Revision

Should Redmond or Woodinville wish to revise the above boundaries, the party desiring the change shall make a proposal to the other party with reasons for the change. The boundary may be revised as approved by a written amendment to this agreement.

4) Remainder of Agreement Unchanged

Except as stated above, the interlocal agreement between the District and Redmond shall remain unchanged and in full force and effect.

DATED this 12th day of February, 2002.

City Of Redmond

By _____

Its MAYOR

Approved As To Form:
Office Of The City Attorney

By _____

Woodinville Water District

By _____
Its President

By _____
Its Secretary

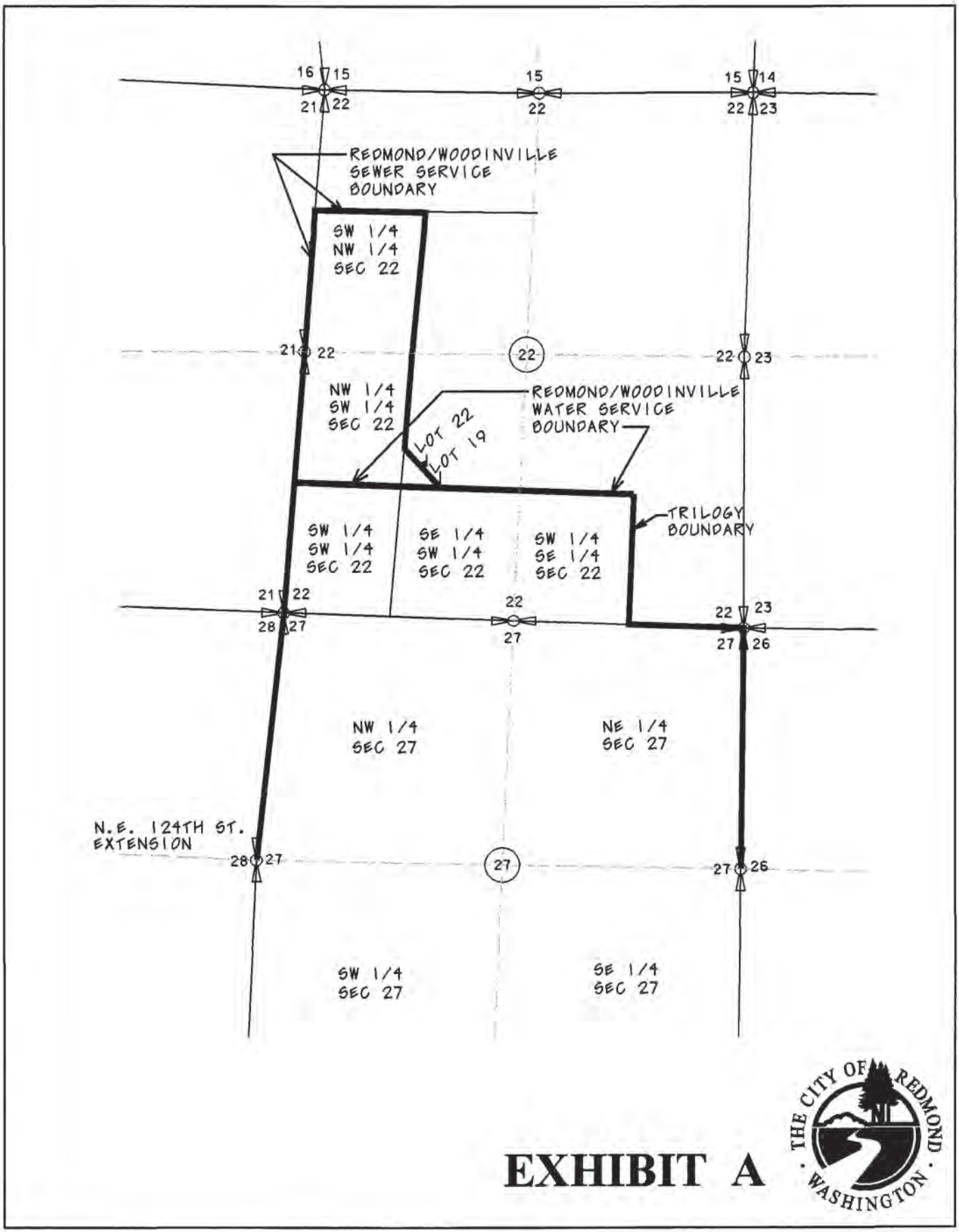

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BOUNDARY
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SEC 22
REDMOND/WOODINVILLE
WATER SERVICE
BOUNDARY
LOT 22
LOT 19
TRILOGY
BOUNDARY
SW 1/4
SW 1/4
SEC 22
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NW 1/4
SEC 27
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SEC 27
N.E. 124TH ST.
EXTENSION
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SW 1/4
SEC 27
SE 1/4
SEC 27
THE CITY OF REDMOND
WASHINGTON

EXHIBIT A

After recording return to:

_____

_____

_____

CR# 37620 DATE 6-8-05 LOC 05-488

Res 7196

AMENDMENT NO. 1
TO
INTERLOCAL OPERATION AND MAINTENANCE AGREEMENT

THIS AMENDMENT NO. 1 to that certain Interlocal Operation and Maintenance Agreement dated October 9, 1997 (the "1997 Agreement") is made by and between the cities of Kirkland ("Kirkland"), Redmond ("Redmond") and Bellevue ("Bellevue"), all municipal corporations in King County, Washington, collectively referred to as the "Cities" for the purposes set forth herein.

RECITALS

A. The Cities previously entered into an Assumption Agreement whereby the Cities assumed the assets, liabilities and operations of the Rose Hill Water District, a former municipal corporation in King County, Washington.

B. Section 5 of the 1997 Agreement provides for the purchase of water from the City of Seattle, and anticipates the possibility that the City of Seattle may choose not to renew its purveyor contract with Kirkland.

C. The City of Seattle has chosen not to renew the existing purveyor contract with Kirkland.

D. The Cascade Water Alliance is a regional water supply organization ("Cascade") of which the Cities are members.

E. The Cities wish to amend the 1997 Agreement to reflect the purchase of water from Cascade as of January 1, 2004;

NOW, THEREFORE, in consideration of the terms and conditions contained herein, the parties agree as follows:

1. Water Supply. Section 5 of the 1997 Agreement is deleted in its entirety and replaced with the following:

> 5. Water Supply. Kirkland, Redmond and Bellevue shall each contract with the Cascade Water Alliance ("Cascade") for the purchase of their respective water supplies, and shall pay all applicable costs of supply to Cascade in accordance with such agreements. Kirkland shall operate the Joint Facilities to distribute Cascade water to Kirkland, Redmond and Bellevue.

2. Water Usage. Section 6 of the 1997 Agreement is amended by deleting the reference to the "City of Seattle" and replacing it with "Cascade."

3. Water Supply, Operation and Maintenance Costs. Subsections 9(a), 9(b), 9(e), and 9(i) of the 1997 Agreement are deleted and replaced with new subsections 9(a), 9(b), 9(e) and 9(i) to read as follows:

> a. Water Charges. The charge for water shall be paid directly by each city to Cascade in accordance with Cascade's membership agreement and resolutions.
>
> b. Meter Charges. There are no Cascade meter charges for the supply meters. There shall be no charges for any city-operated master meter. Costs associated with the operation and maintenance of master meters shall be borne by the city served by the master meter. City-operated master meters will be tested and calibrated as determined by the Joint Board.
>
> e. Administration Charges. Kirkland shall assess Redmond and Bellevue based on water usage for their proportionate shares of the administrative costs incurred by Kirkland to provide administrative activities and duties for this Agreement and operation and maintenance of the joint facilities for which Kirkland is responsible. These administrative activities include but are not limited to financial and accounting services, record keeping, and billing.
>
> i. Demand Metering. This subsection is deleted.

4. Water Supply, Operation and Maintenance Payments. Subsections 10(b) and 10(c) of the 1997 Agreement are deleted and replaced with new subsections 10(b) and 10(c) to read as follows:

> b. Supply and Consumption Reports. Kirkland shall prepare a supply and consumption report for each month of the year within ninety (90) days of the end of each such month. The report shall indicate the total purchased supply, the wholesale usage and retail water usage reported by each city, and the unaccounted

water usage calculated for each city. This report shall correlate the total purchased supply and reported usages to actual calendar periods of use as may be determined based on the varying meter read dates and frequency of meter readings. Kirkland shall provide copies of the monthly supply and consumption reports to Cascade.

c. Billings and Payments. Each city shall invoice the other cities monthly or quarterly as determined by the billing city for any charges authorized herein.

5. Seattle Water Purveyor Contract. Section 11 of the 1997 Agreement is hereby deleted in its entirety.

6. Severability. The invalidity of any clause, sentence, paragraph, subdivision, section or portion of this Amendment No. 1 shall not affect the validity of the remainder of this agreement.

7. Counterparts. This document may be signed in two or more counterparts, all of which, when considered together, shall constitute one fully executed document.

8. Effective Date and Ratification. This Amendment shall take effect upon signature by each City and filing with the King County Department of Records and Elections. The Cities intend that this Amendment relate back to January 1, 2004, and this Amendment shall ratify the prior oral understandings between the parties now set forth in this Amendment.

Except as expressly modified by this Amendment No. 1, all terms and conditions of the 1997 Agreement shall remain in full force and effect.

EXECUTED by the parties on the dates set forth below.

CITY OF KIRKLAND

By: [signature]
Its: ASSISTANT CITY MANAGER
Dated: 7/11/05

APPROVED AS TO FORM:

By: [signature] 07/08/05
Kirkland City Attorney Date

CITY OF REDMOND

By: [signature]
Its: MAYOR
Dated: 4-5-2005

APPROVED AS TO FORM:

By: [signature] 4/5/05
Redmond City Attorney Date

CITY OF BELLEVUE

By: ERObers
Its: Deputy City Manager
Dated: 6/8/05

APPROVED AS TO FORM:

By: Patricia Cole 5/23/05
Bellevue City Attorney Date

{ASB571685.DOC;1/00020.900175/}

CR# 37669 DATE 6-8-05 LOC 05-487

AGS 7197

AGREEMENT FOR WATER DISTRIBUTION BETWEEN THE CITY OF BELLEVUE AND THE CITY OF REDMOND

This Interlocal Agreement is made and entered into by and between the City of Bellevue, hereinafter referred to as "Bellevue", a municipal corporation of the State of Washington, and the City of Redmond, hereinafter referred to as "Redmond", a municipal corporation of the State of Washington.

WHEREAS, there currently exists an Interlocal Agreement dated November 6, 1998, between Bellevue and Redmond, providing for the operation of a water supply and distribution system within the service areas specified in said agreement; and

WHEREAS, Bellevue and Redmond are members of Cascade Water Alliance (Cascade) which is now the wholesale water supplier for the cities; and

WHEREAS, it is necessary and desirable to enter into a new Interlocal Agreement between Bellevue and Redmond which updates the respective duties and responsibilities of said cities with respect to distribution of water supplied by Cascade within the respective service areas of said cities; and

WHEREAS, it is in the interests of the public served by both Bellevue and Redmond to enter into a new Interlocal Agreement;

NOW, THEREFORE, it is covenanted and agreed as follows:

1. **Purpose**. The purpose of this Interlocal Agreement is to provide for the respective responsibilities and obligations of Bellevue and Redmond to provide for the operation and maintenance of water supply facilities within the common service area set forth in the Agreement.
2. **Joint-use/Ownership Distribution Mains**. The existing watermains listed below are to be classified as joint-use/ownership. Each city shall have a 50 percent (50%) ownership of these joint-use/ownership mains. The city identified as having responsibilities for each

watermain is responsible for all maintenance and operation of the watermain, including mainline valves, hydrants and hydrant piping. Each city is responsible for maintenance and repair of its own individual service lines (including saddles, corporation stops and any valves) and any mainline connection to a joint-use/ownership main. The cost of replacement of a joint-use/ownership main shall be shared equally between each city. The city identified as having responsibility for each joint-use/ownership main shall have the authority to determine when the joint-use/ownership main needs to be replaced. Each city shall provide at least two years notice of any scheduled replacement to the other city so budget impacts can be planned for.

Joint-Use/Ownership Distribution Mains:

A. Existing watermain on 148th Avenue NE between NE 20 Street and NE 51st Street - City of Bellevue's responsibility.

B. Existing watermain on NE 20th Street and Bellevue-Redmond Road from 148th Avenue NE to 156th Avenue NE – City of Redmond's responsibility.

C. Existing watermain on 156th Avenue NE from Bellevue-Redmond Road to NE 28th Street – City of Redmond's responsibility.

Joint-Use/Ownership Transmission Mains:

The existing watermains listed below were constructed pursuant to an "Agreement for Construction, Operation and Maintenance of Joint-Use Storage and Pumping Facility" dated September 28, 1990. The ownership in these mains is 56% Bellevue and 44% Redmond according to the terms of that Agreement.

- Existing transmission main on NE 40th Street between the Seattle meter at 140th Avenue NE and the joint-use pump station and reservoir.

This section is not intended to amend the terms of said Agreement but to document the water mains constructed under the terms of said Agreement.

3. **Service Area**. Redmond and Bellevue have established their common service area boundary to be as shown on Exhibit 1. Each city shall be the direct provider of water service within its service area boundary except for those properties shown on Exhibit 1 or defined by subsequent amendment to this Agreement.

Unless otherwise agreed, ownership and water service responsibilities for any non-joint-use watermains, services and customers are placed with the city in which they exist.

Within the Redmond service area there are herby established "direct read meter areas" and a "master meter area". The boundaries for direct read meter areas are shown on Exhibit 1. Remaining areas within Redmond with water delivered under this Agreement are in the master meter area.

Within the Bellevue service area there is hereby established a "direct read meter area" as shown on Exhibit 1 for water delivered by Redmond.

4. Metering

A. Master Meter Areas

1) Redmond. Redmond shall operate and maintain three master meters to measure the quantity of water entering the Redmond master meter area. The location of the meters are as follows:

a. NE 40th Street between SR 520 and 156th Avenue NE.

b. 156th Avenue NE between NE 31st Street and NE 36th Street.

c. NE 24th Street between 171st Avenue NE and 173rd Avenue NE.

The meters shall be maintained to provide 98 percent (98%) accuracy for a flow range between 50 gpm and 1,000 gpm.

2) Bellevue. Bellevue shall operate and maintain one master meter to measure the quantity of water leaving the Redmond master meter area. The location of the meter is as follows:

a. Bellevue-Redmond Road between NE 32nd Street and NE 35th Street. The meter shall be maintained to provide 98 percent (98%) accuracy for a flow range between 50 gpm and 1,000 gpm.

3) Ownership/Maintenance. Each city shall own its respective master meters and shall provide routine operation and maintenance.

B. Direct Read Meter Areas.

1) Redmond. The City of Redmond shall construct, operate, and maintain individual service meters to all water users to measure the quantity of flow consumed in the Redmond direct read meter area. These meters shall be the standard distribution meters used by the City of Redmond.

2) Bellevue. The City of Bellevue shall construct, operate, and maintain individual service meters to all water users to measure the quantity of flow consumed in the Bellevue direct read meter area. These meters shall be the standard distribution meters used by the City of Bellevue.

3) Ownership/Maintenance. Each city shall own all individual service meters in its service area and shall provide routine operation and maintenance.

C. Calibration and Replacement of Meters. All meters two (2) inches and smaller shall be replaced after 20 years of service from the time of installation. All meters three (3) inches and larger shall be calibrated at regular intervals to provide for proper measurement of water usage. Meters shall be calibrated according to the following schedule:

1) Master Meters: The first quarter of every odd numbered year.

2) All meters three (3) inches and larger: Every five (5) years.

The cost of meter calibration or replacement shall be paid by the owner of the meter. Any meter with accuracy limits which do not meet or exceed those listed in the latest edition of the AWWA Manual M6 under "Accuracy Limits for Removal from Service" shall be replaced by the owner of the meter. Each city shall provide a calibration and replacement report to the other city on an annual basis.

5. **Interconnection or Extensions with Other Parts of Redmond Water Systems**. Redmond agrees not to interconnect the water system within the direct read meter areas to other parts of its water system or customers outside the direct read meter areas without the written (or oral, in case of emergency) approval of Bellevue.

6. **Distribution of Water**. Any restriction of the distribution of water to Redmond shall be on an equitable basis in relation to the service provided to Bellevue customers in the general vicinity.

7. **Water Consumption Reporting**.

A. Determining consumption. Redmond shall read the individual service meters in the Redmond direct read meter areas. All meters shall be read monthly or bi-monthly. The Redmond direct read meter area consumption shall be determined by summing the consumption of all individual service meters then multiplying the total by 1.11. (The factor is to provide for unaccounted system losses of 10% of the total direct meter area usage.)

Redmond shall read the Redmond master meters monthly and the Bellevue master meter monthly. The total master meter consumption shall be determined by summing the totalized flow of the three Redmond master meters and subtracting the totalized flow of the Bellevue master meter.

Bellevue shall read the individual service meters in the Bellevue direct read meter areas. All meters shall be read monthly or bi-monthly. The Bellevue direct read meter area consumption shall be determined by summing the consumption of all individual service meters then multiplying the total by 1.11. (The factor is to provide for unaccounted system losses of 10% of the total direct meter area usage.)

B. Reporting Consumption. Each city shall report to the other city and to Cascade the total individual service meter consumption and the calculated direct read meter area

consumption. Redmond shall report to Bellevue and Cascade the master meter totalized flow. Each city shall report consumption data to the other city on a quarterly basis. Each city may request a report of the other city listing all meters within the direct meter area. This report shall be provided to the other city for its use in verifying that all direct read metered consumption is being reported.

8. **Old Water Allowance**. To the extent there is any current or future benefit from "old water" provisions of prior Seattle Water Purveyor Contracts the following "old water" allowances are hereby allocated from Bellevue's water usage to Redmond (hundreds of cubic feet):

	Month	Cumulative
January	17,656	17,656
February	17,235	34,891
March	14,686	49,577
April	18,425	68,002
May	16,794	84,796
June	23,462	108,258
July	22,386	130,644
August	29,010	159,654
September	29,897	189,551
October	27,946	217,497
November	23,128	240,625
December	20,667	261,292
	261,292	

9. **Responsibility for Damages, Repair and Replacement**. Redmond and Bellevue shall each be separately responsible for maintenance, repair and replacement of those facilities which are solely owned by such city. In the event of damages, repair, replacement, and maintenance of joint-use watermains where each city has a 50 percent (50%) ownership of such main pursuant to Section 2 of this Agreement, the cities shall each contribute to the cost of such repair, replacement, or maintenance on a 50/50 percent basis. To the extent that any joint ownership main is damaged in whole or part by the negligent activities of one of the cities, the city so causing such damage shall, in addition to its obligation to pay 50 percent (50%) of the cost of repair, replacement, or maintenance pursuant to the preceding

paragraph, also pay the same percentage of the remaining expense as its degree of negligence bears to 100 percent (100%).

10. **Liability/Hold Harmless**. Bellevue shall indemnify, defend, and hold harmless Redmond, it officers, agents, and employees, from and against any and all claims, losses, or liability, including attorneys fees, arising from injury or death to persons or damage to property occasioned by any act, omission, or failure of Bellevue, its officers, agents, and employees, in the performance of this Agreement. With respect to the performance of this Agreement and as to claims against Redmond, its officers, agents, and employees, Bellevue expressly waives its immunity under Title 51 of the Revised Code of Washington, the Industrial Insurance act, for injuries to its employees and agrees that the obligation to indemnify, defend and hold harmless provided for in this paragraph extends to any claim brought by or on behalf of any employee of Bellevue. This paragraph shall not apply to any damage resulting from the negligence of Redmond, its agents, and employees. To the extent any of the damages referenced by this paragraph were caused by or resulted from the concurrent negligence of Redmond, its agents, or employees, this obligation to indemnify, defend and hold harmless is valid and enforceable only to the extent of the negligence of Bellevue, its officers, agents, and employees.

Redmond shall indemnify, defend and hold harmless Bellevue, its officers, agents, and employees, from and against any and all claims, losses, or liability, including attorneys fees, arising from injury or death to persons or damage to property occasioned by any act, omission, or failure of Redmond, its officers, agents and employees, in the performance of this Agreement. With respect to the performance of this Agreement and as to claims against Bellevue, its officers, agents, and employees, Redmond expressly waives its immunity under Title 51 of the Revised Code of Washington, the Industrial Insurance Act, for injuries to its employees and agrees that the obligation to indemnify, defend and hold harmless provided for in this paragraph extends to any claim brought by or on behalf of any employee of Redmond. This paragraph shall not apply to any damage resulting from the negligence of Bellevue, its agents, and employees. To the extent any of the damages referenced by this paragraph were caused by or resulted from the concurrent negligence of

Bellevue, its agents, or employees, this obligation to indemnify, defend and hold harmless is valid and enforceable only to the extent of the negligence of Redmond, its officers, agents, and employees.

11. **Dispute Resolution**. Each city shall designate representatives for the purposes of administering this Agreement and resolving disputes arising from this Agreement. Each city shall notify the other in writing of its designated representatives. Each city may change its designated representatives on notice to the other.

    Disputes that cannot be resolved by the representatives designated herein shall be referred to the chief executive officer of each city for mediation and/or settlement. If not resolved by them within sixty (60) days, either city, or both of them, may file a demand for arbitration, in which event the issues shall be submitted to an arbitrator acceptable to both parties and the matter shall be arbitrated pursuant to the rules and procedures of the American Arbitration Association. The decision of the arbitrator shall be final and binding on both cities.

12. **Modification of Agreement**. This Agreement may only be modified in writing signed by both cities.

13. **Severability**. If any provision of this Interlocal Agreement shall be held invalid, such invalidity shall not affect the other provisions of this Agreement which could be given effect without the invalid provision, and to this end the provisions of this Agreement are declared to be severable.

14. **Effective Date**. This agreement shall take effect on January 1, 2004.

15. **Repeal**. Upon the effective date of this agreement, the previous Interlocal Agreement dated November 6, 1998 between Bellevue and Redmond is no longer in effect.

HEREBY AGREED TO AND ACCEPTED on this the 8 day of June, 2005.

CITY OF BELLEVUE

By: _____
Steve Sarkozy, City Manager

Approved as to form:

By: _____
Assistant City Attorney

CITY OF REDMOND

By: _____
Rosemarie Ives, Mayor

Approved as to form:

By: _____
City Attorney

FILED NO. 26379
CITY OF BELLEVUE
DATE 4/6/98
CITY CLERK'S OFFICE

AGREEMENT FOR WHOLESALE WATER SUPPLY BETWEEN THE CITY OF BELLEVUE AND THE CITY OF REDMOND

This Interlocal Agreement is made and entered into by and between the City of Bellevue, hereinafter referred to as "Bellevue", a municipal corporation of the State of Washington, and the City of Redmond, hereinafter referred to as "Redmond", a municipal corporation of the State of Washington.

WHEREAS, there currently exists an Interlocal Agreement dated July 19, 1990, between Bellevue and Redmond, providing for the operation of a water supply and distribution system within the service areas specified in said agreement; and

WHEREAS, it is necessary and desirable to enter into a new Interlocal Agreement between Bellevue and Redmond which updates the respective duties and responsibilities of said cities with respect to distribution of water supply within the respective service areas of said cities; and

WHEREAS, it is in the interests of the public served by both Bellevue and Redmond to enter into a new Interlocal Agreement;

NOW, THEREFORE, it is convenanted and agreed as follows:

1. Purpose. The purpose of this Interlocal Agreement is to provide for the respective responsibilities and obligations of Bellevue and Redmond to provide for the construction, operation, and maintenance of water supply facilities within the common service area set forth in this Agreement.

2. Joint-use/Ownership Watermains. The existing watermains listed below are to be classified as joint-use/ownership. Each city shall have a 50 percent (50%) ownership of the joint-use/ownership mains. The city identified as having responsibility for each watermain is responsible for all maintenance and operation of the watermain, including mainline valves, hydrants and hydrant piping. Each city is responsible for maintenance and repair of its own individual service lines (including saddles, corporation stops and any valves) and any mainline connection to a joint-use/ownership main. The cost of replacement of a joint-use/ownership main shall be shared equally between each city. The city identified as having responsibility for each joint-use/ownership main shall have the authority to determine when the joint-use/ownership main needs to be replaced. Each city shall provide at least two years notice of any scheduled replacement to the other city so budget impacts can be allotted for.

Joint-Use/Ownership Watermains:

A. Existing watermain on 148th Avenue between NE 20 Street and NE 51st Street - City of Bellevue's responsibility.

B. Existing watermain on NE 20th Street and Bellevue-Redmond Road from 148th Avenue NE to 156th Avenue NE - City of Redmond's responsibility.

C. Existing watermain on 156th Avenue NE from Bellevue-Redmond Road to NE 28th Street - City of Redmond's responsibility.

3. Service Area. Redmond and Bellevue have established their common service area boundary to be as shown on Exhibit 1. Each city shall be the direct provider of water service within its service area boundary except for those properties shown on Exhibit 1 or defined by subsequent amendment to this Agreement.

Unless otherwise agreed, ownership and water service responsibilities for any non-joint-use watermains, services and customers are placed with the city in which they exist.

Within the Redmond service area there are hereby established "direct read meter areas" and a "master meter area". The boundaries for direct read meter areas are shown on Exhibit 1. Remaining areas within Redmond and supplied by Bellevue are in the master meter area.

Within the Bellevue service area there is hereby established a "direct read meter area" as shown on Exhibit 1 for water supplied by Redmond.

4. Metering

A. Master Meter Areas

1) Redmond. Redmond shall construct, operate, and maintain three master meters to measure the quantity of water entering the Redmond master meter area. The location of the meters shall be as follows:

a. NE 40th Street between SR 520 and 156th Avenue.

b. 156th Avenue NE between NE 31st Street and NE 36th Street.

c. NE 24th Street between 171st Avenue and 173rd Avenue.

The meters shall be designed to provide 98 percent (98%) accuracy for a flow range between 50 gpm and 1,000 gpm.

2) Bellevue. Bellevue shall construct, operate, and maintain one master meter to measure the quantity of water leaving the Redmond master meter area. The location of the meter shall be as follows:

a. Bellevue-Redmond Road between NE 32nd Street and NE 35th Street.

The meter shall be designed to provide 98 percent (98%) accuracy for a flow range between 50 gpm and 1,000 gpm.

3) Ownership/Maintenance. Each city shall own its respective master meters and shall provide routine operation and maintenance.

B. Direct Read Meter Areas.

1) Redmond. The City of Redmond shall construct, operate, and maintain individual service meters to all water users to measure the quantity of flow consumed in the Redmond direct read meter area. These meters shall be the standard distribution meters used by the City of Redmond.

2) Bellevue. The City of Bellevue shall construct, operate, and maintain individual service meters to all water users to measure the quantity of flow consumed in the Bellevue direct read meter area. These meters shall be the standard distribution meters used by the City of Bellevue.

3) Ownership/Maintenance. Each city shall own all individual service meters in its service area and shall provide routine operation and maintenance.

C. Calibration of Meters. All meters shall be calibrated at regular intervals to provide for proper measurement of water usage. Meters shall be calibrated according to the following schedule:

1) Master Meters	January of even numbered years
2) Individual service meters in direct read areas:	
a. over 2 inches	Every 5 years
b. 2 inches and smaller	Every 10 years

The cost of meter calibration shall be paid by the owner of the meter. Any meter with accuracy limits which do not meet or exceed those listed in the latest edition of the AWWA Manual M6 under "Accuracy Limits for Removal from Service" shall be replaced by the owner of the meter.

5. Flushing Allowance. An allowance for actual water used for watermain and tank flushing as stipulated in the water purveyor contract, dated November 1981, between Bellevue and Seattle will be credited to Redmond; provided, however, that Redmond shall furnish Bellevue a certified statement of actual flushing water used by measurement, or calculated by formula acceptable to Bellevue.

6. Interconnection or Extensions with Other Parts of Redmond Water Systems. Redmond agrees not to interconnect the water system within the direct read meter areas, to other parts of its water system or customers outside the direct read meter areas without the written (or oral, in case of emergency) approval of Bellevue.

7. Supply of Water. Any restriction of the supply of water to Redmond shall be on an equitable basis in relation to the service provided to other customers of the water system in the general vicinity.

If noncompatible water sources are used in the future, the city desiring to make the change shall negotiate such change with the other city. To change may result in cross ties being installed at the changing city's expense.

8. Cost of Water. Water Purveyor Rate. It is agreed that the Water Purveyor's rate to be charged to Redmond shall be the rate charged by the City of Seattle. The City of Seattle rate shall be computed to include: Old and new water costs, any demand charges that are related to or caused by Redmond, seasonal charges, conservation charges or any other charge applied by the City of Seattle.

In addition to the water rate charge, Redmond shall pay a fixed monthly charge of $2,800 per month in 1998 dollars to recover administrative overhead costs by Bellevue plus $165 fixed monthly meter charges from Seattle. The fixed monthly charge is based on a report entitled *Redmond Wholesale Water Overhead Charge Calculation* dated 5 June 1998 by Financial Consulting Solutions Group, Inc. (FCSG). The meter charges are based on 44% of the Seattle meter charges to Bellevue for the NE 40th inlet meter.

Bellevue may adjust the fixed monthly charges to account for the increased meter charges by Seattle, inflation, and increased administrative costs. Adjustments shall be based on the same approach used in the analysis completed by FCSG.

9. Billing.

A. Determining Usage. Redmond shall read the individual service meters in the Redmond direct read meter area. All meters shall be read monthly or bi-monthly. The Redmond direct read meter area usage shall be determined by summing the usage of all individual service meters then multiplying the total by 1.111. (The factor is to provide for unaccounted system losses of 10.0 % of the total direct meter area usage.)

Redmond shall read the Redmond master meters monthly and the Bellevue master meter monthly. The total master meter usage shall be determined by summing the usage of the three Redmond master meters and subtracting the usage of the Bellevue master meter.

Bellevue shall read the individual service meters in the Bellevue direct read meter area. All meters shall be read monthly or bi-monthly. The Bellevue direct read meter area usage shall be determined by summing the usage of all individual service meters then multiplying the total by 1.111. (The factor is to provide for unaccounted system losses 10.0% of the total direct meter area usage.)

B. Reporting Usage. Each city shall report to the other city within 30 days of meter reading the total individual service meter usage and the calculated direct read meter area usage from this report shall include a list of all individual meters and accounts and usages in January of each year. Each city shall

prepare a report, listing all meters within the direct meter area which shall highlight any meters added or deleted within the previous calendar year. This report shall be provided to the other city for its use in verifying that all metered usage is being reported. This report shall also identify which meters were calibrated within the calendar year. Redmond shall report to Bellevue within 30 days of reading the master meter usage.

C. Payment. Redmond shall submit a monthly payment to Bellevue based on water volume read for the specific billing period. The Bellevue direct read meter area usage shall be shown and deducted from the Redmond direct read meter area usage to determine the Redmond payment amount. Submitted with the payment shall be a report listing the water usage of all the individual and master meters for the specific billing.

10. Old Water Allowance. The following is Redmond's old water consumption allowances, based on water usage from January, 1979 through December, 1981. Any consumption in excess of the allowance shall be classified as new consumption and charged under Seattle's Growth Charge rate:

	Month	Cumulative
January	17,656	17,656
February	17,235	34,891
March	14,686	49,577
April	18,425	68,002
May	16,794	84,796
June	23,462	108,258
July	22,386	130,644
August	29,010	159,654
September	29,897	189,551
October	27,946	217,497
November	23,128	240,625
December	20,667	261,292
Yearly Total	261,292	

11. Responsibility for Damages, Repair and Replacement. Redmond and Bellevue shall each be separately responsible for maintenance, repair and replacement of those facilities which are solely owned by such city. In the event of damages, repair, replacement, and maintenance of joint-use watermains where each city has a 50 percent (50%) ownership of such main pursuant to Section 2 of this Agreement, the cities shall each contribute to the cost of such repair, replacement, or maintenance on a 50/50 percent basis.

To the extent that any joint ownership main is damaged in whole or part by the negligent activities of one of the cities, the city so causing such damage shall, in addition to its obligation to pay 50 percent of the cost of repair, replacement, or maintenance pursuant to the preceding paragraph, also pay the same percentage of the remaining expense as its degree of negligence bears to 100 percent.

12. Liability/Hold Harmless. Bellevue shall indemnify, defend, and hold harmless Redmond, its officers, agents, and employees, from and against any and all claims, losses, or liability, including attorneys fees, arising from injury or death to persons or damage to property occasioned by any act, omission, or failure of Bellevue, its officers, agents, and employees, in the performance of this Agreement. With respect to the performance of this Agreement and as to claims against Redmond, its officers, agents, and employees, Bellevue expressly waives its immunity under Title 51 of the Revised Code of Washington, the Industrial Insurance Act, for injuries to its employees and agrees that the obligation to indemnify, defend and hold harmless provided for in this paragraph extends to any claim brought by or on behalf of any employee of Bellevue. This paragraph shall not apply to any damage resulting from the negligence of Redmond, its agents, and employees. To the extent any of the damages referenced by this paragraph were caused by or resulted from the concurrent negligence of Redmond, its agents, or employees, this obligation to indemnify, defend and hold harmless is valid and enforceable only to the extent of the negligence of Bellevue, its officers, agents, and employees.

Redmond shall indemnify, defend and hold harmless Bellevue, its officers, agents, and employees, from and against any and all claims, losses, or liability, including attorneys fees, arising from injury or death to persons or damage to property occasioned by any act, omission, or failure of Redmond, its officers, agents, and employees, in the performance of this Agreement. With respect to the performance of this Agreement and as to claims against Bellevue, its officers, agents, and employees, Redmond expressly waives its immunity under Title 51 of the Revised Code of Washington, the Industrial Insurance Act, for injuries to its employees and agrees that the obligation to indemnify, defend and hold harmless provided for in this paragraph extends to any claim brought by or on behalf of any employee of Redmond. This paragraph shall not apply to any damage resulting from the negligence of Bellevue, its agents, and employees. To the extent any of the damages referenced by this paragraph were caused by or resulted from the concurrent negligence of Bellevue, its agents, or employees, this obligation to indemnify, defend and hold harmless is valid and enforceable only to the extent of the negligence of Redmond, its officers, agents, and employees.

13. Dispute Resolution. Each city shall designate representatives for the purposes of administering this Agreement and resolving disputes arising from this Agreement. Each city shall notify the other in writing of its designated representatives. Each city may change its designated representatives on notice to the other.

Disputes that cannot be resolved by the representatives designated herein shall be referred to the chief executive officer of each city for mediation and/or settlement. If not resolved by them within sixty (60) days, either city, or both of them, may file a demand for arbitration, in which event the issues shall be submitted to an arbitrator acceptable to both parties and the matter shall be arbitrated pursuant to the rules and procedures of the American Arbitration Association. The decision of the arbitrator shall be final and binding on both cities.

14. Modification of Agreement. This Agreement may only be modified in writing signed by both cities.

15. Severability. If any provision of this Interlocal Agreement shall be held invalid, such invalidity shall not affect the other provisions of this Agreement which could be given effect without the invalid provision, and to this end the provisions of this Agreement are declared to be severable.

16. Effective Date. This agreement shall take effect on January 1, 1999.

17. Repeal. Upon the effective date of this agreement, the previous Interlocal Agreement dated July 19, 1990 between Bellevue and Redmond is no longer in effect.

HEREBY AGREED TO AND ACCEPTED on this the 6th day of Nov, 1998.

CITY OF BELLEVUE

By: Linda M. Barton
Steve Bauer, City Manager

Approved as to form:

By:
Assistant City Attorney

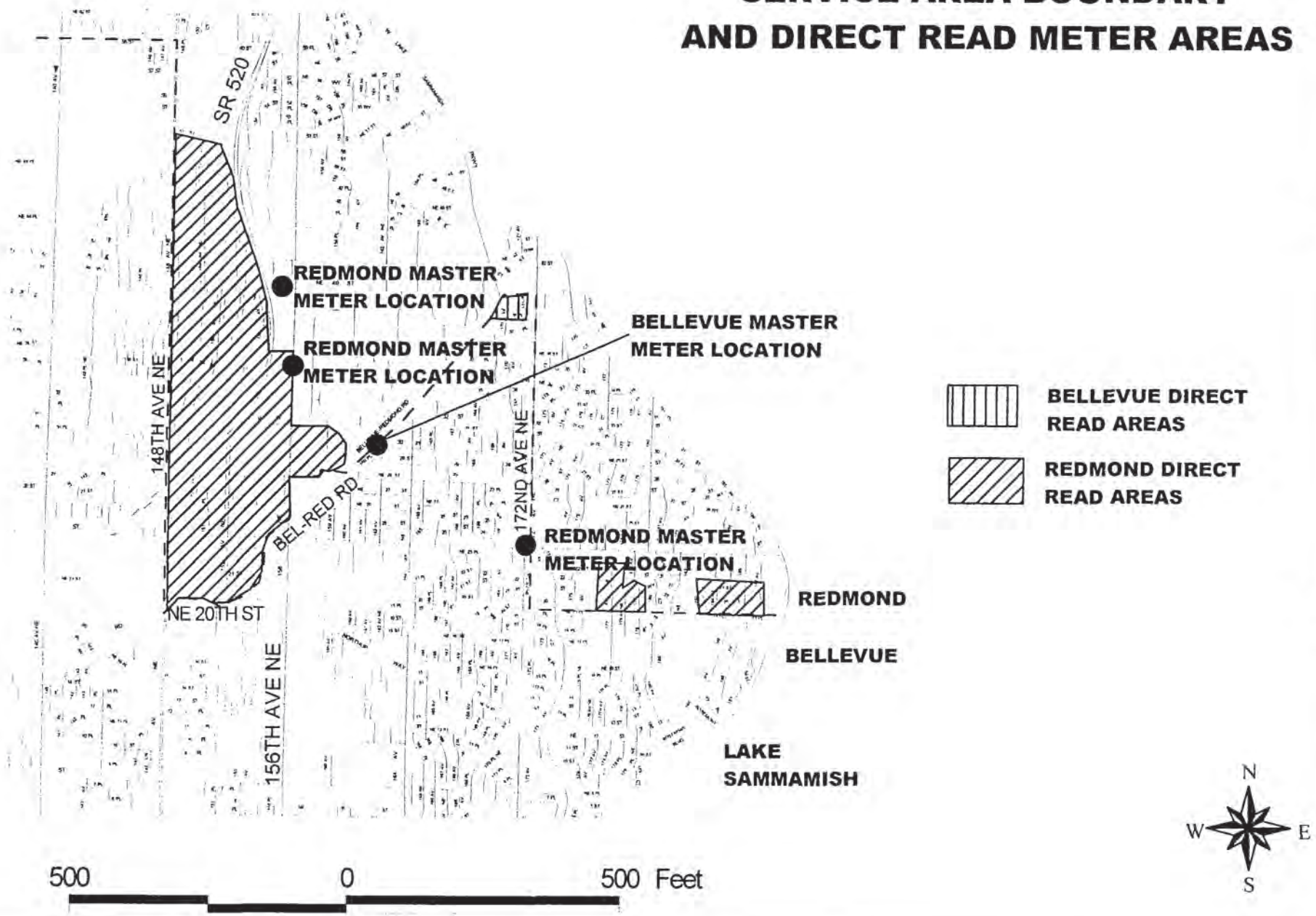
CITY OF REDMOND

By:
Rosemarie Ives, Mayor

Approved as to form:

By:
City Attorney

EXHIBIT 1
SERVICE AREA BOUNDARY AND DIRECT READ METER AREAS



DUPLICATE ORIGINAL
PROJECT FILE RECORDS

ADDENDUM TO INTERLOCAL AGREEMENT BETWEEN REDMOND AND WOODINVILLE WATER DISTRICT BLAKELY RIDGE (TRILOGY)

WHEREAS, the City of Redmond, Washington ("Redmond") and the Woodinville Water District ("the District") are parties to that certain interlocal agreement ("the interlocal agreement") dated July 13, 1988, which designates the common service area boundary between the District and Redmond, and

WHEREAS, paragraph 12 of the agreement provides that future developments that straddle the common boundary line shall be approved by an addendum on a case-by-case basis and

WHEREAS, the Blakely Ridge Urban Planned Development, also known as Trilogy ("Trilogy") straddles the common boundary line and

WHEREAS, Redmond and Woodinville wish to identify a new common boundary line in this area

NOW, THEREFORE, IT IS AGREED AS FOLLOWS:

1) Sewer Service Boundary for Trilogy
The entire Trilogy development as shown on Exhibit A shall be in the sewer service area of the City of Redmond.

2) Water Service Boundary for Trilogy
The Trilogy development south of the north lines of the South half of the Southwest quarter and the South half of the Southeast quarter of Section 22 shall be in the water service area of Redmond. The Trilogy development north of this line shall be in the water service area of the District. (See Exhibit A).

3) Future Boundary Revision

Should Redmond or Woodinville wish to revise the above boundaries, the party desiring the change shall make a proposal to the other party with reasons for the change. The boundary may be revised as approved by a written amendment to this agreement.

4) Remainder of Agreement Unchanged

Except as stated above, the interlocal agreement between the District and Redmond shall remain unchanged and in full force and effect.

DATED this 12th day of February, 2002.

City Of Redmond

By _____

Its MAYOR

Approved As To Form:
Office Of The City Attorney

By _____

Woodinville Water District

By _____
Its President

By _____
Its Secretary

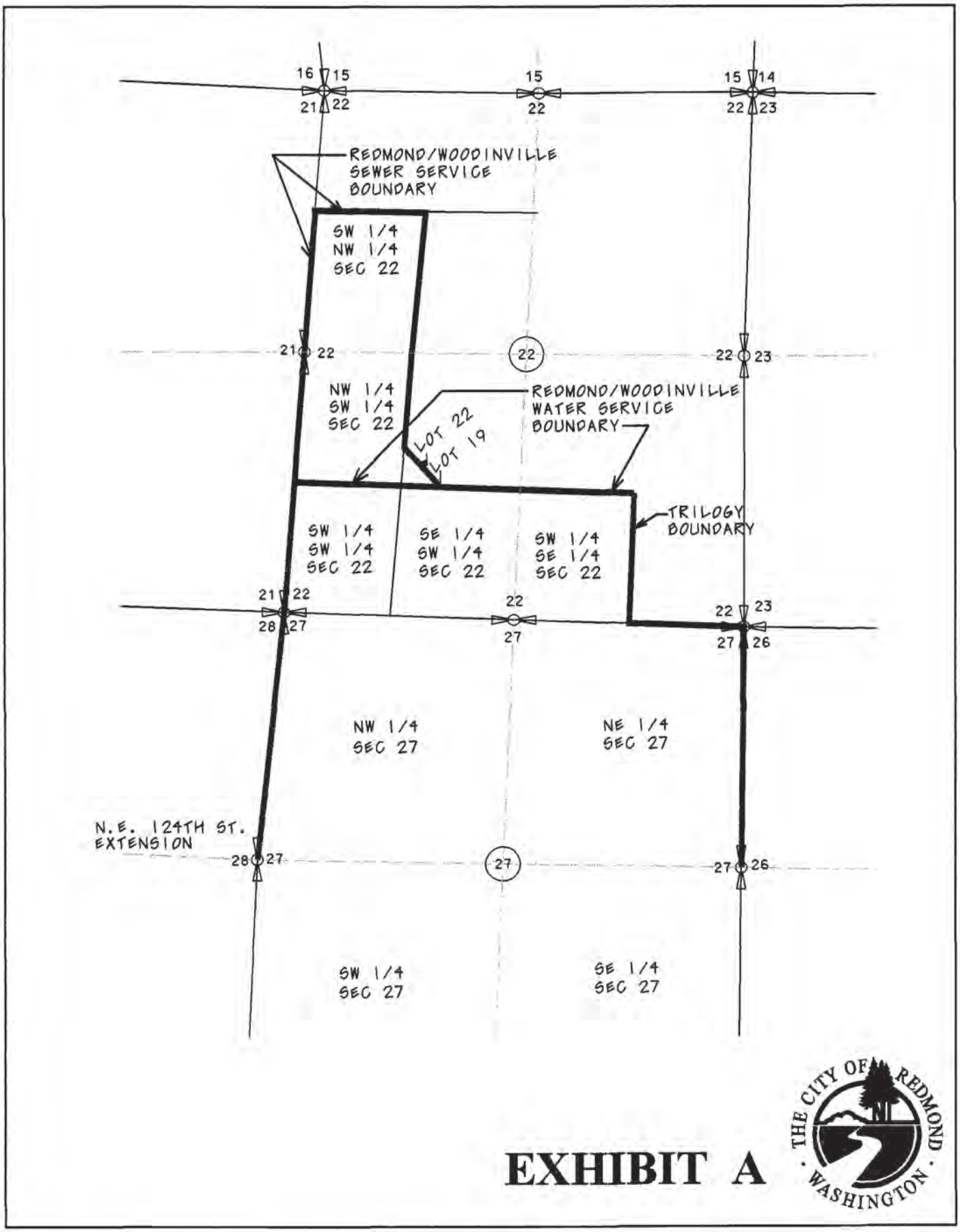

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REDMOND/WOODINVILLE
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SEC 22
REDMOND/WOODINVILLE
WATER SERVICE
BOUNDARY
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LOT 19
TRILOGY
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N.E. 124TH ST.
EXTENSION
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THE CITY OF REDMOND
WASHINGTON

EXHIBIT A

AGREEMENT FOR WATER SYSTEM INTERTIE Contract #4795

BETWEEN THE

CITY OF REDMOND AND THE

SAMMAMISH PLATEAU WATER AND SEWER DISTRICT

(CASCADE VIEW/NOVELTY HILL – NE 80th STREET INTERTIE)

This Agreement ("Agreement") is made and entered into this 11 day of February, 2005 between the Sammamish Plateau Water & Sewer District ("District"), a Washington municipal corporation, and the City of Redmond ("City"), a Washington municipal corporation, (individually a "Party" and collectively the "Parties") for the purposes set forth herein.

W I T N E S S E T H:

WHEREAS, the City is a non-charter, optional municipal code city organized and operating pursuant to Chapter 35A RCW; and

WHEREAS, the District is organized and operating pursuant to Title 57 RCW and is authorized to operate a water system within and without its boundaries; and

WHEREAS, the District has a need for additional water supply to a portion of its service area called the Cascade View Zone, as depicted on Exhibit A, which shall include if annexed to the District in the future, the Dawn Breaker Water Association and the rural portion of the Redmond Ridge East Pan Handle, in addition to all other expansions to this Zone as defined in future District Comprehensive Water Plans; and

WHEREAS, the District and the City are members of the Cascade Water Alliance ("CWA") which provides water supply to its members through a regional water system; and

WHEREAS, the District's Cascade View Zone is not connected to the District's Plateau Zone that will be receiving water directly from CWA; however, the District's water system in the Cascade View Zone may be connected through an intertie to the City's water system, which receives water supply from CWA; and

WHEREAS, CWA is willing to supply water to the District's Cascade View Zone by wheeling such water through an intertie with the City's water system; and

WHEREAS, the District is willing to install an intertie and transmission main between the City's and the District's water distribution systems at the District's sole cost and pay the City a wheeling charge to wheel water from CWA to the District.

NOW, THEREFORE, in consideration of the following terms and conditions, the Parties agree as follows:

1.0 **Purpose.** The purpose of this Agreement is to provide an intertie between the distribution systems of each party to allow the District with access to the CWA water supply.

2.0 **Description of Intertie.** The Cascade View/Novelty Hill – NE 80th Street intertie ("Intertie") shall be constructed by the District at its sole cost and operated by the Parties under the terms of this Agreement. The Intertie shall be as follows:

2.1 The Intertie shall allow the District to obtain water, wheeled through the City's distribution system, from the regional system in accordance with the District's contract with CWA.

2.2 The Intertie shall consist of a connection to the City's existing distribution system within Redmond Ridge Road near its intersection with NE 80th Street, and a Metering Vault to measure total flow and prevent the flow of water from the District's water system into the City's water system.

2.3 The District shall install the Metering Vault within 200-feet of their connection to the City's system.

2.4 The Intertie shall have a normal operating capacity of 200-gpm, for approximately 160 acre/feet per year of CWA water to supplement the District's ground water supplies and a short term maximum capacity of 400-gpm as needed when the District's two production wells are out of service.

2.5 The District shall be responsible for increasing the water pressure of the water supplied by the City as necessary to the required operating pressures of the District's Cascade View Zone. The District's installation of a

booster station to provide the pressure increase shall be on the District's side of the Intertie.

3.0 Construction.

3.1 The District shall undertake the Intertie through a wet tap of the City's existing 12-inch water main north of the City's emergency intertie with the Union Hill Water Association's water system located at Redmond Ridge Drive and NE 80th Street as depicted on Exhibit A (the "Union Hill Intertie").

3.2 The Intertie shall only provide flow to the District and will not be designed or constructed to provide flow from the District to the City.

3.3 The District shall be responsible for the installation of a Metering Vault that will contain a 4-inch flow meter to measure the quantity of water provided to the District by the City and a check valve to prevent water flow from the District to the City.

3.4 The District shall install a control valve and any necessary booster pumps on the District's side of the Metering Vault to maintain a set rate of flow that is manually or remotely adjustable.

3.5 The District's responsibilities shall include, but not be limited to, design, preparation of permit applications, project administration, construction and construction inspection for the Intertie.

3.6 The City's responsibilities shall include review of the plans and specifications for the Intertie and review of applicable permit applications.

3.7 The plans and specifications for the Intertie construction shall meet or exceed the construction standards of the District, as the owner of such intertie and shall be subject to review and approval of the City. The City shall have the right to inspect all work on the Intertie at all reasonable times to assure conformance with approved plans and specifications.

5.0 Construction Schedule. The District shall complete the installation of the Intertie within sixty (60) days of the effective date of this Agreement.

6.0 **Intertie Project Costs.** The term "cost" as used in this section shall include, without limitation, all actual costs of labor, materials, permitting, equipment, engineering, inspection, right-of-way, legal costs, publication, SEPA compliance and any costs customarily incurred in such projects. The District shall pay and be solely responsible for all costs for the Intertie.

7.0 **Ownership.** The District shall own the Intertie.

8.0 **Maintenance.** The District shall maintain the Intertie in good working order in accordance with sound maintenance procedures, good engineering practices and applicable laws, rules and regulations Maintenance shall include meter calibration, to be performed no less frequently than every 2 years from the date of installation of the meter.

9.0 **Destruction and Replacement.** District shall be responsible to repair and replace all or any part of the Intertie in the event of its partial or total damage, loss or destruction at District's sole cost and expense.

10.0 **Notification, Use, and Payment.**

10.1 **Notification.**

10.1.1 The District shall provide the City with notification by CWA stating that water is available for the District's use at Cascade's meter that serves Redmond's Novelty Hill Service Area.

10.1.2 The District shall provide the City with 48-hours notice prior to the start of any use of the Intertie to deliver water from the City to the District. The District shall notify the City of the anticipated rate of flow that is to be received and for what period of time the flow is to be maintained. The District shall notify the City with 24-hours notice prior to changes in the District's rate of flow that will

impact the rate of flow that the City takes from the Tolt Supply System.

10.1.3 The District shall notify the City with 48-hours notice prior to discontinuing the use of the intertie.

10.1.4 The District shall maintain continuous reading of the rate of flow and weekly readings of the total quantity of water received from the City, and shall provide the City with copies of such reports.

10.1.5 The District shall provide the City and CWA with monthly reports showing the usage for each calendar month plus an unaccounted water loss factor of 2% of the monthly use.

10.1.6 The City shall give the District 48-hours notice prior to any operations that may impact the District's use of the Intertie, including but not limited to watermain shutdowns that reduce or eliminate the supply to the Intertie, changes in operating pressure by more than 20 pounds per square inch, introduction of chemicals other than chlorine and fluoride and construction activities in the immediate vicinity of the Intertie.

10.1.7 In the case of an emergency, where unforeseen circumstances of a short duration result from a failure of the District's water system equipment or piping that necessitates transfer of water to meet life safety demands and satisfy minimum levels of service for customers, the District shall be allowed immediate use of the Intertie as long as immediate notification is provided to the City stating the anticipated rate of flow that is to be received and for what period of time the flow is to be maintained.

10.1.8 In the case of an emergency, where unforeseen circumstances of a short duration result from a failure of the City's water system equipment or piping that impacts the ability of the City to provide the District with water, the City shall be allowed to shut down the Intertie as long as immediate notification is provided to the District stating the duration of the emergency and immediate notification is

provided to the District as soon as the City's water system operations are restored such that the Intertie is safe to operate.

10.2 Use.

10.2.1 The District shall be allowed use of the Intertie as needed in accordance with the terms of this agreement, at the District's sole discretion, to obtain water provided to the District under its contract with CWA. This use and discretion is limited and Redmond only agrees to wheel water to the District that is in excess of the City's demand if Seattle or CWA limits flow rates at the CWA meter serving Redmond's Novelty Hill service area.

10.2.2 A normal operating flow of 200-gpm shall be allowed to meet its Cascade View Zone's system demands for an estimated 160 acre/feet of water per year.

10.2.3 A maximum flow of 400-gpm shall be allowed for up to 8-week to support the Cascade View system demands when both wells have been taken out of service.

10.3 Payment for Water Delivered.

10.3.1 The District shall pay directly to CWA for water wheeled through the Intertie to the District at CWA rates in effect at the time of the sale and delivery of the water to the District.

10.3.2 The District shall pay directly to the City a Wheeling charge for the water delivered to the District through the Intertie at fixed and variable rates set through the City's rate setting processes and established by resolution of the City.

10.3.3 The City shall read the meter and invoice the District for the Wheeling charge associated with the water delivered to the District through the Intertie. The City shall own, install, operate and maintain any radio read system required for reading of the meter other then the District's Remote Read Head.

11.0 General.

11.1 Duration. The parties acknowledge and agree: (1) that the use of the Intertie is essential to the operations of District in providing water service to its customers; and, (2) that District will rely upon the continued existence of the Intertie and rights of usage granted hereunder in its long range planning and issuing bonds, notes and other financing documents. Thus, each Party covenants and agrees with the other not to interfere with the other's rights granted hereunder; not to violate applicable laws, rules and regulations of agencies with regulatory jurisdiction over the parties; and not to take any action inconsistent with this Agreement.

11.2 Termination. This Agreement may be terminated through 2-month written notice by the District, 2-years written notice by the City, or the termination of either parties membership in CWA.

11.3 Not a Partnership. This Agreement shall not constitute or create a partnership or a joint venture.

11.4 Compliance with Laws and Regulations. Each Party shall, with respect to its duties, responsibilities and operations hereunder, comply with all applicable laws, rules and regulations governing the same. The District shall submit construction drawings for the Intertie to the Washington State Department of Health for approval and shall be responsible to comply with the requirements of RCW 90.03.383.

11.5 Specific Performance. In addition to all other remedies available to a party hereunder, whether in law or equity, each party to this Agreement shall have the right to seek and obtain specific performance of the terms hereof. The parties agree that damage occurring by reason of the breach

hereof is difficult, if not impossible, to ascertain and that remedies of law are inadequate.

11.6 **Assignment.** Neither party shall have the right in whole or in part to assign this agreement or its rights and obligations hereunder or its interest in the Intertie without prior written consent of the other party, which shall not be unreasonably withheld, delayed, or conditioned.

11.7 **Authority.** This Agreement is entered into by the parties hereto pursuant to the authority contained in RCW 35.67.300, RCW 39.34.080 and RCW 57.08.005.

11.8 **Attorney's Fees.** If a suit or other action is instituted in connection with any controversy arising out of this Agreement, the prevailing party shall be entitled to recover all of its costs and expenses including such sum as the court may judge reasonable for attorneys' fees, including fees upon appeal of any judgment or ruling.

11.9 **Non Waiver.** No waiver by either party of any term or condition of this Agreement shall be deemed or construed as a waiver of any other term or condition or of any breach hereof, whether pertaining to the same or a different provision of this Agreement.

11.10 **Severability.** If any section, subsection, sentence, clause, phrase, or other portion of this Agreement is, for any reason, declared invalid, in whole or in part of any court or agency of competent jurisdiction, said decision shall not affect the validity of the remaining portions hereof.

11.10 **Indemnity.** Each Party agrees to indemnify, defend and hold harmless the other party, its officers, agents, and employees, from and against any and all claims, losses, or liability, for injuries, sickness or death of persons, or

damage to property, arising out of any willful misconduct or negligent act, error, or omission of the indemnifying party, its officers, agents, subcontractors or employees, in connection with actions taken pursuant to this Agreement. Provided, however, that the indemnifying party's obligations to indemnify, defend and hold harmless for injuries, sickness, death or damage caused by or resulting from the concurrent negligence or willful misconduct of the indemnitee and the indemnifying party, or of the indemnifying party and a third party other than an officer, agent, subcontractor or employee of the indemnifying party, shall apply only to the extent of the negligence or willful misconduct of the indemnifying party.

12.0 **Execution of Documents.** Each Party agrees to execute any and all documents and instruments necessary to give effect to and carry out the terms of this Agreement and to obtain the necessary approval of the same by government agencies as required by law.

13.0 **Effective Date.** This Agreement shall be effective upon the approval of the Agreement by the legislative bodies of both Parties and the execution of the Agreement by the Parties' authorized representatives.

SAMMAMISH PLATEAU WATER & SEWER DISTRICT

BY _____
Ronald E. Little, General Manager
Date 1-26-05

CITY OF REDMOND

BY _____
Date 2-1-05

ATTEST:

BY _____
Susan A. Tucker, Notary Public
Date 1/26/05

Notary Public
State of Washington
SUSAN A. TUCKER
My Appointment Expires Apr 1, 2006

ATTEST:

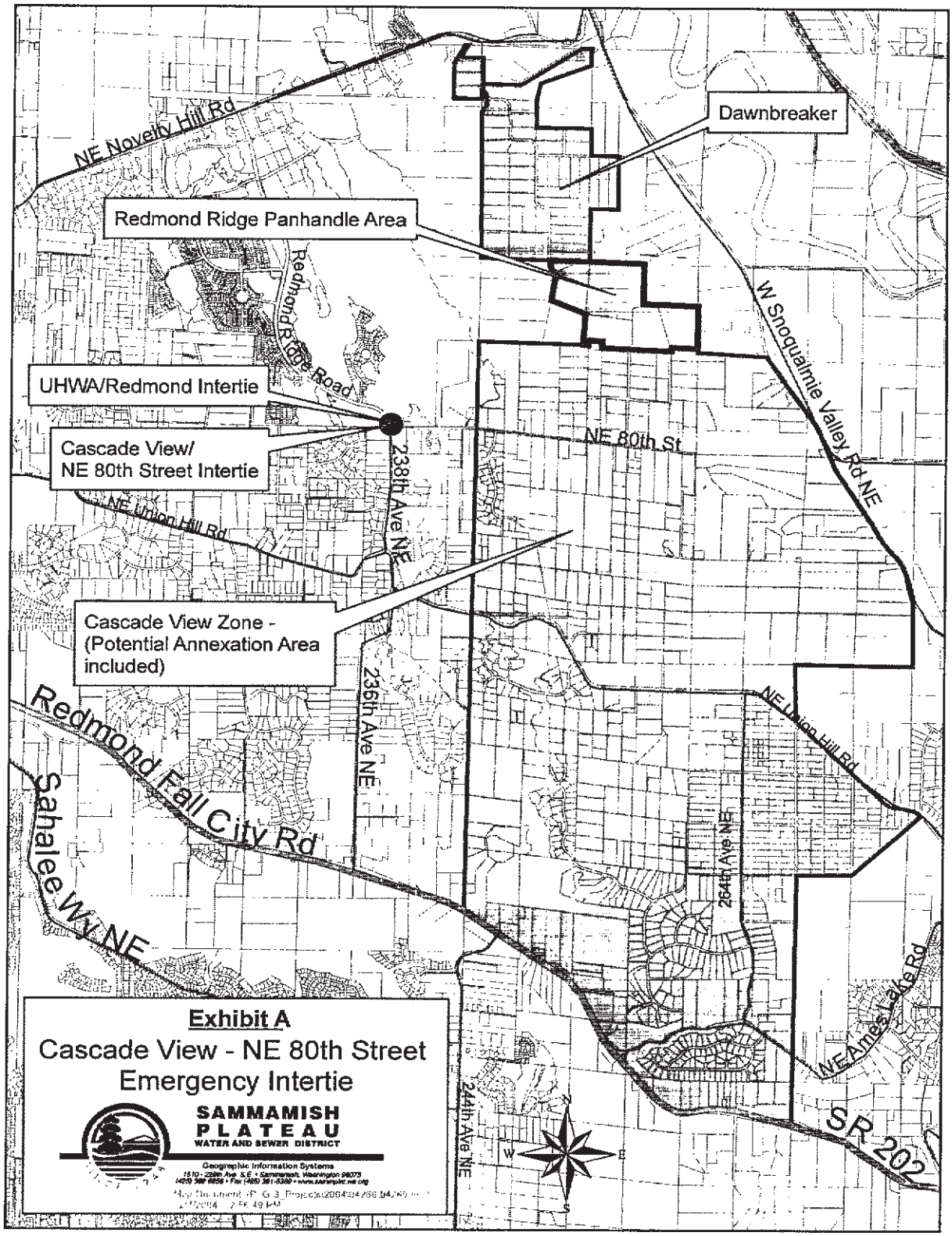
BY _____
Bonnie Matson, City Clerk
Date 2/14/05

APPROVED AS TO FORM:

BY _____
John Milne, District's Attorney
Date 1/26/05

APPROVED AS TO FORM:

BY _____
Date 2/10/05


Dawnbreaker
NE Novelty Hill Rd
Redmond Ridge Panhandle Area
Redmond Ridge Road
W Snoqualmie Valley Rd NE
UHWA/Redmond Intertie
Cascade View/
NE 80th Street Intertie
NE 80th St
238th Ave NE
NE Union Hill Rd
Cascade View Zone -
(Potential Annexation Area
included)
236th Ave NE
Redmond Fall City Rd
Sahalee Wy NE
NE Union Hill Rd
264th Ave NE
NE Ames Lake Rd
244th Ave NE
SR 202
Exhibit A
Cascade View - NE 80th Street
Emergency Intertie
SAMMAMISH
PLATEAU
WATER AND SEWER DISTRICT
Geographic Information Systems

CITY OF REDMOND AND CITY OF KIRKLAND
INTERLOCAL AGREEMENT FOR WILLOWS ROAD INTERTIE
FOR PROCTOR WILLOWS

THIS AGREEMENT is made and entered into by and between the City of Kirkland, a Washington municipal corporation ("Kirkland"), and the City of Redmond, a Washington municipal corporation ("Redmond") for the purposes hereafter mentioned.

RECITALS

A. Redmond, Kirkland, and the City of Bellevue have previously approved Assumption Agreements whereby the Cities have assumed assets, liabilities and operations of the Rose Hill Water District, a municipal corporation in King County, Washington ("District").

B. The cities of Kirkland, Redmond, and Bellevue previously entered into an Interlocal Operations and Maintenance Agreement dated October 9, 1997.

C. The Cities have assumed ownership and responsibility for the District's water supply facilities with the Cities' respective service areas. Certain District facilities are jointly owned and operated by the Cities in accordance with the terms of the Assumption Agreement and their respective undivided ownership interests in such facilities.

D. The City of Kirkland annexed the Kingsgate Annexation Area within the District area in 2013.

E. The Cities entered into a Kingsgate Annexation Agreement Regarding Water Facilities dated December 19, 2013.

F. There exists a water system pressure zone ("the Zone") that is a contiguous area that includes areas within Kirkland and within Redmond. The Zone is not jointly owned by the Cities. However, the water system within the Zone is interconnected and needs to be managed as a system across jurisdictional boundaries to offer the greatest benefits to the Cities' customers. The Zone includes six pressure reducing valves ("PRVs") with four of the PRVs owned, operated and maintained by the City of Redmond and two of the PRVs owned, operated, and maintained by the City of Kirkland.

G. Proctor Willows is a multi-family residential development ("the Development") located in the northwest corner of Redmond within the Zone; ("the Development Property"). The Development Property is shown on Exhibit A attached to this Agreement and incorporated herein by this reference as if set forth in full.

H. Ordinance 2950, adopted by City Council on March 5, 2019, increased the allowable density on the Development Property, thereby increasing the water system demand;

I. A looped and well-gridded water system allows for redundancy and reliability of the water system, and design requirements of both Cities require such a system. Interties between the two Cities' service areas are necessary for a looped and well-gridded system that crosses jurisdictional boundaries and such interties require coordination and cooperation between the Cities.

J. The City of Redmond seeks to approve a new intertie at 124th Ave NE and Willows Road, to provide a well-gridded connection around the Development. The City of Kirkland supports this new intertie, provided that the water main is extended south along Willows Road to complete the loop by connecting to existing City of Redmond water main.

K. It is anticipated that the new intertie may be constructed before the City of Redmond completes the water main extension down Willows Road. The City of Kirkland is concerned about the impact the Development may have on the quality of water within the system during the interim time between construction of the new intertie and completion of the water main loop. This concern can be mitigated through modeling of the system and cooperation between the Cities in operating the six PRVs that distribute flow to and from the Zone and between the two systems.

AGREEMENT

NOW, THEREFORE, IN CONSIDERATION OF the terms and conditions set forth below, Redmond and Kirkland agree as follows:

1. Purpose. The purpose of this Agreement is to provide for a new intertie between the two Cities and to ensure reliable high-quality water supply to both Cities.

2. Willows Road Water Main Intertie. Kirkland hereby grants Redmond permission to connect a twelve-inch (12") water main to Kirkland's water main in the intersection of Willows Road and 124th Ave NE. The intertie will also include an extension of twelve-inch (12") water main along the Development frontage in Willows Road. All construction shall be accomplished at the Development's sole cost and expense. The Development shall obtain any necessary permits from Kirkland to make the connection and shall obtain Kirkland's approval of plans for the connection. The Development shall obtain any necessary permits from Redmond to construct frontage improvements in Willows Road.

3. Willows Road Water Main Extension. The Willows Road water main extension will connect the Willows Road Water Main intertie with City of Redmond water main south of the Development. Redmond will complete the twelve-inch (12") Willows Road water main extension by December 31, 2026.

4. Zone Water Quality. Redmond's water system model will be used to assess "water age" as a measure of water quality within the Zone. This modeling will be performed at City of Redmond cost. The model will be used to develop recommended PRV settings within the Zone as the Development constructs each phase and the City completes the Willows Road Water Main

Extension. Each Cities' operations staff will coordinate PRV settings based upon those recommendations. Each significant change to demand or construction of infrastructure from the Development will be reflected in an updated water system model.

5. Service Area. Each City shall be the direct provider of water within its service area within the Zone as set forth in the 1997 and 2013 Agreements. For purposes of this agreement, "service area" means that portion of the Cities' incorporated area that overlays a portion of the previous District area with the Zone. See Exhibit A.

6. Near-Term Operational Strategy. The Cities will jointly develop a near-term operational strategy "the Strategy" for the Zone by July 1, 2021. The Strategy for the Zone shall include but not be limited to:

- Water System Modeling,
- PRV settings,
- Water quality testing and reporting, and
- Emergency response.

7. Future discussion about a single zone operator. Regardless of the connection granted to the Developer, the Cities will discuss the possibility to transfer the assets, liabilities and operations of the Zone to one of the Cities and, further, to have one of the Cities own the responsibilities and obligations to provide for the ongoing operations and maintenance of the Zone. This discussion would occur no earlier than 2-years after The Strategy for The Zone is completed. The movement to a single zone operator would be accomplished through an amendment to the 2013 Agreement.

8. Duration. This Agreement shall take effect on the date the last party signs the same. Termination may be accomplished only by:

A. Mutual agreement of Redmond and Kirkland; or

B. Termination by either party upon material breach of this Agreement by the other, provided, that no such termination may be accomplished unless the terminating party notifies the breaching party of its intent to terminate and provides the breaching party with no less than thirty days to cure the breach and avoid termination.

9. Property and Financing. No joint property is being acquired by the parties to this Agreement. Water main in Redmond is Redmond's water main. Water main in Kirkland is Kirkland's water main.

10. Administration. This Agreement shall be jointly administered by the public works directors of Kirkland and Redmond.

11. Notices. Any notices required by this Agreement shall be given in writing to the parties at the following addresses:

Kirkland:
Kurt Triplett
City Manager
City of Kirkland
123 Fifth Avenue
Kirkland, WA 98033

Redmond
Angela Birney
Mayor
City of Redmond
P.O. Box 97010
Mail Stop CHEX
Redmond, WA 98073-9710

12. Severability. If any section, sentence, clause, or phrase of this Agreement is found to be invalid or unenforceable by a court of competent jurisdiction, such invalidity or unenforceability shall not affect the validity or enforceability of any other section, sentence, clause, or phrase. The parties agree that in the event such invalidity or unenforceability deprives either party of any of the benefits provided herein, as determined by the party who believes they have been so deprived, a replacement provision will be negotiated to restore those benefits.

13. Entire Agreement. This Agreement constitutes the final and entire agreement and understanding between the parties concerning the water main intertie supersedes all prior agreements and understandings. This Agreement may be amended only by a written instrument signed by both parties.

CITY OF KIRKLAND

Kurt Triplett, City Manager

Dated:

CITY OF REDMOND

Angela Birney, Mayor

Dated:

APPROVED AS TO FORM:
OFFICE OF THE KIRKLAND CITY ATTORNEY:

APPROVED AS TO FORM:
OFFICE OF THE REDMOND CITY ATTORNEY:

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Redmond WASHINGTON

City Contract Routing Form

City Contract #: 955-2

Section 1 – Attach Contract Documents

(multiple files can be uploaded)

Is an insurance certificate attached?

☐ Yes

☒ No/Not applicable Comments: _____

Section 2 – Fill Out Contract Details

Date: 2/9/2022 Department: Public Works Division: EUSD Mail Stop: 2NPW

Project Administrator Name: Teresa Reed-Jennings Extension: 2935

Project Manager Name (if different than above): _____ Extension: _____

Contract Type: Interlocal/Intergovernmental If other, please indicate: _____

Contract Title: Joint-Use Water Storage and Pumping Facility

Contractor/Consultant Business Name: City of Bellevue

Contract Description: Amendment- Agreement for construction, Operation & Maintenance of Joint use water storage facility

Project ID #: _____ Budget/Account #: 401.21203.00480.53481

Council Approval Date: _____ Council Agenda Memo #: _____ RFP/IFB/RFQ #: _____ NIGP #: _____

☐ New Contract

Total Amount: _____

Start Date: _____ End Date: _____

Renewal Option (Y/N): ____ If yes, how many? _____

☒ Amendment/Renewal/Change Order #: No. 1 Original CC #: NA

New Start Date: 1/1/2022 New End Date: NA

Current Contract Amount (including all previous amendments/change orders): NA

Amount of this Amendment/Change Order (proposed increase/decrease): NA

New/Cumulative Contract Amount: NA

Section 3 – Route Contract for Signatures and Approvals

☒ Department Director: DocuSigned by: Phil Williams C70103C168BB4ED... Date: 2/9/2022 Comments: _____

☐ TIS Director: _____ Date: _____ Comments: _____

☒ City Attorney: DocuSigned by: Jim Haney 85394CE968994B5... Date: 2/10/2022 Comments: _____

☒ Risk Manager: DocuSigned by: Charles Corder 581CDD1AF985491... Date: 2/10/2022 Comments: _____

☒ Mayor or Designee: DocuSigned by: Charles Corder (Mayor Designee) 5D9FC672714C4E4... Date: 2/10/2022 Comments: _____

☒ City Clerk's Office: DocuSigned by: Cheryl Xanthos E725E589816E4E1... Date: 2/15/2022 Comments: Electronic Original - in Hummingbird

☒ Purchasing: *no signature required – for copy only*

DocuSign Envelope ID: 30EBCCEC-7CF3-46BE-AC63-48FE5D7F5B9D

AMENDMENT NO. 1 TO THE AGREEMENT FOR CONSTRUCTION, OPERATION AND MAINTENANCE OF JOINT-USE WATER STORAGE AND PUMPING FACILITY

This AMENDMENT No. 1 to the AGREEMENT FOR CONSTRUCTION, OPERATION AND MAINTENANCE OF JOINT-USE WATER STORAGE AND PUMPING FACILITY is made and entered into by and between the City of Bellevue and the City of Redmond, this _____ day of _____, 2021 as follows:

WHEREAS, Redmond and Bellevue entered into an Agreement for Construction, Operation and Maintenance of a Joint-Use Water Storage and Pumping Facility on September 28, 1990 ("1990 Agreement" or "the Agreement"), providing for the joint use and ongoing operations of certain facilities; and

WHEREAS, for the joint benefit of Bellevue and Redmond, facilities were constructed in accordance with the 1990 Agreement, including the NE 40th Reservoir, Pump Station, Valve Vault and buried piping located at 4075 148th Avenue NE, the Meter Vault located in the right-of-way at 14080 NE 40th Street, and associated buried 16" and 20" pipelines in NE 40th Street right-of-way and in easements at 14520 NE 40th Street ("the Facilities"); and

WHEREAS, the 1990 Agreement did not anticipate certain future capital improvements and ongoing costs for the Facilities, including planning, engineering, and construction necessary to maintain service and reliability, conform to changing codes and industry standards, protect water quality, ensure safety, improve resiliency, enhance efficiency, and achieve other purposes that benefit Bellevue and Redmond; and

WHEREAS the 1990 Agreement stipulates that Bellevue shall obtain ownership and be responsible for operation and maintenance of the Facilities, and that Redmond accepts a 44 percent interest in the Facilities and agrees to reimburse Bellevue for 44 percent of certain costs, and

WHEREAS, it is in the interests of the public served by both Bellevue and Redmond to amend various terms of said Agreement;

NOW, THEREFORE, the parties agree as follows:

Purpose

The purpose of this Amendment No. 1 is to clarify ongoing responsibilities and sharing of costs for future capital improvement work related to the Facilities, originally constructed in 1990. Although certain sections referencing the initial construction phases are out-of-date, the guiding principles and procedures are still applicable to the ongoing implementation of the Agreement.

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Section 3. Scope of Work of the 1990 Agreement is amended to add a new paragraph as follows:

> The scope of this agreement shall also include mutually beneficial costs and work associated with the Facilities. This includes all work necessary to maintain reliable customer service at the lowest overall life-cycle cost of the Facilities, in accordance with industry best practices.

Section 6. Sharing of Costs of the 1990 Agreement is amended to add a new paragraph as follows:

> Bellevue shall be responsible for paying all mutually beneficial costs associated with Amendment No. 1, for which Bellevue shall receive reimbursement from Redmond of forty-four percent (44%) of that amount. Costs include, but are not limited to Land, Asset Management, Engineering and Construction costs listed above, and other work associated with the Facilities, including labor, materials, administration, taxes, permits, fees, and other costs necessary to achieve the purpose of the agreement and Amendment No. 1.

Section 7. Method of Payment of the 1990 Agreement is deleted in its entirety and replaced with the following:

> Bellevue will prepare and forward a monthly invoice to Redmond for its share of costs for the normal operation and maintenance activities covered in Section 9 and for implementation of capital improvements covered in Section 10 for the Facilities, together with a copy of all bills/invoices received by Bellevue from its consultants, contractors, and other third parties for costs identified for reimbursement. Redmond shall pay such costs within sixty (60) days of receipt of invoice from Bellevue. Redmond shall provide Bellevue with an accounting of its costs chargeable to the Project and Bellevue shall pay or offset such allowable expenses within sixty (60) days of receipt thereof. If either Redmond or Bellevue fails to make full invoice payment within said sixty (60) days, then penalty interest shall accrue on the unpaid amount at one (1) percent per month. Bellevue and Redmond shall account for such penalty interest and include the interest amount on the following monthly invoice.

Section 9. Operation and Maintenance of the 1990 Agreement is modified to delete the last paragraph of Section 9 and replace with the following:

> Redmond shall remit invoice payment to Bellevue within sixty (60) days after receipt of invoice. If Redmond fails to make full invoice payment within said sixty (60) days, then penalty interest shall accrue on the unpaid amount at one (1) percent per month.

Section 10. Pump Station Change of the 1990 Agreement is hereby deleted in its entirety and replaced with the following:

> 10. Asset Management, Rehabilitation, and Replacement of the Facilities
>
> Bellevue shall take proactive measures to maintain reliable customer service, optimize operational efficiency, adapt to changes in technology, and conform to current codes and standards by identifying, planning, designing, and constructing capital improvements. Bellevue shall be responsible for providing and procuring the necessary personnel,

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consultant services, and contractors associated with the implementation of capital improvements that fall outside of normal operations and maintenance activities covered in Section 9. Capital improvement projects may include, but are not limited to, the following elements: specialized inspections, condition assessments, preliminary planning and engineering, performance analyses and audits, design, public outreach, permitting, seismic retrofits, construction, and construction administration. All consultant and contractor agreements shall be processed in accordance with Washington State statutes and Bellevue's purchasing and procurement procedures and policies.

Bellevue may initiate a joint capital improvement project by submitting a project notice to Redmond that includes a purpose or need statement, joint benefit description, proposed scope of work, schedule, budget, and an overview of any anticipated future phases of the project that may follow the initial work. A project with an initial work budget such that each city's respective share is less than the approval limits delegated to each of the signatories of this Amendment No. 1 may be authorized by written approval of Bellevue's Deputy City Manager and Redmond's Mayor or their designees.

Projects that require approval of the legislative body of either city shall be authorized by a written Project Agreement. The Project Agreement shall include a purpose or need statement, joint benefit description, proposed scope, schedule, budget, and an overview of any anticipated future phases of the project that may follow the initial work. The Project Agreement shall include procedures for each city's review and approval of the scoped tasks, including, but not limited to, the development of construction plans, specifications, and estimates, performance of inspections, and the final acceptance of said capital improvement project. The Project Agreement will also provide for procedures to modify scope of work, budget, schedule, and any other provisions deemed necessary by either city.

The cities agree that nothing in this Amendment No. 1 or the 1990 Agreement shall limit either party's right to initiate a capital project to add capacity to the Facilities in response to changes in applicable land use plans or zoning in the service area. The cities will follow the regular procedures described above to authorize improvement projects necessary for the sole purpose of increasing Facility capacity. At that time, the parties will amend the agreement to reallocate cost based on their proportional share.

In the case of emergencies that damage or otherwise cause immediate impact to the functionality of the Facilities, such as natural disaster (earthquake, flood, volcanic eruption, etc.), sabotage, terrorism, fire, equipment failure, or other adverse event, Bellevue shall take measures necessary to restore reliable operations. As soon as possible, engineering and maintenance staff from both cities shall work together and take such measures as are deemed necessary for repair, rehabilitation, and/or replacement to reestablish service to customers. Bellevue shall make reasonable efforts to obtain timely approval from Redmond for emergency costs, including, but not limited to, labor, materials, evaluations, repair, mitigation, taxes, and additional operations and maintenance. Redmond agrees not to unreasonably withhold such approval.

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Non-emergency replacement and repair projects should generally be planned at least two years ahead and coordinated between the cities so that the project can be properly budgeted in the respective city budgets. Payment for projects shall be in accordance with Section 7 of this agreement and shall include all applicable costs. The cities may mutually elect to amend this agreement at any time to reapportion interests and/or costs associated with the Facilities.

Except as modified by this Amendment No. 1, the 1990 Agreement remains in full force and effect.

HEREBY AGREED TO AND ACCEPTED on this the ___ day of _____, 2021.

CITY OF BELLEVUE

By:_____
Nathan McCommon, Deputy City Manager

Approved as to form:

By:_____
Brian Wendt, Assistant City Attorney

CITY OF REDMOND

DocuSigned by:
By: Charles Corder (Mayor Designee)
5D9EC672714C4E4...
Angela Birney, Mayor

Approved as to form:

DocuSigned by:
By: Jim Haney
85394CE96899485...
James E. Haney, City Attorney

FILED NO. [illegible]
CITY OF BELLEVUE
DATE 9/28/90
[illegible] CITY CLERK
Res. 5227

H20

ORIGINAL

AGREEMENT FOR CONSTRUCTION, OPERATION AND MAINTENANCE OF JOINT-USE WATER STORAGE AND PUMPING FACILITY

This Agreement is made and entered into pursuant to the provisions of the Interlocal Cooperation Act Chapter 39.34 RCW, by and between the City of Bellevue (hereinafter called "Bellevue"), and the City of Redmond (hereinafter called "Redmond"), both municipal corporations of the State of Washington.

WHEREAS, each of the parties has a present and future need for water storage which, if a joint-use storage and pump facility is not constructed would require construction of separate storage and pumping facilities by each party, and

WHEREAS, Bellevue and Redmond desire to work cooperatively in the construction, operation and maintenance of joint-use water storage facilities because of the opportunity for reduced costs and reduced adverse environmental impacts as compared to the construction of separate water storage and pumping facilities, now, therefore,

In consideration of the mutual covenants contained herein, the parties agree to participate in the construction, operation and maintenance of joint-use water storage and pump station facilities pursuant to the following terms and conditions:

1. Purpose

This Agreement is intended to set forth the terms and conditions upon which Bellevue and Redmond agree to cooperate for the purpose of the construction, operation and maintenance of the joint-use water storage and pumping facility.

2. Administration of Agreement

Bellevue shall be the lead agency charged with responsibility for administration of this Agreement. The specific responsibilities of the parties are set forth hereinafter.

3. Scope of Work

For the purpose of this agreement, the project shall include acquisition of site, construction engineering and construction work related to the water storage structure, pump station building, pumps, pipelines and other appurtenances associated with the storage and pump station facilities.

4. Land Procurement

Bellevue has acquired real property at 4075 148th Avenue NE for the construction of the water reservoir and pump station mentioned herein. Redmond shall share in the cost of such acquisition. Redmond shall pay Bellevue 44% of the cost of said property within 45 days of receipt of invoice from Bellevue for acquisition of the property by Bellevue, in consideration of conveyance of a 44% undivided interest in the real property as provided in paragraph 8 below.

5. Construction

The City of Bellevue shall take all necessary steps to provide for the construction, including construction administration and inspection, of the reservoir and pump station, subject to written approval of the design, plans and specification, and construction by the City of Redmond in accordance with this Agreement; Redmond agrees not to unreasonably withhold such approval.

Bellevue has previously furnished Redmond with the plans and specifications for review and approval by Redmond at three stages in the final design. The first stage was when the final design was fifty percent (50%) complete, the second stage was when the final design was ninety percent (90%) complete, and the third stage was when the final design was one hundred percent (100%) complete. Each stage was approved by Redmond.

Bellevue shall be the contracting "owner" with the contractor and shall be responsible for all phases of the construction and completion of the reservoir and pump station in accordance with the approved plans. Bellevue shall coordinate and keep Redmond informed of the contractor's progress during construction. Upon completion of the work in accordance with the approved plans and the satisfactory testing of the reservoir and pump station, Bellevue shall notify Redmond of the date and time of the final construction inspection. Such notice shall be furnished to Redmond in writing, two weeks before the date of final construction inspection. Redmond personnel may accompany the Bellevue personnel on final inspection for purposes of creating a final checklist (punchlist) for the construction contractor to complete. Upon satisfactory completion by the contractor of the checklist (final punch list), Redmond shall furnish its written approval of the construction to Bellevue. Bellevue's acceptance of the work shall be by Motion by the Bellevue City Council. A copy of such Motion shall be furnished to Redmond.

Bellevue shall furnish Redmond with a copy of the advertisements for bids and shall make available bids received for review by Redmond. Bellevue shall recommend the award of a contract to the bidder regarded by Bellevue as the lowest and best bidder. Bellevue shall provide Redmond with a copy of the contract and notice to proceed and approval thereof by Bellevue.

6. Sharing of Costs

The Bellevue Parks Department shall contribute $150,000 to this project to offset increased construction cost to locate the reservoir on the north parcel of land versus the land fronting NE 40th. The remaining costs shall be shared between Bellevue and Redmond.

Bellevue shall be responsible for paying all of the costs of; land procurement, construction of the reservoir and pump station for which it shall receive reimbursement from Redmond of forty four (44%) percent of that amount (minus the $150,000 received from Bellevue Parks Department). Redmond's estimated share of the cost is $1,650,000.00. A copy of the current cost estimate of $3,750,000.00 dated December 1989 is attached for reference. Both Bellevue and Redmond shall maintain separate accounting of its costs associated with the construction of the pump stations. The effective starting date for such accounting for the purposes of cost sharing shall be the date of bid advertisement.

An itemization of the costs for the purposes of calculating the shared cost amounts between Bellevue and Redmond associated with the construction of the reservoir and pump station, consist of the following items:

- Total Consultant fees for labor and expenses for construction administration assistance, startup assistance, construction management, construction inspection and/or other directly related assistance as may be required during the construction period for the reservoir and pump station, shall be shared costs.

- Total construction costs including approved change order extras for the reservoir and pump station shall be shared costs.

- Total labor and expenses incurred after the bid advertisement date by both Bellevue and Redmond associated with construction review, inspection, and administration shall be shared costs.

- Cost of Land

Any future LID assessments to the reservoir and pump station property located at 4075 148th Avenue NE shall be borne by each of the parties in the same percentages as aforementioned.

7. Method of Payment

Bellevue will prepare and forward a monthly invoice to Redmond for its share of costs for construction of the reservoir and pump station, together with a copy of the bills/invoices received by Bellevue from its consultants, contractors, and other third parties for costs for construction for the Project. Redmond

shall pay such costs within forty-five (45) days of receipt of invoice from the City. Redmond shall provide Bellevue with an accounting of its costs chargeable to the Project and Bellevue shall pay or offset such allowable expenses within forty-five (45) days of receipt thereof. If Redmond fails to make full invoice payment within said forty-five (45) days, then penalty interest shall accrue on the unpaid amount at the daily Seattle First National Bank Prime Interest Rate in effect at such time. Bellevue shall account for such penalty interest and include the interest amount on the following monthly invoice.

8. Ownership and Rights

Bellevue shall obtain ownership of the reservoir and pump station along with all the piping and appurtenances. In consideration of Redmond's payment of 44% of the cost of the reservoir and pump station and the real property on which they are situated, Bellevue conveys and Redmond accepts a 44% interest in the property, reservoir and pump station, and all piping and appurtenances. Bellevue shall provide a statutory warranty deed, bill of sale, and all other documents required to evidence conveyance of title to Redmond.

9. Operation and Maintenance

Bellevue shall be responsible for providing necessary personnel, material and supplies, for the proper operation and maintenance of the reservoir and pump station after they are put into service. The operation and maintenance of the reservoir and pump station shall include, but not be limited to the following: Weekly site visits by maintenance staff, test, repair, replacement or overhauling of any pump, motor, pipeline valve, or telemetry component, normal record keeping, maintaining grounds on the site, periodic draw downs of reservoir for inspection, inspection and routine maintenance of system components as recommended by manufacturers, reservoir and pump station painting, meter calibrations and operations of reservoir and pump station in conjunction with flow monitoring. The costs for providing the proper operation and maintenance shall be shared by the parties in accordance with the aforementioned percentages; provided any scheduled maintenance shall not exceed $5,000, unless Redmond has consented to and approved in writing such maintenance item. In addition, the cost of electrical energy required to operate the reservoir and pump station shall be borne in the aforementioned percentages by Bellevue and Redmond.

Bellevue shall maintain a separate labor work order number for operation and maintenance of the reservoir and pump station to record all Bellevue staff work on the reservoir.

Bellevue will prepare and forward a monthly invoice to Redmond, together with a copy of the current electric bill and copies of any charges by third parties associated with operation and maintenance for the period for which Redmond is invoiced.

Redmond shall remit invoice payment to Bellevue within forty-five (45) days after receipt of invoice. If Redmond fails to make full invoice payment within said forty-five (45) days, then penalty interest shall accrue on the unpaid amount at the daily Seattle First National Bank Prime Interest Rate in effect at such time. Bellevue shall account for such penalty interest and include the interest amount on the following monthly invoice.

10. Pump Station Change

Bellevue or Redmond may change the pump size in the pump station as reasonably required subject to the prior approval of the other party which shall not be unreasonably withheld. The terms of such changes shall be negotiated between Bellevue and Redmond at such time as pump station change becomes necessary.

11. Salvage

Should the useful life of either the reservoir or pump station become obsolete, and salvage operations become desirable for whatever reason, Bellevue or Redmond shall make proposal of said disposition to the other party, and obtain written acceptance of this proposal from other party before conducting salvage operations. The costs and benefits of a salvage operation to either of the reservoir or pump station including the land shall be shared in the aforementioned percentages.

12. Indemnity

Bellevue agrees to defend, save harmless, and indemnify Redmond from and against any and all claims and demands for injury or death to persons and/or damage to property arising out of the operation and maintenance of the reservoir and pump station by Bellevue except as may be caused by the acts and negligence of Redmond, its agents, servants, or employees, or through acts of nature.

Bellevue agrees to defend, save harmless, and indemnify Redmond from and against any and all claims for injury or death to persons and for damage to property arising out of the construction of the reservoir and pump station except as may be caused by the acts and negligence of Redmond, its agents, servants, or employees, or through acts of nature.

Bellevue's consultant shall be required to maintain professional liability insurance with limits of not less than $1,000,000.00 and have Redmond named as additional insured.

13. Assignability

This agreement shall be binding upon all successors and assignees of the parties, who must be public agencies.

14. Amendments

Either party may request in writing the other party to consider an amendment to this Agreement. If the amendment is mutually acceptable to both parties said Agreement shall be made in writing, signed by both parties and attached to this Agreement.

15. Filing of Agreement

Pursuant to Chapter 39.34 RCW, a copy of this Agreement shall be filed with the Bellevue City Clerk, Redmond City Clerk, Records and Elections and the Secretary of State.

Dated this 28th day of September, 1990. ~~1988.~~

CITY OF BELLEVUE

By Pam Bissonnette
Phillip Kushlan, City Manager

APPROVED AS TO FORM:

By
Richard Kirkby
Assistant City Attorney

CITY OF REDMOND

By Doreen Marchione
Doreen Marchione, Mayor

APPROVED AS TO FORM:

By
Larry C. Martin
City Attorney

WJ/llm
D8/89-0186

EXHIBIT A

CONSTRUCTION COST ESTIMATE
December 89

City of Bellevue/City of Redmond
NE 40th Reservoir and Pump Station

1)	Land Costs	-	$ 344,137
2)	Construction Engineering		
	I - Consultant Services (JMM)	-	$ 270,000
	II - Cities Staff Admin.	-	$ 40,000
3)	Construction Cost (Based on ENR Index (Seattle) of 4748)	-	$3,095,863
	TOTAL ESTIMATED CONSTRUCTION COST	-	$3,750,000

BELLEVUE'S SHARE (55%) - $2,100,000
REDMOND'S SHARE (44%) - $1,650,000

D11/90-0298

Appendix E
Cascade Water Alliance Water Use Efficiency Annual Report

Cascade 2022 Water Efficiency Program Report

Introduction

The 2022 Cascade Water Efficiency Program saves approximately 4.2 million gallons of water per year. Along with 2019-21 savings, this represents 48% of Cascade's 2019 – 24 Water Use Efficiency Goal. The program benefits thousands of member residents, students, businesses, schools, agencies, parks and more by providing training, education, support, and hardware that achieves water efficiency and sustainability, promotion of the value of water, and extends the region's current water resources useful life further into the future. Cascade employs one full-time employee to manage the program and expenses in 2022 were $494,241.

Classroom Water Education

Cascade's classroom water education program was in high demand throughout 2022. The program delivers high-quality, locally relevant programming that is aligned with Washington educational learning requirements. Through its vendor, Nature Vision, Cascade provided in-person programs, remote learning opportunities, Blue Team projects, and online curriculum to support classrooms that are interested in water issues.

Classroom Presentations

Cascade's vendor provided in-person presentations on diverse topics, such as "Watershed Ecosystems", "Water Supply", "Waterwise Gardening", "All About Groundwater", and "Carbon, Climate, and Conservation" for K – 12 classrooms. The presentations are supported by materials, activities, and videos developed by the vendor and are locally relevant. Teacher reviews were positive:

"The presentation was definitely created for students! Our students were excited, engaged, and learned some facts surrounding groundwater." – Beth Nakatsu, Rosa Parks Elementary (Redmond)

"This type of lesson can't come from a textbook and supplements any curriculum nicely." – Ken Abraham, Pine Lake Middle School (Sammamish)

"I continue to encourage Cascade Water Alliance to sponsor these programs for students in the Tukwila Community." – Jennifer Tison, Cascade View Elementary (Tukwila)

"This program was amazing. So fun and relevant. Students were engaged the whole time." – Kathi McCabe, Challenger Elementary (Issaquah)

Blue Teams

Nature Vision also provides a Blue Team option, where an educator works with a classroom to create a customized project over a period of several visits for a more in-depth study of a particular subject. Thirty-eight Blue Teams were provided in 2022. Example Blue Team projects:

Foster High School (Tukwila), 10th – 12th Grade Environmental Science, Joe Camacho, 26 Students

Project Synopsis: Students studied the hydrology of the Duwamish River, the problems resulting from urban runoff to salmon and other aquatic life, and the importance of healthy plants and soil to the functioning of a healthy ecosystem. Students participated in restoration projects at Crystal Springs Park and Codiga Park. Finally, these students were interested in becoming environmental educators themselves, so they were mentored and learned how to develop their own environmental education curriculum as well as strategies for teaching.

Spiritridge Elementary (Bellevue), 5th Grade, Tessa Heady, Mefan Gegwish, Amy Frieden, 67 Students

Program Synopsis: Students studied several aspects of elements affecting watersheds and biodiversity including the carbon cycle, microplastics, stormwater runoff, and invasive plants. Students practiced water sampling and testing learning scientific methods of observation, note taking, and instrument use to conduct investigations. Students finished their project by reviewing the results of their water sampling to theorize how much pollution was in their local streams and making plans for positive actions to benefit the local environment.

Redmond Elementary, 4th – 5th Grade, Kelsee Herrick and Tara Emitu, 47 Students

Program Synopsis: Students studied the Bear Creek Watershed and challenges to the health of Bear Creek. Students learned about the problems resulting from medications being flushed down the drain. Studies emphasized the importance of healthy soil in functioning watersheds, and field work included spreading mulch around saplings in Bear Creek Park and students making restoration plans for their own back yards to improve local watershed health.

Online Curriculum

During the pandemic, Nature Vision developed several learning packets available online that teachers, parents, or caregivers can use to deliver K – 12 water education absent classroom teaching. The learning packet titles and number of uses in 2022 are listed below:

Watersheds – 176	Humans and Water – 176
Ecosystems – 293	Ecological Impacts - 377
Water Quality - 171	Human Systems - 137
Invasive Plants - 133	

Results

A pre-session survey was conducted with 678 students who received the in-person classroom presentations to determine their understanding of watersheds and water conservation concepts. The average score was 60.8%. The same survey was taken post-session by those students with an average score of 79.4%

A pre-session survey was conducted with 225 students who participated in the Blue Teams program and the average score was 58.3%. A follow-up survey of those students saw an average score of 76.4%. A smaller group of students took the survey again 60 days after the conclusion of the project with an average score 81.1% demonstrating significant retention of key concepts.

Classroom Water Education Program achievements:

- 429 in-person classroom presentations and Blue Team projects delivered to 10,123 students
- 124 remote classroom presentations delivered to 2,759 students
- Online learning packets accessed from website 1,463 times

The total number of confirmed student engagements was 12,882, higher than any previous year (in 2019 the number of total engagements was 11,952). The number of online learning packet student engagements isn't known but could be several thousand.

Problem-Based Learning for Water Systems

Cascade co-created and supports the Problem-Based Learning for Water Systems (PBL4WS) program with Sustainability Ambassadors for teachers and students who want more in-depth learning about water systems. The program provides middle and high school teachers with a wide range of entry points including science, social studies, math, and language arts to incorporate the study of water into their classrooms. Problem-Based Learning for Water Systems Program achievements:

- Published new curriculum units including:
  - Home Water Conservation Audit
  - Mapping my Watershed Address
  - Coolest Graph Ever on Water Conservation
- Published 19 Student Impact Project Templates including:
  - Hidden Toilet Leaks
  - Washing Machine Full Loads
  - Recycling Saves Water Too
  - Don't Drip and Drive
  - Use a Commercial Car Wash
- Produced tables demonstrating PBL4WS curriculum units / student impact projects alignment with member city climate action plans, which allows PBL4WS to focus efforts that have the greatest impact on locally developed climate policies and goals
- Cascade provided a teaching session with Cascade's engineer so students could learn about the math and physics behind the design and operation of utility water towers. The session resulted in the creation of a new student-led campaign called "My Water Tower" with supporting videos and materials to challenge students and parents to consider the importance of water towers in their communities
- Provided two student-voiced videos and one student impact project promoting shorter showers:
  - Anshika: Shorter Showers - video
  - Aylin: Money Down the Drain - video
  - Aditi: Excellent Data Story – impact project
- Published four student-voiced video stories on Stormwater and Salmon Impacts from recorded presentations by Stephanie Blair, research scientist at WSU Stormwater Center:
  - Isolating Chemicals in Stormwater Toxic to Salmon
  - Copper in Brake Pads Toxic to Salmon
  - Toxic Tire Dust on Roadways Kills Salmon
  - How 6-PPD Quinone Impacts Salmon
- Provided seven study groups with custom designed professional development to enable development and utilization of curriculum, impact projects, and other program materials:

School	Cascade Teachers	Student Impacts
Renaissance Middle School (Sammamish)	3	90
Pine Lake Middle School (Issaquah)	6	600

Skyline High School (Sammamish)	2	100
International Community School (Kirkland)	1	40
Gibson Ek Big Picture School (Issaquah)	1	30
Emerson K-12 (Kirkland)	2	11
Willows School (Redmond)	2	30
TOTALS	**17**	**~901**

- Produced seven curriculum design teacher labs with varying levels of emphasis on water sustainability:

PBL Curriculum Design Lab	Cascade Teachers	Student Participation	Student Impacts
4-Day Lab on City Climate Action Planning, Climate Justice, and Green Jobs	1	19	25
4-Day Curriculum Design Lab: Clean Water Future. Included full day workshop with Kate Zabrocki (PAE engineer) on Net Zero Water buildings, full day tour to Tacoma Water Treatment Facility, and a half-day Green Stormwater Infrastructure Engineering tour in West Seattle with Kathy Gwilyn, MIG and Patty Buchannan, Perteet, Co-funded by King County	-	24	-
Facilitated One-Day Curriculum Design Lab: Kirkland Sustainability Master Plan as Living Textbook	2	6	50
Facilitated One-Day Curriculum Design Lab: Integrating Sustainability Across the Middle School Curriculum. Integrated Nature Vision presentations of resources	13	3	1,125
Facilitated a 3-hour workshop on “Writing on Water” to engage English teachers	2	1	200
Facilitated a 3-hour lab on “Cool Math for Climate Solutions” to engage math teachers	-	6	-
Facilitated a Fall Series of Labs for Climate Action Teacher Fellows Cohort with four teachers from Bellevue, one from Issaquah, one from Tukwila	6	1	900
TOTALS	**24**	**60**	**~2,300**

Home Water Audits

Cascade offered materials for teachers who wish to have their students conduct a home water audit to better understand how much water is used in a home. The program includes digital materials to guide students through the process, measuring devices, and spreadsheets that record the findings. The spreadsheets calculate not only the potential water savings, but also the energy savings, and avoided greenhouse gas emissions. When a classroom or entire grade sum the collective savings, the potential impacts are significant. Cascade also provides showerheads and aerators for students who find high-flow fixtures in their homes. In 2022 teachers at Foster High School (Tukwila) and Pacific Cascade Middle School (Issaquah) participated in the program.

Water Bottle Filling Station Project

Cascade worked with Redmond High School to achieve the installation of a water bottle filling station at the school. The project was initiated by a student who wanted to encourage others to switch from single-use plastic bottles to reusable. Cascade provided partial funding for the cost of the new station and 2,300 *We Need Water* stainless steel water bottles for any student who took a pledge to avoid plastic bottles and use the station. The school held a ribbon-cutting ceremony in April to recognize the work of the student and promote the value of water. The event was attended by representatives from Lake Washington School District, Redmond Mayor Angela Birney, and Cascade.

The event inspired a student at Skyline High School in Sammamish to initiate a similar project with Cascade's help. This project will be completed in 2023.

Cascade Gardener

Remote Learning

Cascade continued its remote gardening classes with a spring and a fall series. There were thirteen classes with 1,505 total attendees and an average of 116 per class. Almost all attendees said they prefer remote learning to in-person classes. Of the survey respondents, 92% rated the classes as "Awesome" (the highest rating), and 0% said, "Didn't Like It". The remote learning format allows Cascade to survey attendees on areas of interest beyond sustainable landscaping. The most popular areas of interest for additional learning were "climate change", "water scarcity", "water system resiliency", and "water quality". This presents opportunities for additional outreach and education in the future.

Cascade Gardener Spring Series			
Presenter	**Class**	**Date**	**Attended**
Peggy Campbell	Sustainable Gardening: A Better Way to Beautiful	3/19/2022	138
Greg Rabourn	Gardening for Wildlife	3/26/2022	87
Christina Pheiffer	Mulch for a More Drought Resilient Garden	4/2/2022	114
Marianne Binetti	Heavenly Plants	4/9/2022	178
Lisa Taylor	Easy to Grow Plants that Beneficial Creatures Love	4/23/2022	99
Total			**616**

Cascade Gardener Fall Series			
Presenter	**Class**	**Date**	**Attended**
Emily Bishton	Prepping for an Autumn Food Garden	9/13/2022	87
Christina Pheiffer	Fall Planting and Transplanting Trees and Shrubs	9/20/2022	96
Lisa Taylor	Something's Rotting: Make Compost and Build Soil	9/27/2022	65
Jessi Bloom	Weeds & Water: Wisdom and Resiliency	10/4/2022	81
Marianne Binetti	4 Seasons of Color	10/11/2022	146
Emily Bishton	Native Splendor in the Garden	10/18/2022	153
Jessi Bloom	Gardening for Climate Change	10/25/2022	138
Lisa Taylor	Putting Your Garden to Bed	11/1/2022	123
Total			**889**

Reviews were positive:

"Peggy Campbell did an excellent job with the presentation last night. I look forward to the future programs you have lined up as they all have been insightful and provide wonderful knowledge for us to apply. Thanks again".

"Keep emphasizing drought tolerance."

"This one was the clearest explanations of sheet mulching I've ever heard."

"Wonderful presentation, thank you so much for offering this free talk to the public!"

"Just keep doing what you're doing!!!"

Garden Walking Tours

In addition to the remote classes, Cascade offered three in-person garden walking tours. These tours allowed attendees to get outside and have a more direct experience learning about sustainable gardening and water efficiency. Approximately 120 people attended the garden walking tours.

Garden Hotline

Cascade supports the regional Garden Hotline, which is a resource for residents to have their gardening and landscaping questions answered by gardening professionals from Tilth Alliance with an emphasis on water efficiency and sustainability. In 2022 the garden hotline received 237 calls from residents in Cascade member areas.

Watershed Ecology Field Trips

Working with member staff, Cascade provided watershed ecology field trips for residents who are interested in learning about ecology, plants and wildlife, and stream sampling. Families sometimes attend the field trips and reviews are positive. The field trips are typically held in local parks with streams nearby. In 2022 there were field trips in Issaquah, Kirkland, and Redmond for about 45 attendees.

Cascade provided a variant of the watershed ecology field trip as a Senior Day Camp in Redmond, where 20 senior attendees learned about native plants and watershed health.

Irrigation Assessments

Cascade provided 11 irrigation system assessments for high-peak season use customers. Cascade provides a detailed report of the assessment with specific strategies for achieving greater water efficiency and sustainability. Cascade maintains contact with staff at these properties and will assist in the implementation of Cascade's recommended measures over time:

- Brauerwood Homeowners Association (Sammamish Plateau Water)
- Colony at Bear Creek (Redmond)
- Pine Lake Estates (Sammamish Plateau Water)
- King County Housing Authority (Bellevue)
- Lake Washington School District (four, Redmond and Kirkland)
- Tukwila Parks Department (three)

Leak Detection Dye Distribution

Cascade delivered 6,391 toilet leak detection dye packets to 175 multifamily properties across all member areas and 475 toilet leak detection dye packets to seven motels in Kirkland and Redmond. Cascade will visit motels in other member areas in 2023. Cascade follows up with all accounts to encourage the continued use of the dye and to fix leaks when they are found.

Soil and Water Stewardship

Cascade co-created and partners with Tilth Alliance to deliver the Soil and Water Stewardship program, which provides free training for residents on sustainable landscaping practices, rainwater harvesting, drip irrigation, and other water-related topics. Cascade assisted in promoting the program to recruit residents from Cascade member areas. The program was very active in 2022 with 17 Soil and Water Stewardship training events and four community projects completed in Cascade member areas:

Task 1. Soil and Water Stewardship Training

Training Event	Location	Date	# of Participants
Training: Food/environment overview	Zoom	Sat 2/26	30
Project: Seed starting and orchard planting	Rainier Beach Farm, Seattle	Sun 2/27	15
Project: Seed starting and forest restoration	McAuliffe Park, Kirkland	Sun 2/27	13
Training: Soil	Zoom	Sat 3/26	25
Project: Orchard planting	IRC St James Garden, Kent	Sun 3/27	9
Project: Orchard planting	World Relief Garden, Kent	Sun 3/27	5
Project: Native plant & pollinator planting	Riverton Park, Tukwila	Sun 3/27	10
Training: Sustainable and edible landscapes		Sat 4/24	23
Project: Compost build for Burien and Skyway	Rainier Beach Farm – for Campbell Hill, Skyway	Sun 4/24	8
Project: Orchard planting	Campbell Hill, Skyway	Sun 4/24	5
Project: Garden bed renovation	Casa Juanita, Kirkland	Sun 4/24	9
Training: Water conservation and drip irrigation	Zoom	Sat 5/21	23
Project: Drip irrigation installation	SHARK Garden, Burien	Sun 5/22	7
Project: Drip irrigation installation	Marra Farm, Seattle	Sun 5/22	7
Project: Drip irrigation installation	Pacific Court, Tukwila	Sun 5/22	6
Training: Permaculture	Zoom	Sat 6/25	20
Project: Rainwater harvesting, social permaculture	Good Shepherd Center, Seattle	Sun 6/26	9
Project: Rainwater harvesting and worm bin	Rainier Beach Farm, Seattle	Sun 6/26	7
Training: Organic Vegetable Gardening	Zoom	Sat 7/23	22
Project: Garden maintenance	Rising Star Elementary, Seattle	Sun 7/24	7
Project: Drip irrigation installation	Redmond High School	Sun 7/24	8
Project: Garden Maintenance	New Holly, Seattle	Sun 7/24	7
Training: Natural Weed and Pest Management	Zoom	Sat 8/27	12
Project: Weed ID and hügelkultur bed building	Rainier Beach Farm, Seattle	Sun 8/28	12
Training: Water Quality	Zoom	Sat 9/24	20
Project: Raingarden container	Emerson High School, Kirkland	Sun 9/25	10
Project: Raingarden maintenance	South King Tool Library, Federal Way	Sun 9/25	9
Training: Native Plants & Ecosystem Restoration	Zoom	Sat 10/22	18
Project: Native planting	McAuliffe Park, Kirkland	Sun 10/23	7
Project: Native planting	Riverton Park, Tukwila	Sun 10/23	11

Tasks 2. Resources, Workshops

Description	Location	Date	# of Participants
Service learning with Eastside Prep	McAuliffe Park, Kirkland	3/22	14
Service learning with IACS youth	McAuliffe Park, Kirkland	4/3	36
Service learning with IACS youth	McAuliffe Park, Kirkland	6/4	38
Google Service Day	McAuliffe Park, Kirkland	6/16	30
Service learning with IACS youth	McAuliffe Park, Kirkland	7/10	26
Drip installation at Riverton Park	Tukwila	7/28	1
Green Kirkland Day	McAuliffe Park, Kirkland	10/23	40

Tasks 3. School Garden Water Efficiency Projects

Description	Location	Date	# of Participants
Garden expansion at Campbell Hill	Campbell Hill, Skyway	4/24	5
Drip irrigation maintenance at Campbell Hill	Campbell Hill, Skyway	6/28	1
Drip installation at Redmond High School	Redmond	7/24	9
Raingarden installation at Emerson High School	Kirkland	9/25	12

Events

Cascade supports its members through events, such as fairs and festivals to promote water efficiency and support member objectives. Cascade attended the following events in 2022 and provided 4,034 conservation items, such as shower timers, rain gauges, and toilet leak detection dye:

- Bellevue Family Fourth
- Issaquah Salmon Days
- Kirkland Farmer's Market and Concert Series
- Lake Washington Tech Plant Sale
- Northwest Flower and Garden Show
- Redmond Derby Days
- Sammamish Party on the Plateau
- Skyway Health and Wellness Fair
- Tukwila Bark in the Park

Online Orders

Cascade provided 620 shower timers, rain gauges, leak detection dye packets, and other conservation items through Cascade's website. The conservation items are provided free of charge to Cascade member residents, schools, businesses, and homeowner associations who pay the postage. Cascade also provides members with conservation items for distribution to customers at utility offices, community meetings, and events. For example, Sammamish Plateau Water requested and received hundreds of showerheads, shower timers, aerators, and rain gauges from Cascade in 2022.

We Need Water

Cascade has operated a social media campaign for a few years with limited success. In 2022 Cascade desired to expand the outreach and conducted a search for a professional social media consultant. Staff selected Brilliant Marketing to assist with the development of a strategic plan to create more effective engagement of its social media platforms. The strategic plan included:

- Customer surveys and interviews
- Four audience personas around which to target social media content
- Annual calendar of events and materials to post
- Templates for posts and reels

The plan was implemented in December and began providing immediate results of higher numbers of engagement and put Cascade into an excellent position for moving ahead with its social media campaign in 2023.

Shared Rebate Programs

Cascade cost shares with Puget Sound Energy on selected Energy Star and WaterSense rebate programs, such as clothes washers, showerheads, and faucets. In 2022 Cascade shared in 369 clothes washer, 167 shower adaptor, and 44 tub spout diverter rebates. Total savings from these rebates and other measures was 11,553 gallons of water per day. This is a disappointing and much lower figure than in previous years. The rebate programs that Cascade shares were significantly disrupted by the supply chain crises and the pandemic, which continue to limit certain program activities, such as direct installation of high efficiency fixtures in apartment complexes. If these programs don't rebound in early 2023, Cascade will find other avenues to generate the savings necessary to achieve its adopted savings goal.

Photos of 2022 Cascade Activities



Garden Walking Tour, Marymoor Park



Northwest Flower and Garden Show



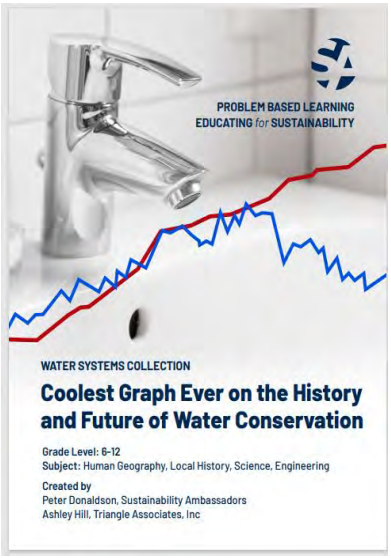
Skyway Health and Wellness Fair



Lake Washington Tech



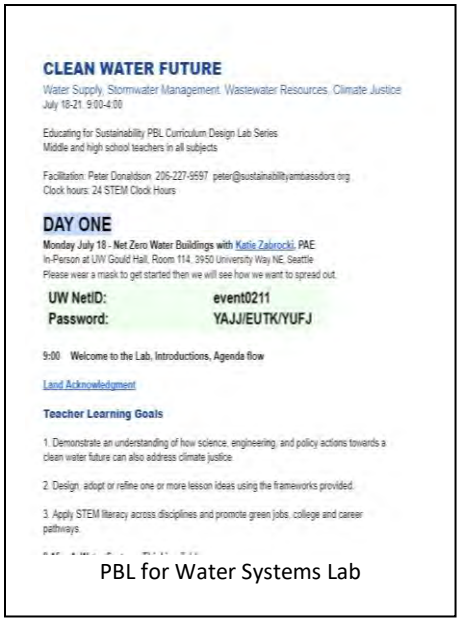
Riverton Park, Tukwila



PBL for Water Systems Curriculum



Senior Day Camp, Redmond



CLEAN WATER FUTURE

Water Supply. Stormwater Management. Wastewater Resources. Climate Justice
July 18-21. 9:00-4:00

Educating for Sustainability PBL Curriculum Design Lab Series
Middle and high school teachers in all subjects

Facilitation: Peter Donaldson 206-227-9597 peter@sustainabilityambassdors.org
Clock hours: 24 STEM Clock Hours

DAY ONE

Monday July 18 - Net Zero Water Buildings with Katie Zabrocki, PAE
In-Person at UW Gould Hall, Room 114, 3950 University Way NE, Seattle
Please wear a mask to get started then we will see how we want to spread out.

UW NetID:	**event0211**
Password:	**YAJJ/EUTK/YUFJ**

9:00 **Welcome to the Lab, Introductions, Agenda flow**

Land Acknowledgment

Teacher Learning Goals

1. Demonstrate an understanding of how science, engineering, and policy actions towards a clean water future can also address climate justice.
2. Design, adopt or refine one or more lesson ideas using the frameworks provided.
3. Apply STEM literacy across disciplines and promote green jobs, college and career pathways.

PBL for Water Systems Lab



Watershed Ecology Field Trip, Redmond



Sammamish Party on the Plateau



Bellevue Family Fourth



Campbell Hill Elementary, Skyway



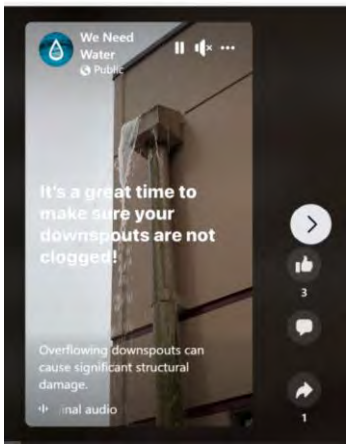
Student Impact Project



Video Highlighting Sammamish Plateau Water AMI



Kirkland Concert Series



We Need Water Content



Support of Member Activities



Emerson K-12, Kirkland

Appendix F
City of Redmond Environmental Sustainability Action Plan (excerpt)

The following pages are excerpts from the City of Redmond Environmental Sustainability Action Plan related to water use efficiency.



City of Redmond
Environmental Sustainability Action Plan

SEPTEMBER 2020

Water Management

What is included?

Clean, safe, and reliable drinking water is critical to successful, growing communities. Redmond is fortunate to have ample supplies of water that, if protected and used in a sustainable manner, will last long into the future. Redmond is working to implement sustainable water resource management practices and regulations to achieve greater conservation and more efficient use of our water supply. Healthy water quality and a sustainable water supply depend on the entire community, from our municipal partners and utilities—who develop and approve infrastructure and policy—to the businesses and residents who use water resources. Water is a precious natural resource and the actions in this section will ensure that Redmond's future generations have clean and abundant water.

Water Management Goal: Protect and conserve water resource quality and quantity.



How is Redmond doing?

KEY ACHIEVEMENTS

- The City recently updated **groundwater protection areas** (Wellhead Protection Zones) and established updated Critical Aquifer Recharge Area (CARA) boundaries to enhance management of a clean water supply. The City conducts **quality testing and water level measurements** for approximately 100 monitoring wells, including testing of one third of monitoring wells for groundwater quality and collecting depth-to-water measurements semi-annually. The City **reduces pollution risks to the City's aquifer**. In 2018, inspection staff issued 21 spill kits, and six drainage maps; moved 2,366 gallons of hazardous materials to secondary containment, and removed 1,360 gallons of hazardous materials from sites.[7]
- **Artificial turf** has been installed at 100% of City-owned fields—saving precious water resources.The City offers **water conservation information and rebates** through Cascade Water Alliance. Offerings include toilet, showerhead, and irrigation retrofits and rebates, residential water audits, classes and consultants for professional landscapers, and incentive-based water pricing to promote water conservation.
- The City Parks Department utilizes a **centralized water control system** called Maxicom to monitor and control landscape irrigation. The City replaced annual planting beds with **drought-tolerant perennials**, transitioned to as-needed irrigation, and utilizes drought-resistant landscaping on City Hall Campus.

LSLU Meeting Materials
Page 643
January 21, 2026

Key Performance Indicators

Performance Measure	Status	Historic Trend	Trend Insights
Pollution prevention site visits *(% of high-risk sites visited and provided technical assistance)*	Improving		**Increasing.** Pollution prevention efforts continue to reduce pollution risks to our aquifer. The number of high-risk sites visited and provided technical assistance rose sharply from 2013 to 2015 and has held at100% over the last four years. Increased awareness of risks to polluting water resources has resulted in an improved focus on implementation of pollution prevention BMPs.
Groundwater quality *(% of groundwater quality samples that meet Groundwater Quality Standards)*	Maintaining		**Maintaining.** Temporary construction dewatering activities affected groundwater flow patterns and source areas through mid-2019 causing locations not typically sampled under normal flow conditions to be monitored. A subset of wells that were sampled each year from 2016 showed a higher % of compliance. Monitoring wells above groundwater quality standards were impacted by metals.
Groundwater quality *(% of groundwater quality samples that meet Primary Drinking Water Standards)*	Maintaining		**Maintaining.** Primary drinking water standards are consistently met at most monitoring wells. Typical impacts are metals, less typical impacts have included total coliforms.
Aquifer recharge *(change in Aquifer Recharge Area)*	Declining		**Declining.** Recharging the City's aquifers is important to maintaining water supply. Additions of impervious area since 2013 has reduced recharge to our aquifer. Increasing use of pervious pavement and retrofits for infiltration of runoff are starting to slow the trend. Where feasible, the City promotes the use of infiltration systems to preserve and restore recharge.

Business-As-Usual: Where We're Heading

For the foreseeable future, about 40% of Redmond's drinking water will be supplied by our local groundwater system, with the remaining water resource coming from the Tolt Watershed in the Cascade Mountains. We will continue to emphasize protecting our groundwater resources from two challenges. First, when groundwater is not adequately recharged at the same rate it is pumped out of the ground, shortages can occur. Maintaining a sustainable infiltration rate in our urban areas not only protects our drinking water supply, but reduces potential for flooding and surface water pollution. Second, industrial and other potential groundwater contaminants are abundant in urban areas and when groundwater becomes contaminated, it can become unusable as a drinking water source for many years. Keeping contaminants out of the aquifer is essential and will require widespread participation in water quality protection actions.

In 2019, the City's supply wells pumped over one billion gallons from the aquifer. To supply these needs, the City of Redmond pumps almost 3 million gallons per day and purchases over 4 million gallons per day from the Cascade Water Alliance during the peak season. Community potable water consumption will continue to steadily increase with continued population and economic growth in King County and the Puget Sound region.Recognizing that water is vital for the prosperity of all life in the Puget Sound region as well as for a sustainable drinking water supply, stimulating efficient water use is a central part of Redmond's water resource management efforts. Any future reductions will largely be dependent on residential and commercial water reduction strategies such as water fixture upgrades, education programs, and increases in recycled water use. To reach more ambitious goals, Redmond should continue to expand regulatory requirements to become more stringent and implement operational efficiency upgrades. Redmond is a member of the Cascade Water Alliance (CWA) and some of these reductions may be addressed through participation in CWA's programs. During development of the Water Use Reductions Strategy, Redmond will consider whether to align with CWA conservation goals or take more aggressive water use reduction approaches.

Targets: Where We Want to Be

Redmond single-family residents are currently exceeding the national and Washington State averages for domestic residential water use (55 gallons per day per capita [GPDC] versus 82 GPDC and 101 GPDC, respectively). When other commercial and industrial uses are considered, Redmond is still exceeding national and Washington State averages (73 GPDC versus 81 GPDC and 120 GPDC, respectively). However, the more we continue to conserve, the more sustainable will be our supply.

As a member of Cascade Water Alliance, Redmond subscribes to their water efficiency savings goal, which calls for a cumulative savings of 0.6 million gallons per day on an average annual basis and 1 million gallons per day on an average peak season basis for the period 2014 through 2019. In addition to participating in Cascade Water Alliance efficiency savings programs and goals, Redmond plans to develop a water service area centric water consumption reduction goal. Redmond will take the first step in developing this goal by completing a comprehensive Water Use Reduction Strategy, which will specify the detailed water use reduction actions to expand on the broad strategies outlined in this plan. The Water Use Reduction Strategy will include evaluation of the appropriate GPDC target for implementation.

TARGET INDICATOR	TARGET VALUE
Reduce per-capita gallons of potable water consumed.	**Develop a comprehensive Water Use Reduction Strategy that identifies a quantitative target.**

Strategies: How We'll Get There

This plan sets forth the following high-level strategies for attaining water management goals and targets.

STRATEGIES	
W1	Achieve a secure and sustainable water supply that is equitable, affordable, and accessible.
W2	Conserve community water resource and maximize water efficiency savings.
W3	Protect quality and quantity of drinking water resources.

We anticipate that the identified strategies above will achieve the targets set in the Water Use Reduction Strategy. Additional strategies or actions may be identified in the Water Use Reduction Strategy and will further improve our commitment to a sustainable water supply. This includes developing a plan to have all public golf courses use recycled water for all irrigation, complete water fixture upgrades, utilize water-efficient landscaping practices, expand grey water reuse, and continue water conservation education and outreach programs.

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Action Roadmap

#	Action	Description	Investment	Impact	Co-Benefits	Timeframe
Strategy W1: Achieve a secure and sustainable water supply that is equitable, affordable, and accessible.						
W1.1	**Align with regional planning**	Ensure continued alignment of City water management actions with regional planning framework, City policies, sustainability practices, and state and federal environmental regulations.				
W1.2	**Climate risks to water availability**	Evaluate risks to water availability due to changes in precipitation patterns (more frequent drought conditions, high precipitation events, low recharge).				
Strategy W2: Conserve community water resource and maximize water efficiency savings.						
W2.1	**Community awareness program**	Conduct climate-science based community awareness programs for water conservation practices.				
W2.2	**Water-efficient landscaping**	Continue to install and implement water-efficient landscaping and practices for streetscapes (including traffic circles), park sites, City facilities, and City-maintained plantings.				
W2.3	**"One water" education**	Expand public education on water conservation and the "one water" concept that all water is reusable.				
W2.4	**New standards for resilience in water systems**	Study and determine if new standards need to be adopted to strengthen infrastructure to address increased flooding, such as larger bridges and culverts and other stormwater conveyance systems.				
W2.5	**Water Usage Reduction Strategy**	Create a Water Usage Reduction Strategy to provide the strategic framing for all other water efficiency strategies and actions.				
W2.6	**Grey water for irrigation**	Study code barriers and code/policy incentives for promoting greywater reuse over traditional irrigation. Establish a plan to upgrade irrigation controls and operational efficiency on City properties using grey water.				
W2.7	**Golf course recycled water**	Partner with King County to use recycled water for irrigation of golf courses. Develop a plan to have all public golf courses 100% irrigation with recycled water.				

#	Action	Description	Investment	Impact	Co-Benefits	Timeframe
Strategy W3: Protect quality and quantity of drinking water resources.						
W3.1	**Identify groundwater impacts**	Protect groundwater by identifying impacts to groundwater through inspection and education.				
W3.2	**Groundwater contamination management**	Refine a plan to manage existing groundwater contamination. Identify and address groundwater resources at risk. Include a monitoring and tracking program.				
W3.3	**Groundwater Monitoring Program**	Monitor groundwater monitoring well network to identify impacts to water quality and quantity early, monitor emerging contaminants, and provide an early warning to supply wells.				
W3.4	**Update TCD code**	Conduct a triple bottom line analysis of temporary construction dewatering (TCD) to determine policy options to reduce tensions between water resources management and compact growth.				
W3.5	**Septic/sewer system improvements**	Eliminate direct discharge into the stormwater system from the sanitary and private septic/sewer systems.				
W3.6	**Water efficiency standards**	Increase water efficiency and resiliency standards for new development such as requiring dual piping so new buildings are rainwater and reclaimed water ready.				
W3.7	**Irrigation water efficiency**	Revise City codes to promote greater irrigation water efficiency. Considerations could include rate change, irrigation standards, equipment upgrades, and scaling up properties.				
W3.8	**Septic elimination / sewer system expansion**	Encourage conversion from on-site wastewater disposal systems as sewer lines become available so that all septic systems in the city are eventually eliminated.				
W3.9	**Landscaping and irrigation standards**	Require drought-tolerant planting and efficient irrigation systems on all new development.				

What You Can Do

INSTALL EFFICIENT APPLIANCES AND FIXTURES

Install water-efficient toilets, showerheads, and faucet aerators. Before buying, check how much water and energy new appliances, faucets, and water heaters will use. Remember, cheaper up-front purchases could cost more in water and electricity bills over time.

Related action(s):

- Community awareness program
- Water usage reduction strategy

SAVE WATER AT THE TAP

Check all faucets, toilets, and showerheads for leaks. Have your irrigation system audited for leaks, broken equipment, overspray, or inefficient watering schedules.

Related action(s):

- Water-efficient landscaping
- Water usage reduction strategy

PRACTICE XERISCAPE LANDSCAPING

Xeriscaping is the process of landscaping or gardening that reduces or eliminates the need for additional water. Choose the right Northwest-friendly plants and watch them thrive in our environment. Group plants with the same watering needs together to avoid overwatering some while underwatering others. Try collecting water from your roof and directing the runoff to plants and trees.

Related action(s):

- Water usage reduction strategy
- Reuse education
- Water-efficient landscaping

Focus Area: Water Management

Goal: Protect and conserve water resources, including water quality and quantity.

*Note that this is a working document. It reflects the comments submitted by stakeholders, City staff, and the consultant team throughout the development of the Plan.

#	Action Short Name	Action Description	Lever	C/M/B/R	Timeframe	City stakeholders	External Stakeholders/Partners	Barriers to Implementation & Other Considerations*	Next Steps*
W1: Achieve a secure and sustainable water supply that is equitable, affordable, and accessible									
W1.01	**Align with regional planning**	**Ensure continued alignment of City water management actions with regional planning framework, City policies, sustainability practices, and state and federal environmental regulations.**	Reg	M	Ongoing	Public Works - EUSD	Cascade Water Alliance		
W1.02	**Climate risks to water availability**	**Evaluate risks to water availability due to changes in precipitation patterns (more frequent drought conditions, high precipitation events, low recharge).**	SPP	M	Mid-term (5-10 years)	Public Works - EUSD	Cascade Water Alliance	Supply is stable now, but climate risks should be identified in the mid term to inform longer term supply planning. There is currently a regional effort, Cascade Water Suppliers Forum, that looks at many issues like water supply and availability. Potential partner with Redmond.	
W2: Conserve community water resource and maximize water efficiency savings.									
W2.01	**Community awareness program**	**Conduct climate-science based community awareness programs for water conservation practices.**	Vol	C	Ongoing	Public Works - EUSD; Executive - Sustainability	Cascade Water Alliance	Cascade Water Alliance does not currently provide education on gray water. There is an opportunity to define this more clearly. Water conservation education should be climate-based and should highlight the water-energy nexus.	
W2.02	**Water-efficient landscaping**	**Continue to install and implement water-efficient landscaping and practices for streetscapes (including traffic circles), park sites, City facilities, and City-maintained plantings.**	Cap	M	Ongoing	Parks; Public Works - Operations; Executive - Sustainability	Landscape architects; Nurseries; Irrigation system installers	Landscape management occurring in multiple departments, specific policies/operations may not be consistent. This could be a driver to centralize landscaping, but this will take serious effort to implement. Parks has smart watering system, other departments may not be using the same technology or methods (e.g. drought tolerant plants). Considering mitigation - around park sites that currently damages. Mitigate negative impacts to water systems from other actions. Includes replacing annual planting beds with drought-tolerant perennials and turning on irrigation systems only when needed. Landscape architects, nurseries, irrigation system installers - planning, potential changes in regulatory framework to have them on-board	
W2.03	**"One water" education**	**Expand public education on water conservation and the "one water" concept that all water is reusable.**	Vol	C	Near-term (0-5 years)	Public Works - EUSD	Cascade Water Alliance	Cascade Water Alliance is working towards refining and expanding programs in schools. The City could aid in resource distribution and facilitating partnerships. Could also add other topics as it makes sense (e.g. pollution prevention and source protection).	- Would start with "one water" since this is more holistic, and then integrate water conservation.
W2.04	**New standards for resilience in water systems**	**Study and determine if new standards need to be adopted to strengthen infrastructure to address increased flooding, such as larger bridges and culverts and other stormwater conveyance systems.**	Reg	C	Near-term (0-5 years)	Public Works - EUSD			
W2.05	**Water Usage Reduction Strategy**	**Create a Water Usage Reduction Strategy to provide the strategic framing for all other water efficiency strategies and actions.**	SPP	M	Near-term (0-5 years)	Public Works - EUSD		The more we reduce water usage, it will affect utilities. This will need to be done strategically, so might be foundational to other tasks. Open House participants supported this action and showed additional interest in landscaping and irrigation standards for existing developments.	
W2.06	**Grey water for irrigation**	**Study code barriers and code/policy incentives for promoting greywater reuse over traditional irrigation. Establish a plan to upgrade irrigation controls and operational efficiency on City properties using grey water.**	Reg	B	Mid-term (5-10 years)	Public Works - EUSD	WA Department of Health	Important to consider health impacts.	

Focus Area: Water Management

Goal: Protect and conserve water resources, including water quality and quantity.

*Note that this is a working document. It reflects the comments submitted by stakeholders, City staff, and the consultant team throughout the development of the Plan.

#	Action Short Name	Action Description	Lever	C/M/B/R	Timeframe	City stakeholders	External Stakeholders/Partners	Barriers to Implementation & Other Considerations*	Next Steps*
W2.07	**Golf course recycled water**	**Partner with King County to use recycled water for irrigation of golf courses. Develop a plan to have all public golf courses 100% irrigation with recycled water.**	SPP	C	Long-term (10+ years)	Public Works - EUSD	King County	There could be cost impacts for setting this up. Concerns of aquifer health and drinking water impacts. Also around human health. Potential loss of revenues for water utilities could affect infrastructure planning. Would need a permitting process for this other utility.	
W3: Protect quality and quantity of drinking water resources.									
W3.01	**Identify groundwater impacts**	**Protect groundwater by identifying impacts to groundwater through inspection and education.**	SPP	M	Ongoing	Public Works - EUSD			
W3.02	**Groundwater contamination management**	**Refine a plan to manage existing groundwater contamination. Identify and address groundwater resources at risk. Include a monitoring and tracking program.**	SPP	M	Ongoing	Public Works - EUSD		Incorporate monitoring of contaminants of emerging concern, such as pharmaceuticals and microplastics, into the plan.	
W3.03	**Groundwater Monitoring Program**	**Monitor groundwater monitoring well network to identify impacts to water quality and quantity early, monitor emerging contaminants, and provide an early warning to supply wells.**	Reg	M	Ongoing	Public Works - EUSD		Program could include the monitoring and evaluation of temporary construction dewatering impacts to aquifers.	
W3.04	**Update TCD code**	**Conduct a triple bottom line analysis of temporary construction dewatering (TCD) to determine policy options to reduce tensions between water resources management and compact growth.**	Reg	M	Ongoing	Public Works - EUSD		Could expedite this due to current economic concerns.	
W3.05	**Septic/sewer system improvements**	**Eliminate direct discharge into the stormwater system from the sanitary and private septic/sewer systems.**	Reg	C	Ongoing	Public Works - EUSD	WA DOH		
W3.06	**Water efficiency standards**	**Increase water efficiency and resiliency standards for new development such as requiring dual piping so new buildings are rainwater/reclaimed water ready.**	Reg	C	Mid-term (5-10 years)	Public Works - EUSD		Consider incentives to encourage new construction to install rainwater harvesting for toilet flushing.	
W3.07	**Irrigation water efficiency**	**Revise City codes to promote greater irrigation water efficiency. Considerations could include: rate change, irrigation standards, equipment upgrades, and scaling up properties.**		C	Mid-term (5-10 years)	Planning - CDI; Public Works - EUSD		Could target specific industries (e.g. irrigation installers). Consider including standards for soil amendment, reduction of turfgrass, and emphasis on drought tolerant plantings.	
W3.08	**Septic elimination / sewer system expansion**	**Encourage conversion from on-site wastewater disposal systems as sewer lines become available so that all septic systems in the city are eventually eliminated.**	Reg	M	Long-term (10+ years)	Public Works - EUSD; Planning - Long Range Planning	Builders and developers; neighborhoods and residents	Assessment in the mid-term; implementation might be long-term.	- Identify and implement preliminary steps that are needed to support longer-term goal.
W3.09	**Landscaping and irrigation standards**	**Require drought-tolerant planting and efficient irrigation systems on all new development.**	Reg	C	Long-term (10+ years)	Public Works - EUSD; Planning CDI		Perhaps over time, City of Redmond could develop some basic standards for **existing** systems, such as: 1) a minimum distribution uniformity (a measure of the evenness the irrigation system applies water). 2) monitoring to ensure there are no major leaks or line breaks. 3) installation of a rain sensor shut off device, and ensuring minimal overspray onto sidewalks or impervious surfaces. Such standards could be confirmed and submitted to the City at the beginning of the irrigation season.	

Appendix G
Water Shortage Response Plan

City Of Redmond

Water Shortage Response Plan

NOVEMBER 2016

Approved:

John Marchione, Mayor

Introduction

This Water Shortage Response Plan provides guidance for the City of Redmond to respond to events that affect the supply of water available to our customers and to manage water demands during these events. This plan is to be implemented for longer term water shortage events and is not for short term events such as a water main break or other physical disruption to the water system. The Emergency Response Plan should be consulted for these short term events.

Several events have occurred during the last three decades that have resulted in the region implementing curtailment activities in accordance with adopted water shortage response plans. The first was during the summer and fall of 1987, the second during winter and spring 1992, and the third during the spring through fall of 2001. The fourth was during the winter of 2002, and the most recent was during the spring and summer of 2005. Each of these weather related shortages have helped guide the development of the current regional water shortage response plans.

Redmond's Water Supply

Redmond's has two sources of water. One is groundwater that supplies a portion of the demand for the Well Service Area which is the area of Redmond lying east of the Sammamish River. The second is regional surface water that is purchased through Cascade Water Alliance (CWA). CWA purchases its supply from Seattle Public Utilities. This supply is primarily from the Tolt River. Occasionally water from the Cedar River is also provided to Redmond. This purchased surface water supply is the only supply to Redmond's Rose Hill Service Area, Overlake/Viewpoint Service Area, and Novelty Hill Service Area. Redmond's ground water supplies between one quarter and one third of Redmond's annual demand so any decrease in the regional surface water supply significantly impacts Redmond's water supply.

Regional Shortage Response Plans

Cascade Water Alliance's (CWA) supply is purchased from Seattle Public Utilities (SPU). CWA will coordinate its water shortage response activities with Seattle and Tacoma. The CWA membership agreement provides that members must respond to water shortages in a collective, shared fashion under a CWA shortage management plan and that resources must be shared in a manner that reduces the risk of severe shortages to each member. CWA has published its Water Shortage Management Plan, which was adopted by the Board of Directors on October 26, 2016. CWA's Water Shortage Management Plan is included as Appendix A.

SPU published its most recent Water Shortage Contingency Plan in July 2006. The plan explains different types of droughts that can affect the region, and identifies instream flow issues for the Tolt and Cedar Rivers. A Drought Management Strategy includes;

monitoring of water and snow in the watersheds, monitoring daily and seasonal weather forecasts, reductions of use of water through operational adjustments and phased curtailment actions, and communication activities to help inform customers and other stake holders about the status of the water supply and what actions are being taken. The phased curtailment plan is the primary tool that is used to have customers reduce their consumption of water. The plan has four stages; Advisory, Voluntary, Mandatory, and Emergency Curtailment. The objectives, triggers, and planned communication actions for each stage are described. SPU's plan is included as Appendix B.

An effective response to water shortages must be regionally consistent throughout the service area of the regional water supplies. Public support and cooperation is likely to be greater if requested curtailments are equitable across the region. It is easier to communicate curtailment actions through the media if all agencies are coordinated with their responses and messaging.

Water Shortage Response Plan Activation

Within the City of Redmond and the Redmond Water Service Area not within the City the Mayor is designated as the individual with the authority to "impose, order and enforce restrictions and/or limitations on the use of water by type of use, customer class or geographic area, or other appropriate distinction depending upon the nature and extent of the water supply shortage." For a regional shortage, the Mayor in consultation with Cascade Water Alliance and Seattle Public Utilities shall activate the phased curtailment plan described in Cascade's and Seattle's water shortage plans. The restrictions and limitations to be imposed by the Mayor shall be generally consistent with the regional response directed by Cascade and Seattle. For a local shortage (the loss of the well supply that is not able to be replaced with the purchase of water from the regional system), the Mayor shall activate the phased curtailment plan and establish restrictions and limitations commensurate with the demand reduction that needs to be achieved.

City of Redmond Water Shortage Response Team

The Mayor shall form a City of Redmond Water Shortage Response team to be composed of selected individuals from the various departments of the city. The team shall coordinate curtailment activities for the use of water by the city and within the city, coordinate local media messaging, coordinate customer support and education, and coordinate enforcement actions consistent with the degree of curtailment actions imposed. The team shall be guided by the communications actions, operating actions, and supply and demand management actions within the CWA and SPU response plans. For a regional shortage the team shall be guided by the specific actions and responses being called for by CWA and SPU. For a local shortage the team shall develop specific actions and responses commensurate with the demand reduction that needs to be achieved.

Financial Implication

In 2008 The City of Redmond created a rate stabilization fund to minimize the financial risk stemming from low water demands that can be caused by impacts of a drought or other circumstance. The City's water utility is particularly vulnerable to lower than projected water demands because it consists of predominantly fixed costs covered primarily by rate generated revenues which are sensitive to water demands. Due to this exposure it was determined that the level of existing operating reserves could prove inadequate to offset adverse cash flows impacts during a poor water year and that a rate stabilization fund would sustain positive financial performance when needed.

The purpose of the rate stabilization fund is to provide a reserve specifically intended to address periods of short-term revenue instability, so that financial performance objectives can still be satisfied, with rates continuing to be based on water demand patterns in normal operating years. Establishing the rate stabilization required an upfront accumulation of cash which was accomplished by setting aside a portion of the existing fund balance that was in excess of the minimum threshold. The City still maintains its existing minimum operating fund balance thresholds to protect working capital needs.

APPENDIX A:

Cascade Water Alliance's

Water Shortage Management Plan



Cascade Water Alliance
Shortage Management Plan

Resolution 2016-18

Adopted October 26, 2016

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Appendix A: Actions that Can Reduce Water Usage by Distribution Systems and Customers

1.0 Introduction and Purpose

Municipal water suppliers must be prepared for water shortages in order to minimize effects on the communities they serve. This Shortage Management Plan ("SMP") outlines how Cascade Water Alliance ("Cascade") will respond to a water supply shortage affecting its regional water supply.

At the present time, Cascade purchases all of its water from Seattle Public Utilities ("SPU" or "Seattle"). Various events could cause a shortage in the SPU water supply system. These include reduced snowpack in the Cascade Range due to a dry winter or early spring melt; an earthquake or other event that damages reservoirs, treatment facilities or transmission lines; water quality problems; or intentional destructive acts. These different kinds of events may cause shortages with different characteristics in terms of advance warning, severity and duration. The SMP offers flexibility for a range of appropriate responses.

As required under Washington State Department of Health ("DOH") regulations, SPU and each Member of Cascade has its own shortage management plan to guide water system operations and interaction with end-use customers in each community during a water shortage. Cascade's SMP complements the SPU and Member SMPs.

Cascade's primary role in the event of a water shortage is to coordinate responses among the Cascade Member water systems that receive water from the regional supply and SPU, as the source of the regional supply. Therefore, this SMP focuses on the communication and coordination activities to be carried out by Cascade staff during a water shortage.

2.0 Related Agreements and Water Rights

2.1 Cascade Joint Municipal Utilities Authority Agreement

The Cascade Water Alliance Joint Municipal Utilities Authority Agreement ("Joint Agreement", 2012) established Cascade as a municipal corporation and provides the agreement of the Cascade Members on operations. Section 7.3 of the Joint Agreement provides (emphasis added):

> **7.3 Shortages and emergency.**
>
> A. Shortages. Members must respond to water shortages in a collective, shared fashion under a Cascade Shortage Management Plan adopted by the Board. Resources must be shared in a manner that reduces the risk of severe shortages to each Member. **Cascade's Shortage Management Plan may include without limitation, a definition and classification of shortages, a shortage contingency**

plan including mandatory programmatic actions among all Members in the event of shortages, allocation of authority for determining and responding to shortages, and a communications and outreach program for the public. Members shall not be required to implement Cascade's Shortage Management Plan in areas not served by the Supply System.

In the event of shortages, Cascade shall reduce or halt Interruptible Supply before invoking the Shortage Management Plan with respect to all Members with a Full Supply Commitment. However, the Board may, by 65% Dual Majority Vote, continue service in the amounts it deems appropriate to one or more Members receiving Interruptible Supply.

The Board may require that Members failing to comply with mandatory shortage management programs implemented under Cascade's Shortage Management Plan assume a disproportionate reduction in supply or pay penalty charges, or both.

In the event of a Cascade-wide water shortage, Members with Independent Supply may, without penalty, decline to participate in the shortage management program for that shortage by foregoing all supply from Cascade for the duration of the emergency or shortage.

To avoid shortages resulting from emergencies or the inability to develop sufficient supplies, **the Board may, by 65% Dual Majority Vote, establish moratoria on connections or additional commitments for future water services by the Members**. A moratorium may be discontinued by a Dual Majority Vote of the Board.

B. Emergency. The Board shall include in Cascade's Shortage Management Plan policies and procedures for addressing short-term disruptions of water supply.

The Joint Agreement also provides Cascade with the authority to impose minimum demand charges on Members (which Cascade has implemented in certain instances) as follows:

A Member shall be assigned a Demand Share based on the Board's best estimate of capacity to be used by that Member. The Demand Share shall be established based on an audit of that Member's past three (3) years of water use. After three (3) years as a Member, the baseline demand and capacity obligation for that Member shall be fixed based on actual experience as a Member. **A specific Demand Share may be set by the Board to account for circumstances, such as (by way of example and not by limitation) costs of extending the Supply System to a Member, or when Independent Supplies affect regional demand patterns.**

Section 7.5 (in part and emphasis added).

2.2 Seattle Block Contract

The 2013 2nd Amended and Restated Declining Block Water Supply Agreement Between the City of Seattle and Cascade Water Alliance ("Block Contract") provides for shortage management. Section 7.2 provides:

> Cascade and Seattle shall coordinate the development, adoption and implementation of their respective Water Shortage Management Plans. Before invoking its Water Shortage Management Plan, the Parties shall communicate with each other concerning current and projected water supply conditions.

Section 12.1 of the Block Contract recognizes that unilateral actions by Seattle may be needed at times due to unforeseen and unavoidable events, including water shortages. It provides (emphasis added):

> The Parties recognize that unforeseen and unavoidable events may occur which would require Seattle to act unilaterally for what it deems to be in the best interest of the general public served by the Seattle Water System; including water shortages resulting from drought circumstances and temporary reduction in water supply associated with turbidity events. **Upon the occurrence of an unforeseen or unavoidable event, Seattle shall, to the extent practicable, treat its wholesale and retail customers equally and any curtailment of supply shall be imposed proportionately among these customers.** This authority to act unilaterally carries with it a unilateral responsibility of Seattle to restore, expeditiously, the Seattle Water System to its pre-emergency capability to supply the region.

As a separate matter, Section 7.3 of the Block Contract provides that if water use restrictions are imposed on SPU by the terms of its agreements with Federal and State agencies and Tribes, such restrictions will be borne proportionally by SPU and its other wholesale customers, and Cascade with respect only to the size of the Cascade Block at the time curtailment is required. In this event, Cascade and its Members will need to review the restrictions and determine appropriate short-term or long-term actions.

2.3 Tacoma Public Utilities Water Supply Agreement

Cascade entered into an *Agreement for the Sale of Wholesale Water* (2005) with Tacoma Public Utilities (TPU). In 2012, Cascade and TPU amended the *Agreement* to require Cascade to make specified supply capacity reservation payments to TPU, in lieu of the minimum purchase payments provided for in the 2005 agreement. Through 2042, Cascade may request that TPU provide up to 8 MGD wholesale water supply, and TPU has sole discretion to determine the availability, disruption, interruption, suspension and curtailment of such supply. At this time, Cascade is not using this supply source. At such time as Cascade begins receiving regional water supply from Tacoma, the need to incorporate

shortage response actions in coordination with TPU will be reviewed.

2.4 White River-Lake Tapps Water Rights

The Water Right Permit No. S2-29920(A), issued in 2010 to Cascade for the withdrawal or diversion of water from the White River into Lake Tapps for municipal purposes, is subject to conditions including the maintenance of minimum flows in the White River and the maintenance of specified lake levels during a specified recreational period. These conditions are not considered in the SMP at this time for the following reasons: Cascade is not currently using Lake Tapps for municipal supply and Cascade's current planning vision indicates that Cascade's use of Lake Tapps is at least 20 years away. Cascade will update the SMP to include lake level triggers at such time as Lake Tapps is brought on line for municipal supply purposes.

2.5 Member Water Audit Agreements

Each Member has executed a water audit agreement with Cascade. For those Members with independent supply, that agreement defines and quantifies independent supplies, documents member utilization of those supplies, and establishes production requirements imposed on Members as related to those supplies.

3.0 Plan Activation and Applicability to Cascade Members

3.1 Activation of SMP

Cascade may activate its SMP under the following circumstances:

1) When SPU activates its Water Shortage Contingency Plan, the Cascade CEO may activate the SMP and determine the appropriate stage of curtailment and, at its next meeting, the Cascade Board will take action to end or continue activation at the appropriate stage of curtailment;

2) In the event that a supply shortage or threat of a supply shortage requires immediate action to prevent risks to public health and safety, the Cascade CEO may declare an emergency and activate the SMP and determine the appropriate stage of curtailment and, at its next meeting, the Cascade Board will take action to end or continue activation at the appropriate stage of curtailment; or

3) For any other reason through action of the Cascade Board.

Unless otherwise directed by the Cascade Board, the Cascade CEO, in consultation with the Water Shortage Management Committee (Section 3.2 below), may elevate or diminish the stage of curtailment from one stage to another as appropriate.

3.2 Water Shortage Management Committee

The Cascade CEO shall designate a Water Shortage Management Committee consisting of Cascade staff and Member staff to advise the Cascade CEO on implementation of the SMP. The Water Shortage Management Committee may be designated at any time, but no later than immediately following SMP activation and shall exist the duration of the water shortage. The existing Member staff committee may be designated as the Water Shortage Management Committee. The Cascade CEO may consult with the Water Shortage Management Committee by any means including in-person, by phone or by email.

3.3 Coordination with SPU and Members

As provided in the Block Contract with SPU, Cascade will coordinate and communicate closely with SPU regarding activation of the SMP and a change in the stage of shortage as indicated in Section 4 below.

Cascade and its Members have a key role in the communications strategy during a regional water shortage. It is anticipated that SPU will communicate with its own retail customers, wholesale customers, large retail customers, regional stakeholders, state/federal resource agencies, and regional media. Cascade encourages its Members to communicate with retail customers, wholesale customers, local stakeholders, and local media. Cascade will help to coordinate and facilitate communications among the Members and between the regional level and the local level.

Cascade will strive to make its public messaging at each stage of curtailment consistent with SPU's messaging during the shortage event.

Cascade will maintain a current copy of SPU's Water Shortage Contingency Plan on file at Cascade offices, and encourages Members that receive water from Cascade's regional water supply system maintain a copy of both the Cascade SMP and SPU Water Shortage Contingency Plan readily available with their own Member SMP.

In addition, the Block Contract with SPU contains provisions related to SPU's supply commitment and Cascade's participation in shortages. These include financial provisions that, in the event of a voluntary or mandatory curtailment, require revision to the cost borne by Cascade. Whenever SPU moves a shortage to the voluntary, mandatory or emergency stage, Cascade will initiate discussion with SPU regarding adjustments to the supply commitment and payments due from Cascade. Cascade will inform the Members of any proposed financial treatment regarding SPU charges occurring as a result of the shortage and these discussions.

3.4 Applicability to Cascade Members

Consistent with the Section 7.3 of the Joint Agreement, activation of the SMP applies to Cascade Members as follows:

- **Members receiving all of their water supply from Cascade:** Required to comply with Cascade's SMP.
- **Members receiving partial supply from Cascade:** Required to comply, in portions of their service areas that receive regional supply; *or* to discontinue use of Cascade supply during the water shortage.
- **Members not receiving Cascade supply.** Not required to comply with Cascade's SMP.
- **Members with interruptible supply**. *None at this time.*

3.5 Member Shortage Plans

DOH regulations at WAC 246-290-100(4)(f) require water utilities to have their own water shortage response plan. These are typically submitted to DOH every six years with their comprehensive water system plan update. Cascade recommends that Members review and revise their water shortage response plans to ensure the Member plans use similar stages of curtailment as listed in the Cascade SMP, and that provisions in the Member SMPs support effective coordination with SPU and Cascade during a water shortage.

3.6 Communications During Water Shortages

In addition to the communication actions listed for each curtailment stage in Section 4, in the event of a water shortage that requires this SMP to be activated, Cascade will coordinate closely with its Members and SPU regarding public communications. It is anticipated that SPU will take the lead on communications involving regional media such as major radio, television and newspaper outlets. Members will have the primary responsibility for communicating directly with their own customers and local communities. Cascade will coordinate communications among Members and SPU and will assist its Members issue consistent and effective communications to the communities that they serve.

3.7 Relief of Conflicting Obligations During Water Shortages

When the SMP is activated, and with each stage of curtailment, Cascade will review and adjust production requirements and minimum demand shares to avoid potentially contradictory obligations of members. Since minimum production requirements may be inconsistent with desired or mandated demand reductions, and since minimum demand shares provide financial disincentives to demand reduction, Cascade will determine necessary and appropriate

adjustments to provide for consistent incentives and impacts among members. Specifically:

- The Cascade CEO, in consultation with the Water Shortage Management Committee and each affected Member, will recommend to the Board to amend or suspend production requirements so that demand reduction and supply production objectives are not in conflict, while recognizing that increased reliance on independent supplies is a desirable outcome when addressing a shortage from Cascade's regional sources.

- The Cascade CEO, in consultation with the Water Shortage Management Committee and each affected Member, will recommend to the Board to amend or suspend minimum demand shares in order to encourage reduced demand on impacted regional sources.

- In the event that a shortage is caused by a shortage in independent supply resulting in a shortage that Cascade chooses to share in, the Cascade CEO, in consultation with the Water Shortage Management Committee and each affected Member, will recommend to the Board to make adjustments specific to each Member to reflect the unique circumstance of the shortage.

The recommended adjustments will be taken to the Board for approval or adjustment.

4.0 Stages of Water Use Curtailment

Cascade's SMP has four stages of curtailment that coincide with the stages of curtailment in SPU's Water Shortage Contingency Plan:

- Advisory Stage
- Voluntary Stage
- Mandatory Stage
- Emergency Stage

These four stages are designed for progressive implementation during a drought or other long-range disruption of water supply. However, any of the four stages can be activated from the outset of the event as appropriate and the stage of curtailment maybe elevated or diminished from one stage to another as appropriate.

Sections 4.1 through 4.4 provide details in each of the four stages of curtailment. Table 1 provides a summary of the triggers of each stage. Table 2 provides a summary of actions to be taken in each stage.

4.1 Advisory Stage

This stage is advisory only, and does not require curtailment actions by water users. The public is informed as early as meaningful data are available that a water shortage may occur.

4.1.1 Objectives of Advisory Stage

- Prepare Cascade, its Members and water users for a potential water shortage, thereby allowing for adequate planning and coordination.

- Support distribution system management actions by Cascade Members that can help to forestall or minimize the need for more stringent demand or supply management actions.

4.1.2 Triggers of Advisory Stage

1) Upon notice from SPU that it has activated the Advisory Stage of their Water Shortage Contingency Plan, the Cascade CEO may activate the SMP and the Advisory Stage and, at its next meeting, the Cascade Board will take action to end or continue activation; or

2) In the event that a supply shortage or threat of a supply shortage requires immediate action to prevent risks to public health and safety, the Cascade CEO may declare an emergency and activate the SMP and the Advisory Stage and, at its next meeting, the Cascade Board will take action to end or continue activation; or

3) The Cascade Board may act to authorize activation of Cascade's Advisory Stage.

4.1.3 Communication Actions During Advisory Stage

Once the Advisory Stage has been activated by Cascade, Cascade will:

- Inform Cascade Members that they are required to activate their Advisory Stage (or equivalent actions per each Member's individual SMP). This will not apply to Cascade Members exempted per Section 3.4 of this SMP.

- Establish a regular communication mechanism to keep Cascade Members and the Cascade Board informed regarding stages of curtailment; water supply conditions; actions taken by Cascade Members and others in the region; and information that should be communicated to the public, local parks departments, large customers, landscape industry professionals and others.

- Request Cascade Members carry out supply-side management actions they will take during the Advisory Stage to reduce use of water for local water distribution system operations,

and compile information on the actions taken. For Members that have independent supply, this may include relying more heavily on these supplies where feasible, to reduce pressure on the Cascade regional supply.

- If requested by SPU, participate on SPU's Water Shortage Advisory Group to help develop public information messages and materials and to provide input on Cascade Member actions.

- Assist Cascade Members acquire and distribute public information materials as needed. This may include materials from SPU or other sources, as appropriate. Post information on Cascade's web site regarding the Advisory Stage.

4.1.5 Operating Actions of Advisory Stage

- Cascade will initiate planning and preparation for actions under an elevated stage of curtailment, including an assessment of potential staffing impacts, training needs and communications strategies.

- Cascade will assist Members plan specific actions under an elevated stage of curtailment, including distribution system actions by the Member and voluntary water use curtailment actions Members can suggest to their end-use customers if the elevated stage of curtailment is activated.

4.2 Voluntary Stage

If supply conditions indicate the need for actions greater than those in the Advisory stage, the plan moves to the Voluntary Stage which relies on voluntary cooperation and support of customers to meet target consumption goals. During this stage, specific voluntary actions are suggested for residential and commercial customers.

4.2.1 Objectives of Voluntary Stage

- Encourage Members to take distribution system management actions to further stretch available supply.

- Encourage customer voluntary actions to maintain or reduce demand to meet target consumption levels.

- Forestall or minimize need for later more stringent demand or supply management actions.

- Maintain drinking water quality at acceptable levels throughout the shortage.

4.2.2 Triggers of Voluntary Stage

1) Upon notice from SPU that it has activated the Voluntary Stage of their Water Shortage Contingency Plan, the Cascade CEO may activate the Voluntary Stage and, at its next meeting, the Cascade Board will take action to end or continue activation; or

2) In the event that a supply shortage or threat of a supply shortage requires immediate action to prevent risks to public health and safety, the Cascade CEO may declare an emergency and activate the Voluntary Stage and, at its next meeting, the Cascade Board will take action to end or continue activation; or

3) The Cascade Board may authorize activation of Cascade's Voluntary Stage.

4.2.3 Communication Actions of Voluntary Stage

Once the Voluntary Stage has been activated by Cascade, Cascade will:

- Inform Cascade Members that they are required to activate their Voluntary Stage (or equivalent actions per each Member's individual SMP). This will not apply to Cascade Members exempted per Section 3.4 of this SMP.

- Request Cascade Members report to Cascade regarding supply-side management actions they will take during the Voluntary Stage. For Members that have independent supply, this may include relying more heavily on these supplies where feasible, to reduce pressure on the Cascade regional supply.

- Request Cascade Members communicate with their largest customers to request percentage reductions.

- Communicate regularly with Cascade Members regarding information that should be communicated to the public, local parks departments, large customers, landscape industry professionals and others. At the Voluntary Stage, this will include specific recommendations on how customers can reduce water consumption, including links to the *savingwater.org* website or equivalent information resources.

- Communicate with the Washington State Department of Health regarding actions being taken by Cascade and its Members.

- If requested by SPU, participate on SPU's Water Shortage Advisory Group to help develop public information messages and materials and to provide input on Cascade Member actions.

- Assist Cascade Members acquire and distribute public information materials as needed. Review information from SPU, including materials in the Water Shortage Contingency Plan, regarding actions customers can take to reduce their water consumption. As appropriate, post information for Cascade Members and their customers on Cascade's web site regarding the Voluntary Stage. Appendix A provides examples of water saving actions customers can take.

4.2.4 Operating Actions in Voluntary Stage

- Cascade will assess revenue implications and potential remedies and report to the Cascade Board.

- Cascade will initiate planning and preparation for actions under an elevated stage of curtailment, including an assessment of potential staffing impacts, training needs and communications strategies. Assist Cascade Members to identify mandatory restrictions that may apply during the Mandatory Stage, if it is needed.

4.3 Mandatory Stage

If supply conditions indicate a need for actions greater than those in the Voluntary stage, the Mandatory Stage would be implemented. This stage prohibits or limits certain water actions. Cascade will rely on its Members to enforce mandatory actions, using techniques as appropriate to each service area or jurisdiction.

4.3.1 Objectives of Mandatory Stage

- Achieve targeted goals for reducing consumption, by restricting certain water uses. Goals will be determined in consultation with SPU, based on the characteristics and severity of the water shortage.

- Ensure that adequate water supply will be available for the duration of the supply shortage.

- Minimize the disruption to customers' lives and businesses while meeting target consumption goals.

- Maintain drinking water quality at acceptable levels throughout the shortage.

- Promote equity among Cascade Members in responding to the supply shortage.

4.3.2 Triggers of Mandatory Stage

1) Upon notice from SPU that it has activated the Mandatory Stage of their Water Shortage

Contingency Plan, the Cascade Board will consider activation of the Mandatory Stage; or

2) In the event that a supply shortage or threat of a supply shortage requires immediate action to prevent risks to public health and safety, the Cascade CEO may declare an emergency and activate the Mandatory Stage and, at its next meeting, the Cascade Board will take action to end or continue activation; or

3) The Cascade Board may authorize activation of Cascade's Mandatory Stage.

4.3.3 Communication Actions of Mandatory Stage

Once the Mandatory Stage has been activated by Cascade, Cascade will:

- Inform Cascade Members that they are required to activate their Mandatory Stage (or equivalent actions per each Member's individual SMP). This will not apply to Cascade Members exempted per Section 3.4 of this SMP. Enforcement actions may be needed in the Mandatory Stage. Cascade expects each Member to enforce restrictions in a manner suitable to the local service area or to work with other local governments having enforcement powers to do so.

- Gather information from SPU regarding any water quality or water pressure problems, if any, that are identified or that may possibly occur at the mandatory stage, and communicate these to Cascade Members management, operations staff and public affairs staff.

- Continue communication actions from the Voluntary Stage, with modifications as appropriate for the Mandatory Stage (as determined in consultation with SPU and Cascade Members).

4.3.4 Operating Actions of Mandatory Stage

- Cascade will continue operating actions from the previous stages, and:

- Cascade will initiate planning and preparation for Emergency Stage actions, including an assessment of potential staffing impacts, training needs, communications strategies. Cascade will assist Members to plan specific actions that may be needed if the Emergency Stage is activated.

- If necessary the Board will consider enforcement actions against any Members who do not comply with Mandatory Stage actions, as allowed under the Cascade Joint Agreement.

4.4 Emergency Stage

At this stage Cascade and its Members recognize that a critical water situation exists and that, without additional significant curtailment actions a shortage of water for public health and safety is imminent. This would be used as the last stage of a progressive drought or similar situation, or to address an immediate crisis such as a disruption to water sources, treatment or transmission facilities. This type of situation has never occurred in Cascade or SPU history, but could occur during a very severe drought or under emergency conditions such as a major earthquake that ruptures transmission pipelines.

4.4.1 Objectives of Emergency Stage

- Strive to meet the water use goals established for this stage, recognizing that customers' lives and businesses may be significantly impacted in order to achieve necessary water savings. Goals will be determined in consultation with SPU, based on the characteristics and severity of the water shortage.

- Promote equity among Cascade Members in responding to the supply shortage.

4.4.2 Triggers of Emergency Stage

1) Upon notice from SPU that it has activated the Emergency Stage of their Water Shortage Contingency Plan, the Cascade Board will consider activation of the Emergency Stage; or

2) In the event that a supply shortage or threat of a supply shortage requires immediate action to prevent risks to public health and safety, the Cascade CEO may declare an emergency and activate the Emergency Stage and, at its next meeting, the Cascade Board will take action to end or continue activation; or

3) The Cascade Board may authorize activation of Cascade's Emergency Stage.

If SPU activates its Emergency Stage, Cascade anticipates that Section 12.1 (Emergency Events) of the Block Contract would also be triggered. This section permits SPU to curtail supplies to Cascade, on a proportional basis with its retail customers and other wholesale customers. In the event of significant curtailment, Cascade and its Members would need to activate their SMPs in order to manage the situation effectively.

4.4.3 Communication Actions of Emergency Stage

Once the Emergency Stage has been activated by Cascade, Cascade will:

- Inform Cascade Members that they are required to activate their Emergency Stage (or

equivalent actions per each Member's individual SMP). This will not apply to Cascade Members exempted per Section 3.4 of this SMP. Enforcement actions may be needed in the Emergency Stage. Cascade anticipates each Member will enforce restrictions in a manner suitable to the local service area or will work with other local governments having enforcement powers to do so.

- Continue and intensify communication actions from the previous stages, with modifications as appropriate for the Emergency Stage (as determined in consultation with SPU and Cascade Members). This includes, but is not limited to, Cascade's role in supporting effective communications between individual Cascade Members and SPU.

- For Members that have independent supply, request they rely as much as possible on these supplies, to reduce pressure on the Cascade regional supply.

- Alert Members of particular operational problems that may occur with system-wide reduced water consumption, and communicate these to Cascade Members management, operations staff and public affairs staff and on the Cascade website. These could include, for example, taste and odor problems; and reduced pressures in Member distribution systems.

- Assist Cascade Members to define and communicate exemptions for medical facilities and other facilities having key responsibilities for public health and safety.

4.4.5 Operating Actions of Emergency Stage

- Cascade will continue to monitor staffing impacts, training needs and communications strategies and make adjustments where feasible to enhance effectiveness of the regional water shortage response.

- If feasible and applicable, Cascade will make staff resources available to Cascade Members to assist them in the water shortage response. This may include temporary reassignment of Cascade staff; and/or outsourcing of specialized functions or additional staffing resources that could provide assistance to Cascade Members.

- If volunteer services are available and deemed valuable to the water shortage response, and if desired by the Members, Cascade will coordinate volunteers on behalf of its Members.

- If necessary the Board will consider enforcement actions against any Members who do not comply with Emergency Stage actions, as allowed under the Cascade Joint Agreement.

TABLE 1: Triggers for Plan Activation and of Curtailment Stages

TRIGGERS	CASCADE SMP/Stage	MEMBERS
SPU activation plus CEO activation Cascade (Board confirmation); or CEO declaration of emergency (Board confirmation at next meeting); or Board Action	Activation to any of the 4 Stages	
SPU activates to Advisory Stage plus CEO activation (Board confirmation at next meeting); or CEO declaration of emergency (Board confirmation at next meeting); or Board Action	Advisory Stage	Cascade inform and advise Members
SPU activates to Voluntary Stage plus CEO activation (Board confirmation at next meeting); or CEO declaration of emergency (Board confirmation at next meeting); or Board Action	Voluntary Stage	Member compliance required
SPU activates to Mandatory Stage plus Board Action; or CEO declaration of emergency (Board confirmation at next meeting). or Board Action	Mandatory Stage	Member compliance required
SPU activates to Emergency Stage plus Board Action; or CEO declaration of emergency (Board confirmation at next meeting); or Board Action	Emergency Stage	Member compliance required

Table 2: Four Stages of Curtailment

	Advisory	Voluntary	Mandatory	Emergency
Theme of Public Messages from SPU	A shortage may occur soon; get ready.	A shortage has occurred. We are requesting voluntary curtailment to reduce demand by x percent.	A severe shortage has occurred. Mandatory curtailment is necessary and specific uses of water are restricted.	An emergency shortage has occurred. Mandatory curtailment is necessary and public health and safety uses are the priority.
Cascade Communication Actions	• Inform Members they are required to activate their Advisory Stage (see exemptions). • Establish a regular communication mechanism with Members. • Request Cascade Members carry out supply-side management actions. • Participate on SPU's Water Shortage Advisory Group. • Assist Members to acquire and distribute public information materials.	• Inform Members they are required to activate their Voluntary Stage. • Request Cascade Members report to Cascade regarding supply-side management actions. For Members that have independent supply, this may include relying more heavily on these supplies. • Request Cascade Members communicate with their largest customers. • Communicate regularly with Cascade Members. • Communicate with the Washington State Department of Health. • Participate on SPU's Water Shortage Advisory Group. • Assist Cascade Members to acquire and distribute public information materials.	• Inform Cascade Members that they are required to activate their Mandatory Stage, including enforcement as appropriate. • Gather information from SPU on water quality or pressure problems, and communicate these to Members. • Continue communication actions from the Voluntary Stage, with modifications as appropriate for the Mandatory Stage.	• Inform Cascade Members that they are required to activate their Emergency Stage, including enforcement as appropriate. • Continue and intensify communication actions from the Mandatory Stage. • For Members that have independent supply, request they rely as much as possible on these supplies. • Alert Members of particular operational problems that may occur with system-wide reduced water consumption. • Assist Cascade Members to define and communicate exemptions for public health and safety.
Cascade Operating Actions	• Initiate preparation for Voluntary Stage.	• Assess revenue implications remedies. • Initiate preparation for Mandatory Stage.	• Continue operating actions from the Voluntary Stage • Initiate preparation for Emergency Stage. • If necessary consider enforcement actions against any non-complying	• Continue operating actions from Mandatory Stage. • Make staff resources available to Cascade Members. • Coordinate volunteers on behalf of Members.

APPENDIX A

POSSIBLE ADVISORY STAGE WATER CONSERVATION TIPS FOR CUSTOMERS (Adapted from SPU 2006 WSCP)

Conserve Inside

For most households, the vast majority of water is used indoors. Taking conservation actions and installing efficient fixtures help reduce your water use year-round. There are also ways to conserve water in outdoor uses and at work. Below are suggested actions:

- Fix leaking faucets and toilets.
- Wash only full loads in the dishwasher and clothes washer.
- Minimize faucet use when brushing your teeth, shaving and washing dishes.
- Don't pre-rinse dishes unless you need to. Most new dishwashers don't require pre-rinsing.
- Save lukewarm water for watering plants, etc. while you wait for hot water in kitchens and showers.
- If you are buying a new toilet, look for a WaterSense model.
- If you are buying a new washing machine, purchase a high-efficiency model. WashWise rebates may be available for qualified machines.

Conserve Outside

Make the most of the water you will use in the spring and summer:

- Aerate lawns in the spring to better absorb water.
- Mulch planting beds to decrease evaporation.
- Select the right plants for the right place – contact SPU or see our website for information.
- Tune-up and improve your irrigation system - rebates may be available.
- Wash your cars at locations that recycle their water.

Note: For more information on home water conservation tips for inside and out, visit www.savingwater.org or call 684-7283 (684-SAVE)

Conserve at Work

Businesses and institutions can reduce water use and lower utility costs by adopting conservation practices and replacing inefficient equipment or operations.

- Check for leaks.
- Use a broom, instead of a hose, to routinely clean driveways and sidewalks
- Tum off water-using equipment when not in use, including dishwashers, garbage disposals, and food troughs.
- Upgrade equipment efficiency -rebates may be available.
- Increase employee awareness of water conservation.

POSSIBLE VOLUNTARY STAGE CUSTOMER WATER SAVING ACTIONS
(Adapted from SPU 2006 WSCP)

The following voluntary actions are being requested of all customers:

SET A GOAL: Such as use 10% less water

Most customers can easily save 10% by choosing several items from the menu of water saving actions below. If you routinely do outdoor watering, select those actions first. Set a goal to reduce your water use by 10% from the amount you used during the same billing period last year. Most utility bills contain your water consumption for each billing period. Much of the 10% can probably be achieved through conservation actions that are wise to do all the time. If that is not sufficient, then the special curtailment actions listed here can be implemented during the duration of the supply problem.

REDUCE OUTDOOR WATER USE

Conservation Actions:

- **Avoid watering** between 10 AM and 7 PM to reduce evaporation.
- **Stop obvious water waste** such as gutter flooding, sidewalk and street watering, and fix leaks.
- **Never leave a hose running,** always use a shut-off nozzle.
- **Use a broom** rather than a hose or pressure washer to clean sidewalks and driveways.

Curtailment Actions:

- **Reduce lawn watering** (twice a week or less if possible).
- **Let your lawn go dormant.** Customers who choose to not water their lawns should water deeply once each rainless month to keep grass roots alive. To avoid runoff when you water, if the water puddles, cycle your sprinkler on and off until water is absorbed.
- **Refrain from filling** empty pools and hot tubs.
- **Turn off water features** and fountains.
- **Wash vehicles only at car washes that recycle their water.**

REDUCE INDOOR WATER USE

Conservation Actions:

- **Install a water efficient WaterSense toilet.** These toilets have proven to perform well and give long-term water savings. Replacing a frequently used old toilet with a new efficient toilet can save most households in utility bills. Check www.savingwater.org for WaterSense toilet models.
- **Install a high-efficiency clothes washer**. New washers are typically one-third more water efficient than old washers.
- **Wash only full loads in the clothes washer and dishwasher**, or choose an appropriate load-size setting for the number of items in the washer.
- **Turn off the tap** while brushing your teeth, hand-washing dishes or shaving.
- **Fix leaky faucets and toilets**. Put several drops of food coloring in your toilet tank. After 20 minutes, if you have color in the bowl, you have a slow leak that over time can amount to a lot of water.
- **Install an efficient showerhead**. New showerheads work well and use much less water than old high-flow models.
- **Install an efficient faucet aerator**. Replace your older bathroom faucet nozzle (aerator) with one that uses one gallon per minute or less.

Curtailment Actions:

- **Spend one minute less in the shower.** Try to limit showers to five minutes or less.
- **Flush your toilet less often**. Toilet flushing is the largest water use inside the home. As the saying goes, "If it's yellow, let it mellow."

REDUCE WATER USE AT WORK

There are a wide variety of opportunities for businesses and agencies to reduce their water use and operating expenses.

Conservation Actions:

- **Check cooling towers**. Cooling towers - and the ways that they regulate water use – represent real opportunities for improving water efficiency.
- **Check for and fix leaks**. Toilet and urinal leaks are very common. Investigate obvious or suspected leaks.
- **Use a broom**, instead of a hose or pressure washer, to routinely clean driveways and sidewalks.
- Turn off water-using equipment when not in use, including open hoses, dishwashers, garbage disposals, and food troughs.
- **Check air conditioners, refrigerators, and ice machines**. If your company's air conditioners or refrigerators use water-cooled condensers, investigate air-cooled equipment for possible efficiencies. Rebates are available. Visit www.savingwater.org.
- **Install water-efficient toilets, urinals and faucets** in public and employee restrooms. Replacing old toilets, urinals, and faucet aerators with efficient ones can produce substantial savings. Rebates are available. Visit www.savingwater.org.
- **Reuse process water**. Water used in industrial and manufacturing processes should be reused as often as possible. Rebates are available. Visit www.savingwater.org.
- Hospitality businesses can offer guests the option of clean linens each day.
- **Increase employee awareness of water conservation** through management memos or newsletter messages. Install signs that encourage water conservation in restrooms or work areas where water is used. For additional work-related conservation tips, call (206) 343-8505.

Curtailment Actions:

- **Reduce outdoor watering** (twice a week or less if possible). Rebates are available for smart irrigation technologies. Visit www.savingwater.org.
- **Minimize vehicle washing**, defer or use a water recycling car wash.
- **Turn off** decorative water fountains.
- **Serve water only on request** at restaurants. Avoid thawing with running water.

For home water conservation tips, visit www.savingwater.org or call (206) 684-7283 (684-SAVE)

APPENDIX B:

Seattle Public Utilities'

Water Shortage Contingency Plan

SEATTLE PUBLIC UTILITIES

WATER SHORTAGE CONTINGENCY PLAN

July 2006

SUPPLEMENT TO THE SEATTLE PUBLIC UTILITIES
2007 WATER SYSTEM PLAN

SEATTLE PUBLIC UTILITIES
WATER SHORTAGE CONTINGENCY PLAN
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SEATTLE PUBLIC UTILITIES
WATER SHORTAGE CONTINGENCY PLAN

SECTION I

INTRODUCTION

This plan provides guidelines for Seattle Public Utilities (SPU) to manage water supply and demand in the event of a supply problem. Such problems could include imminent supply disruptions resulting from a major pipeline failure as well as forecasted water supply shortages due to droughts. "Water shortage" as is discussed in this document means that SPU will not have the normal amount of water to provide to its customers. It is extremely improbable that SPU would ever run out of water. The stages noted in the plan will be implemented depending on the magnitude of the water shortage. This document supplements the *2007 Water System Plan*, and updates the April 2001 Water Shortage Contingency Plan (WSCP).

OBJECTIVE OF WSCP

The objective of the WSCP is to establish actions and procedures for managing water supply and demand during water shortages. The plan enables SPU to maintain essential public health and safety and minimize adverse impacts on economic activity, environmental resources and the region's lifestyle.

INTEGRATION INTO OTHER EMERGENCY PLANNING

A discussion of how SPU will respond to non-drought water emergencies, such as a major transmission pipeline break, is provided in Section 4 of this plan.

RELATIONSHIP TO WHOLESALE CUSTOMERS' WSCPS

There are approximately 1.45 million people living in the areas served by SPU and our wholesale water customers. SPU provides water to utilities in much of King County and a small part of Snohomish County. SPU has contracts with 21 wholesale customers, including the Cascade Water Alliance, which wholesales water to eight utilities in the region. Water supply disruptions affect Seattle, Seattle's wholesale customers, and their respective retail customers.

SPU's wholesale contracts include a provision that wholesale customers will assist and support emergency curtailment measures required to manage demand during an emergency or shortage. This plan has been developed by SPU, in consultation with its wholesale customers and other participants, based on the premise that an effective demand management strategy must be regionally consistent. This is based on several considerations:

- Public support and cooperation is likely to be higher if actions are equitable, i.e., all water users are experiencing the same service level and degree of hardship.

- A unified message and approach is easier to understand and distribute through the media, which is key in communicating information to the public.

- Consistency makes it easier for Seattle to forecast demand reductions, which is essential to effectively manage the system during a water shortage.

SECTION 2

OVERVIEW OF DROUGHT MANAGEMENT STRATEGY

This Water Shortage Contingency Plan focuses on weather-related water shortages – generally referred to as "droughts." Droughts are naturally occurring unpredictable weather events of varying frequency, duration and severity. In the region served by the Seattle Regional Water System, available data indicate a very low probability of a multi-year drought, but the region has experienced short-term droughts.

This region is generally faced with a relatively dry summer period. In the Seattle area, only about 5 of our 37 inches of annual precipitation fall during the summer months (based on National Weather Service data for 30-year average at SeaTac Airport). The Seattle Regional Water System operates with an annual refill and drawdown cycle of its water supply storage reservoirs. Highly unusual weather events affect this cycle and can cause water shortages.

TYPES OF DROUGHTS BY SEASON

The types of droughts that affect the Seattle Regional Water System range from poor snowpack accumulation in the winter to delayed onset of rains in the fall. Since the nature of these droughts varies, Seattle's response will also vary. The types of droughts the system has experienced can be categorized by season as follows:

Winter/Spring Drought

Low snowpack is the primary issue with winter/spring droughts. While a below normal snowpack may not lead to poor water supply conditions if ample spring rains occur, caution is used in managing the water supply in these situations because rainfall is inherently difficult to forecast. Below normal snowpack can occur during a winter when mountain temperatures are warm, when precipitation is below average, when intense rainfall events melt off low to mid-elevation snow cover, or through a combination of these factors. Tracking El Niño events, which are typified in the Pacific Northwest by warmer and drier than average winter conditions, can alert water managers to the increased potential of a winter/spring drought. Seattle's use of the dynamic rule curve – varying reservoir storage targets based on real-time snowpack measurements and soil moisture estimates – in these types of droughts helps to ensure that our reservoirs are as close to full as possible at the start of the summer drawdown cycle.

When winter/spring drought conditions result in low water supply availability, water use restrictions may need to be imposed because the potential for water use reductions by customers is greater in the spring and summer, there is much uncertainty about impending summer weather which is so influential on demand, and weather forecasts of when the fall rains will begin are not reliable. These conditions generate uncertainty about whether water stored in the spring will be sufficient to meet demands until supplies are replenished in the fall. This can make the imposition of water use restrictions in the

spring and summer necessary, despite the fact that in some years no water shortfall may ever really develop.

Summer/Fall Drought

In years in which reservoirs refill as normal in early summer, droughts can still develop over the summer and extend into the fall if summer demands are high and inflows to the reservoirs drop below normal levels for an extended period of time. These types of droughts require careful monitoring of summer demands and water supply. Unfortunately, it is not possible to accurately predict in advance the timing and amount of the fall rains. When these types of droughts become apparent, and are significant, Seattle will ask for curtailments and prepare to use emergency storage at Chester Morse Lake should it be needed later in the year (see below for details on the pumping plants at Chester Morse Lake).

Fall/Early Winter Drought

Fall is the time when demands for fish habitat needs are especially high and the ability for people to cut back on water is limited since little water is being used for landscape irrigation. These factors can make fall droughts particularly challenging. Droughts can occur in the fall, and extend into the early winter. When the normal rainy season develops later than normal, storage reservoirs can be depleted to minimum levels. For this reason, the emergency pumping plants at Chester Morse Lake are maintained and may be used if needed to allow use of "dead storage" below the lake's natural outlet. Other emergency supplies that may be activated in these types of droughts are discussed later in this WSCP.

Attachment A provides examples of past drought events that resulted in Seattle activating its Water Shortage Contingency Plan.

MANAGING INSTREAM FLOWS DURING WATER SHORTAGES

The management of stream flows downstream of Seattle's water storage and diversion facilities is a critical consideration in managing water resources during water shortages. In addition to meeting the needs of SPU's retail and wholesale customers, the Cedar and South Fork Tolt rivers are managed to protect instream resources. Seattle has ongoing formal and informal agreements with state, federal and local resource agencies, Indian Tribes and the U.S. Army Corps of Engineers that help guide how it manages streamflows. Streamflow management in the South Fork Tolt is governed by the South Fork Tolt River Settlement Agreement. Cedar River flows are governed by the Cedar River Instream Flow Agreement, a component of the Cedar River Watershed Habitat Conservation Plan (HCP). These agreements provide guaranteed flow regimes as well as adaptive features to ensure that water is released from Seattle's mountain storage reservoirs in a manner that provides beneficial conditions for salmon and other species downstream of the Seattle's reservoirs. During substantial portions of the year, total runoff into the Cedar River and South Fork Tolt basins can exceed the amount required to meet municipal demands and the guaranteed flow regime. This additional water is managed adaptively and in collaboration with the Cedar River Instream Flow

Commission and Tolt Fisheries Advisory Committee in an effort to further enhance conditions for instream resources. The protective provisions of the governing agreements are particularly important during droughts and associated periods of low stream flow.

The Cedar River also provides approximately half of the inflow to Lake Washington on an annual average basis. The U.S. Army Corps of Engineers manages Lake Washington lake levels as part of its Lake Washington Ship Canal Project (Hiram Chittenden Locks in Ballard) which connects Lake Washington to the saltwater of Puget Sound. Their management objectives include providing water flows at the Locks for navigation, fish passage, and control of the salt water intrusion caused by operation of the Locks.

DROUGHT MANAGEMENT STRATEGY

Seattle's strategy for dealing with the hydrologic uncertainty associated with drought management involves several components:

- Monitoring current conditions,
- Forecasting,
- Communication,
- Operational Adjustments,
- Curtailment Actions, and
- Alternative Water Supplies.

During years in which precipitation is significantly below normal, Seattle expands and utilizes these management strategies as explained below.

Monitoring Current Conditions

To deal with hydrologic uncertainty in real-time and in longer term planning horizons, Seattle's water resource management team uses a number of available informational and data gathering sources. Seattle contracts with the U.S. Geological Survey (USGS) to provide continuous streamflow monitoring and data collection services. Strategic placement of USGS stream gauging stations provides real-time information for understanding the hydrologic state of the water supply and river systems. Seattle also contracts with the Natural Resources Conservation Service (NRCS) to provide real-time snow monitoring and weather data collection services.

Forecasting

Through the National Oceanic and Atmospheric Administration (NOAA), Seattle regularly monitors daily weather forecasts (National Weather Service Seattle Forecasting Office), mid-range weather forecasts (National Centers for Environmental Prediction), 30- and 90-day and multi-season climate outlooks (Climate Prediction Center), and daily hydrometeorological forecasts (Northwest River Forecast Center in Portland, Oregon). The internet provides access to vast amounts of additional useful information to assist SPU in forecasting. For example, NOAA's web information on El Niño/La Niña provides a wealth of timely information on current and forecasted El Niño and La Niña conditions with enough lead time for water resource managers to prepare for such events.

Seattle uses a number of analytical tools for forecasting hydrologic conditions as they relate to water supply and fisheries including:

- Streamflow forecasts prepared by the USGS and NRCS.
- Weather, climate and river forecasts from NOAA.
- In-house reservoir management and streamflow forecasts using a computer model known as the Seattle Forecast Model, or SEAFM. This model is regularly updated with hourly meteorological and hydrological data, and simulates the current state of the watershed (including snowpack, soil moisture, aquifer storage, and streamflows) and water supply system. The model is used to analyze and assess various future reservoir operating scenarios, both in real time and in near- and long-term operational planning, based on probabilistic analysis of over 70 years of historic weather; and
- Seattle's Conjunctive Use Evaluation (CUE) model, which is a weekly time step simulation model used for calculating and evaluating the firm yield and reliability of Seattle's water supply system and potential future water supply projects. While not a forecast tool, per se, the model provides valuable insight into the hydrologic record.

Communication

SPU's Water Resources Management staff work closely with members of other city, local, state, federal and tribal resource agencies, including Seattle City Light, City of Renton, King County, Washington State Department of Ecology, Washington State Department of Fish and Wildlife, U.S. Army Corps of Engineers, U.S. Fish and Wildlife Service, National Marine Fisheries Services, Muckleshoot Indian Tribe and Tulalip Tribes.

The interagency Cedar River Instream Flow Commission established by the Cedar River Watershed HCP, convenes in regularly scheduled meetings once per month throughout the year to oversee Seattle's instream flow management on the Cedar River. Additional meetings, in person or by conference call, are scheduled on an as needed basis, especially during periods of water shortages. The interagency Tolt Fisheries Advisory Committee, established by the South Fork Tolt River Settlement Agreement convenes on an as needed basis throughout the year and is the primary forum for interagency technical communications related to that river during water shortages.

In addition to the communications noted above, throughout this plan are references to communication to customers, stakeholders and the media. What is in this plan regarding communications is guidance. It may be appropriate to do more or less communication depending on the particular circumstances of the water shortage.

Operational Adjustments

Specific operational actions that will be made to reduce all non-essential water use are provided in Section 3 for each WSCP stage. Below is a discussion of how Seattle's water supply reservoirs are managed for people and fish during droughts.

Management of Water Supply for People and Fish

Operational flexibility is key, with operating plans changing as conditions and forecasts change. SPU has developed "dynamic rule curves" to operate its mountain reservoirs in the winter season. These rules set target reservoir levels that vary with watershed snowpack and soil moisture conditions. At times when there is little snowpack and low soil moisture, the reservoir target will be set higher than normal flood control levels, and vice versa. Dynamic reservoir rule curves are used to adjust operations to actual watershed conditions and to help manage risk and uncertainty. Also, periodic salmon and steelhead redd surveys are undertaken during seasonal fish spawning events that enable informed management decisions to be made that seek to ensure adequate flow levels are provided during critical fish incubation and emergence periods.

Curtailment Actions

Customers will be asked to take actions to curtail their use of water during a shortage. Those actions will depend on the stage of the WSCP being implemented at the time. Examples of potential water saving actions are noted in Section 3.

Criteria for Curtailment During a Water Shortage

There are several criteria for deciding which curtailment measures are appropriate to reduce demand during a water shortage:

- Timing: Can the measures or actions produce results in the necessary timeframe?
- Magnitude of savings: Will the measures or actions result in enough savings to make a meaningful difference; i.e., reduce demand to the level the impaired water system can handle?
- Season: Are the actions or measures relevant to the time of year; i.e., banning lawn watering during the summer irrigation season vs. during non-irrigation season?
- Costs: How severe are the cost implications of the measure to the customer, including local business and industry, relative to the need for action? Note: While there could be costs to certain customers, which would be considered, particular actions still may be necessary for public health and safety reasons.

Exit Strategy for WSCP Stages

As soon as actual and forecasted supply conditions substantially improve, SPU will either inform the public of the return to normal use of water, or inform them that the utility is moving from one stage to a lesser stage of this plan. This latter process would occur until there was a return to normal operations. Stages could be skipped in this process as conditions and forecasts warrant.

Alternative Water Supplies

Depending on the nature and timing of a water shortage, alternative or emergency water supplies may be useful to supplement existing supplies. SPU has several options available:

- Chester Morse Lake "Dead Storage" – Seattle's primary storage reservoir has a natural, gravity fed outlet. When inflows to the reservoir are low, its water surface elevation can fall below the natural outlet, but still contain a substantial amount of high-quality water in what is called "dead storage." In 1987, Seattle installed the first of two emergency pump stations to pump the water over the natural outlet and into the river, thereby augmenting both instream flows and water availability for customer use. The second Morse Lake Pumping Plant was installed in 1992. These pumping plants allow use of dead storage during drought emergencies.

- Interties - Since water supply problems will not affect all water suppliers in the region to the same extent, it is sometimes feasible for SPU and its wholesale customers to obtain water from other providers through interties.

- Reclaimed water - Reclaimed water is highly-treated effluent that may be used instead of potable water for irrigation, street washing, construction purposes, etc., in order to reduce demand for potable water and lessen the impact of shortages on the community. Currently there are some significant constraints on the use of reclaimed water during a shortage, e.g., lack of availability, cost and safety of trucking or piping water over long distances. It is important to note, however, that if reclaimed water becomes more widely available in the region and becomes less expensive it may become prudent for SPU to draw on it as a limited back-up supply during water shortages, for non-potable uses only. If reclaimed water is used it would be in adherence with applicable state regulations governing reclaimed water use.

A key assumption of this plan is that abundance, shortage and risk must be shared among all beneficiaries of the water resource. For example, critical minimum instream flow levels at locations specified in the Tolt and Cedar agreements referenced above are resorted to only after human water consumption is curtailed. All of the tools, information sources and communications outlined above, are needed for coordinating and making decisions related to real-time operations.

WATER SHORTAGE CONTINGENCY PLAN PRINCIPLES

SPU has learned a great deal over the years about how best to operate the utility during drought events, while minimizing impacts to customers and instream resources. This knowledge is reflected in this Water Shortage Contingency Plan, and articulated in the following principles:

- Given clear, timely and specific information on supply conditions and the necessary actions to forestall worsening conditions, customers prefer the opportunity to meet targeted demand reduction levels through **voluntary** compliance measures. The decision to move to mandatory restrictions is more acceptable if the voluntary approach has been tried first but has not resulted in enough demand reduction to ensure public health, safety and adequate streamflows through the projected duration of the shortage.

- Each drought or other shortage situation has enough unique characteristics that a plan cannot specifically define all the scenarios and specific supply and demand management actions. The usefulness of a Water Shortage Contingency Plan lies in planning the range of supply and demand management actions in advance of the situation, and in defining the communication mechanisms by which decisions will be made during the event.

- Given the highly-effective long-term regional conservation program operated by SPU, it is important to distinguish between the short-term **curtailment** measures necessitated by a water supply problem, and the **conservation** measures SPU regularly promotes to its customers. Conservation focuses on long-term efficiencies which do not adversely affect customers' accustomed use of water, whereas curtailment measures involve short-term water use reductions that can create hardships.

- It is essential to closely monitor water quality during droughts and particularly during a warm weather drought. This applies to water quality in rivers as well as to the drinking water provided to customers. Water quality issues must be considered for drinking water and instream uses when supply management decisions are made. The Seattle water distribution system is designed to carry a large capacity of water during summer peak months. If demand is significantly lowered, water will not move through the system at the "design" rate. The slower moving water, coupled with higher summer temperatures will increase the likelihood that drinking water quality problems may arise.

SECTION 3

PHASED CURTAILMENT PLAN

OVERVIEW OF PLAN STAGES

This plan provides four stages of response based on increasing severity, as progressively more serious conditions warrant. This type of response would be appropriate for a drought or other long-range disruption. It is the role of the Mayor of Seattle to officially activate the WSCP, when necessary. The four response stages include a variety of communications, internal operations, and supply and demand management strategies as appropriate, and are characterized as follows:

- **Advisory Stage** - The public is informed as early as meaningful data are available that a water shortage may occur.

- **Voluntary Stage** - If supply conditions worsen, the plan moves to the Voluntary Stage which relies on voluntary cooperation and support of customers to meet target consumption goals. During this stage, specific voluntary actions are suggested for both residential and commercial customers.

- **Mandatory Stage** - If the Voluntary Stage does not result in the reduction needed, or supply conditions worsen, the Mandatory Stage would be implemented. This stage prohibits or limits certain actions, and may be accompanied by an enforcement plan which could include fines for repeated violation.

- **Emergency Curtailment** - This stage addresses the most severe need for demand reduction and includes a combination of mandatory measures and rate surcharges. This would be used as the last stage of a progressive situation, such as a drought of increasing severity, or to address an immediate crisis, such as a facility failure.

PREPARATION FOR IMPLEMENTING WSCP STAGES

Recommendations about implementing the WSCP are made to the SPU Director by the SPU Water Shortage Response Team formed at the direction of the Director. Suggested team membership is provided in Attachment B. The actual composition of the team may change at any time as requested by the Director. This team, involving key departmental staff, would meet as often as appropriate to consider many or all of the following factors in making its recommendations about entering into any stage of this WSCP and modifying its recommendations as conditions change:

- total supply availability, including groundwater, interties, and modified instream flow releases
- the rate of decline in total reservoir storage compared with typical rates
- short- and long-term weather and hydrologic forecasts

- computer modeling of streamflow and reservoir storage, for different weather and demand assumptions (see Attachment C for possible demand management scenarios)
- the trends and forecasts of the system's daily water demands
- recommendations from the Water Shortage Advisory Group (if it has already been formed, if not yet formed, move forward in creating this group, see Attachment B for suggested role of this group and membership)
- recommendations from the Cedar River Instream Flow Commission and the Tolt Fisheries Advisory Committee
- the estimated margin of safety provided by the demand reduction, compared with the level of risk assumed if no action is taken
- potential water quality issues
- increased operating costs of potential actions and the value of lost water sales revenue, compared with the increased margin of reliability (see Attachment D for estimated costs and revenue losses for different stages of the WSCP)
- consultation with elected officials, wholesale customer representatives, state resource agencies, the Army Corps of Engineers and Tribes
- the length of time between stage changes (abrupt starts and stops are to be avoided, at least two weeks between stages is best to allow time to prepare)
- current events
- customer response, and
- water use consumption goals to be achieved, which may be revised as needed.

An SPU staff member is to be identified by the SPU Director to lead the water shortage response effort before it is activated.

The SPU Director will communicate the nature and scope of WSCP stage measures and strategies to the Mayor and Seattle City Council prior to implementing the WSCP and receive their input. The Director will communicate regularly throughout the shortage with the Mayor and City Council.

Preparation Between Plan Stages

When SPU is considering moving from one stage of the plan to another the department evaluates the need for doing so using much of the same information as noted above. Prior to moving to different stages of the plan, SPU will plan to consult with key stakeholders. There are also a number of preparatory measures that need to occur prior to moving from one stage to another, including, but not limited to: modifying any communication materials including customer water saving measures for the given stage, and "Questions and Answers" for customer groups, the determination of any staffing reassignments needed, and estimated costs and plans for covering those costs.

ADVISORY STAGE

Objectives

- Prepare the Department, City, relevant agencies and water users for potential water shortage thereby allowing all parties adequate planning and coordination time.

- Undertake supply management actions that forestall or minimize the need for more stringent demand or supply management actions.

Triggers

As presented earlier, there are a variety of weather and other conditions that may cause concern about water availability and a potential water shortage. SPU will enter the "Advisory Stage" if supply conditions and supply forecasts raise significant concerns about the utility's ability to meet supply needs later in the year.

Public Message

"Potential exists for lower than normal supply; conditions **may** return to normal, or later on, we may need to reduce consumption. Continue to use water wisely to help ensure sufficient supply for people and fish. We'll keep you informed."

Communication Actions

- Step-up and/or alter message of ongoing media education effort about the water system, particularly relationship of weather patterns to supply and demand; provide up-to-date data and implications for water use, if known.

- Initiate report to wholesale customers and request that they trigger their WSCPs.

- Provide periodic updated information on supply and demand data to SPU's wholesale customers via SPU's web page, or other means.

- Meet with landscape industry representatives to inform them of current and projected conditions; develop partnership programs and informational materials on the shortage, consumption goals, etc. for distribution by industry and utilities. Use landscape industry newsletter to communicate with industry members. As appropriate, communicate essential information via email by using Resource Conservation's professional landscape industry database.

- Communicate with other special interests, e.g., large water users including parks, and major water using industries and provide periodic updated information to a variety of key customers (see Attachment E for a list of key contacts and Attachment F for potential Advisory Stage tips for saving water).

- Step-up communication and encourage cooperation of City departments and other public agencies, including: state and federal resource agencies, tribes, and other

regional water suppliers, including the Cities of Everett and Tacoma, about water supply conditions and projections.

- Prepare and distribute public information materials explaining the Water Shortage Contingency Plan stages and communicate water use efficiency tips to customers (see Attachment F).

Operating Actions

- Increase data collection actions (i.e., streamflows, snowpack conditions, etc.) and monitoring weather forecasts.

- Increase SPU's computer modeling runs of projected supply, storage, demand and revenue scenarios.

- Identify and implement supply side management techniques to optimize existing sources.

- Assess current water main flushing and reservoir cleaning activities to determine whether they should be accelerated to be completed prior to the peak season or reduced to conserve supply; communicate strategy to wholesale customers.

- Assess water quality in reservoirs and distribution system to identify areas that may experience severe degradation with reduced consumption.

- Initiate planning and preparation for Voluntary Stage actions, including an assessment of potential staffing impacts, training needs, and communications strategies.

VOLUNTARY STAGE

Objectives

- Take necessary supply management actions to further stretch available supply.
- Maintain or reduce demand to meet target consumption levels by customer voluntary actions.
- Forestall or minimize need later for more stringent demand or supply management actions.
- Minimize the disruption to customers' lives and businesses while meeting target consumption goals.
- Maintain the highest drinking water quality standards throughout the shortage.

Triggers

The "Voluntary Stage" will be implemented when one or both of the following factors applies: 1) supply conditions have not improved, or have worsened, 2) demand levels need to be reduced given supply conditions.

Public Message

"Demand needs to be reduced by _____%. Customers are responsible for determining how they will meet that goal. We are relying on support and cooperation of all water users to stretch the available water supply. If everyone cooperates, we may avoid imposing more stringent restrictions. In addition to meeting essential water needs of customers, meeting the needs of fish habitat and other environmental concerns is a priority."

Communication Actions

- Communicate regularly with wholesale customers, groups that may be especially impacted by the water shortage, tribes, and resource agencies.
- Continue to communicate with other City departments and other public agencies to inform them of conditions, and encourage their cooperation.
- Identify and communicate actions taken by City departments to meet the voluntary curtailment goal.
- Consult with the Water Shortage Advisory Group, throughout the shortage, to help develop public information messages and materials and to obtain feedback on utility shortage actions.
- Develop and initiate a strategic public information, media and advertising campaign appropriate to the severity of the problem and the goal for demand reductions. This

could include publishing consumption information in daily newspapers to communicate the goal and ways to reduce consumption.

- Establish routine timing for press releases (e.g., every Monday morning) that provide current status and outlook; present information in standardized format that becomes familiar to media and public.

- Provide recommendations for customer actions to reduce consumption. See Attachment G for a list of recommended actions for this stage. Encourage customers to visit the *savingwater.org* website for more details on reducing water use.

- Include drinking water quality information in public information so that if flushing is necessary, the public understands that it is essential for drinking water quality maintenance.

- Publicize the water supply conditions web page, which is updated regularly. Ensure the information provided covers the needs of all key interests: the public, news media and key customers.

- Continue and intensify coordination and communication with state and federal resource agencies and tribes about supply conditions, demand management actions and streamflow levels.

- Establish and promote "hotlines" or websites for customers to obtain additional water conservation information.

- Contact largest customers to request percentage reduction.

- Establish regular communication mechanism to keep Department employees up to date on goals, conditions, and actions, especially utility account representatives that are tracking costs associated with the water shortage.

- Respond to customer correspondence regarding the shortage as quickly as possible and acknowledge receipt of correspondence if information is not readily available.

Operating Actions

- Continue actions listed in the Advisory Stage.

- Increase drinking water quality monitoring.

- Communicate flushing restrictions based on contract type to wholesale customers; eliminate demand metering charges, if demand metering is in effect.

- Assess revenue implications and potential remedies, including reprioritizing current revenue, reprioritizing expenses, and potential withdrawals from the revenue stabilization fund.

Supply and Demand Management Actions

Based on the consumption goal, some or all of the following actions will be taken. **Those actions that are asterisked (*)** will be considered initially for implementation if demand reductions more than 10 percent are necessary, or later if voluntary measures are not delivering targeted savings.

Supply Actions

- Eliminate all operating system water uses determined to be non-essential to maintain drinking water quality such as pipeline flushing, reservoir overflows. Complete cleaning of any in-town reservoirs only as needed.

- Request that wholesale customers who have alternative sources use them.*

- Request the Corps of Engineers to reduce flow requirements and modify use of the Chittenden (Ballard) Locks.*

- Investigate using any existing interties to increase supply availability.*

- Begin to ready the pumping plants on Chester Morse Lake.*

- In coordination with state and federal resource agencies and tribes, review stream flow levels.

Demand Actions

- Restrict hydrant permits to essential purposes.*

- Request that Fire Department limit training exercises that use water.

- Request that City and County agencies eliminate washing of fleet vehicles unless water recycling car washes are used.

- Attachment G provides many possible actions customers can take to reduce water use. The actual actions requested at the time will depend on the specific demand reduction goal and the possible savings that can be achieved at that time.

- Evaluate ability to accelerate or enhance or expand long-term conservation programs; implement as appropriate.

MANDATORY STAGE

Objectives

- Achieve targeted consumption reduction goals by restricting defined water uses.
- Ensure that adequate water supply will be available for the duration of the situation to protect public health and safety and to balance the need for stream flows for instream resources, including fish habitat.
- Minimize the disruption to customers' lives and businesses while meeting target consumption goals.
- Maintain the highest drinking water quality standards throughout the shortage.
- Promote equity among customers by establishing clear restrictions that affect all customers.

Triggers

The "Mandatory Stage" will be implemented if supply conditions have not improved, or the level of demand needs to be further reduced.

Public Message

"It is necessary to impose mandatory restrictions to reduce demand because the voluntary approach has not resulted in the necessary savings [*or* conditions have continued to get worse and even more savings are needed]. We are continuing to rely on the support and cooperation of the public to comply with these restrictions, but need the certainty and predictability of restricting certain water uses in order to ensure that throughout the duration of this shortage an adequate supply of water is maintained for public health and safety."

Communication Actions

- Inform the public about the nature and scope of the mandatory restrictions through a press conference, potentially paid advertising and other means. The enforcement mechanisms, rate surcharges (if the City determines that a surcharge should be implemented at this stage), target consumption goals, projections for how long restrictions will be in place and the reasons for imposing restrictions will also be identified, as will the possible consequences if goals are not met.
- Identify clearly any exemptions from restrictions.
- In communicating mandatory restrictions to the public, distinguish clearly between lawn/turf watering and watering gardens since lawns and turf can go dormant in the summer. The type and amount of watering allowed will be clearly defined.

- Urge customers who irrigate with private wells, reclaimed or recycled water to install signs to let the public know the type of water being used.

- Continue and enhance communication actions from the Advisory and Voluntary stages.

- Prepare plans to move into the fourth stage - Emergency Curtailment - and begin preparatory measures, as appropriate.

Operating Actions

- Continue appropriate actions from previous stages.

- Increase drinking water quality monitoring as necessary to ensure the water supply and demand management strategies will not result in unacceptable drinking water quality.

- Make reclaimed water available to tanker trucks for street cleaning, construction projects, landscape irrigation, dust control, etc., if practical.

Supply and Demand Management Actions

Supply Actions

- Commence emergency pumping of Chester Morse Lake when water levels are several feet above the rim of the natural lake and gravity flow is no longer sufficient, if needed.

- Continue intensive supply side management measures, including possible changes in instream flow releases in consultation and cooperation with the Corps of Engineers, Tribes, and state and federal resource agencies.

- If not already implemented, activate interties and any other alternative sources of supply, as feasible.

Demand Actions

- Finalize and implement procedures for exemptions from restrictions.

- Consider implementing rate surcharges to accelerate customer compliance with the restrictions, as authorized by the Director. These could potentially be implemented as outlined under the Emergency Stage of this plan.

- Adopt Council legislation on mandatory restrictions and on rate surcharges, if surcharges are to be implemented.

- Intensify communication of actions that customers should be taking that are identified in Attachment G, and modify if needed.

- If supply conditions continue to deteriorate and irrigation is still occurring, before moving to the Emergency Curtailment Stage, lawn watering will be restricted. Newly installed lawns may be watered according to certain guidelines, if procedures described in the section below are followed.

- Possible water restrictions are noted below. The nature of the restrictions used will depend on the severity and timing of the situation:

  - Prohibit all watering during the warmest hours of the day, for example between 10:00 a.m. and 7:00 p.m.

  - Limit all watering to a specific number of days per week or per month. This choice will depend on target consumption goals, the time of year and the extent to which watering is occurring, and how much demands have already decreased. For example, if demand has already been reduced by 15% through other measures, during July and August limiting turf watering to **two** days a week on a region-wide basis could further reduce average daily demand by as much as 15 million gallons. Limiting lawn or turf watering to **one** day a week could yield an additional average daily reduction of up to 15 to 20 million gallons.

  - Ban lawn watering (see exemptions section below), with other watering prohibited during the warmest hours of the day, for example, between 10:00 a.m. and 7:00 p.m. Note: This should be considered only when the less stringent measures noted above have been tried and found inadequate; it would be best to consult with utility and landscape partners before taking this action.

- Other possible restrictions are noted below. Again, the nature of the restrictions used will depend on the severity and timing of the situation:

  - Prohibit use of any ornamental fountain using drinking water for operation or make-up water.

  - Prohibit car washing except at commercial car wash facilities that recycle water.

  - Rescind hydrant permits.

  - Prohibit washing of sidewalks, streets, decks or driveways except as necessary for public health and safety.

  - Limit pressure-washing of buildings to situations that require it as part of scheduled building rehabilitation project (e.g., painting).

  - Prohibit water waste including untended hoses without shut-off nozzles, obvious leaks and water running to waste such as gutter flooding and sprinklers/irrigation whose spray pattern unnecessarily and significantly hits paved areas.

Possible Exemptions from Water Use Restrictions

Categories of possible exemptions include: new lawns, new landscapes, sport fields and golf courses, ball fields and play fields, use of water for dust control at construction areas and other areas to comply with air quality requirements. The exemptions noted in Attachment H are possibilities for SPU to consider in creating actual exemptions at the time of the event.

EMERGENCY CURTAILMENT STAGE

At this stage, SPU recognizes that a critical water situation exists and that, without additional significant curtailment actions, a shortage of water for public health and safety is imminent. This type of situation has never occurred in the Seattle water system's history.

This stage is characterized by two basic approaches. First, increasingly stringent water use restrictions are established. Secondly, significant rate surcharges are used to increase customer compliance. A surcharge is a key component to the success of this stage.

Objectives
Strive to meet the water use goals established for this stage, recognizing that customers' lives and businesses may be significantly impacted in order to achieve necessary water savings.

Triggers
The water savings needed to ensure sufficient water is available for public health and safety throughout the water shortage are not being achieved, or conditions have worsened, therefore, more stringent measures are needed.

Public Message
"We are in an emergency water supply situation and need the immediate assistance of the public to achieve necessary water savings. We are imposing additional water restrictions and a rate surcharge to achieve the savings because the mandatory approach has not resulted in sufficient savings [*or* conditions have continued to get worse], and we need to ensure water will be available for public health and safety throughout this shortage."

Communication Actions
- Continue and intensify all previous, applicable actions.
- Define the problem to the public as an emergency and institute formal procedures to declare a city emergency.
- Inform customers of the rate surcharge and how it will affect them. Provide information on an appeal process.
- Coordinate with police and fire departments requesting their assistance in enforcing prohibition of water waste, if authorized by the Director.
- Inform customers that taste and odor water quality problems may occur with system-wide reduced water consumption.
- Inform customers about possible pressure reductions and problems that may occur, if any, due to the emergency water supply situation.

- Define and communicate exemptions for medical facilities and other public health situations.

Operating Actions

- Continue actions listed in prior stages.

- Curtail fire line testing unless it can be shown to be essential to protect the immediate public health and safety.

- Further enhance drinking water quality monitoring actions.

Supply and Demand Management Actions

Supply Actions

- Continue actions listed in prior stages.

- Work with Army Corps of Engineers to substantially limit use of the Hiram Chittenden Locks.

Demand Actions

- Implement rate surcharges to accelerate customer compliance with the restrictions, as authorized by the Director. These could potentially be implemented as follows:

  Commercial Customers - Commercial, multifamily and industrial users would be asked to reduce water use by a set percentage of their consumption during the same period in the previous year. Emergency rate surcharges would be established to provide an additional incentive to reduce water use. It is SPU's intention to establish a two-tiered structure. This "variable block approach" would allow for two different surcharge rates: one on the first block and a higher rate on the second block. These "blocks" would be based on the individual customer's consumption during the same period in the previous year. For example, if we were to target desired consumption to be 85% of the previous year's consumption in that period, any consumption between 0% and 85% would be billed at one rate and any consumption over 85% would be billed at the second, much higher rate. In this way, the targeted reduction amount and resulting surcharges would be customized around each customer's water use patterns, while still resulting in a steep surcharge for consumption in excess of the target amount for each block.

  A billing system modification would be needed to allow SPU to accomplish this. If this has not been done by the time it may be needed, a simple across-the-board rate surcharge would be applied.

  Residential Customers - A three-tiered, increasingly steep rate structure would be implemented for residential customers (includes single-family dwellings and

duplexes). While there are differences in household size, there is more similarity in residential domestic water use than there is in commercial water use.

Exemption from Rate Surcharge for Special Medical Needs - The utility will exempt customers with special medical needs such as home dialysis from a rate surcharge, provided individual customers notify the utility of such a need.

- Prohibit all lawn and sport field watering, with no exemptions.
- Require that all fire fighting agencies discontinue the use of water in training exercises until emergency is over.
- Rescind all hydrant permits.
- Require local parks departments to close down pools.

SECTION 4

NON-DROUGHT WATER EMERGENCY CURTAILMENT PLAN

INTRODUCTION

Although many of the demand reduction measures employed would be similar to those used during a progressive, weather-related shortage, non-drought water emergencies are unique because of a lack of preparation time and the urgency of immediate, potentially large-scale demand reductions. Each emergency scenario is different, but many could require major curtailment actions by customers. Also, unlike droughts, some emergencies may be very localized, requiring demand reduction for only a limited geographic area within the SPU service area.

In order to provide a frame of reference for future emergency situations, a short discussion of potential major water emergencies is provided here. This WSCP complements SPU's Emergency Response Plan. That plan is a supplement to the City of Seattle Disaster Readiness and Response Plan (City Disaster Plan) and would be implemented in immediate emergencies such as in the examples provided below. SPU's emergency plan defines decision-making authority in emergencies and creates specific emergency action plans for a number of systems, security, and management procedures, including information. Furthermore, if needed, SPU has emergency water provisioning equipment and plans for implementation as described in the "Emergency Drinking Water Distribution Plan." This plan would be implemented to provide water if customers in an area, or areas, were unable to receive water through normal means.

TYPES OF POTENTIAL NON-DROUGHT WATER EMERGENCIES

Major Transmission Pipeline Break

One potential water supply emergency is a major transmission line break from either the Tolt or the Cedar River supplies. The potential impact on customers would depend on the location of the break, the extent of damage, the amount of time needed for repair, the season it occurred, and how easily SPU could re-route water supply to customers in the affected area. Due to the redundancy in SPU's system, the two major pipeline failures that occurred since 1987 had fairly minor impacts on customers.

Temporary Treatment Plant Shut Down

Another type of supply emergency is a temporary shut down of either the Cedar or the Tolt water treatment plants. As with a transmission pipeline break, the potential impact on customers would depend on the time needed to return the plant to service and the time of year. An example of this was in 2003 when the Tolt Treatment Facility was shut down for about a week when a raw water inlet valve malfunctioned causing flooding of the plant. Because this event occurred during the winter when demands were low, all retail and most wholesale customers were provided water from the Cedar system without disruption; a few wholesale customers were supplied from water stored at the plant's clearwell.

Major River Flooding Leading to High Turbidity

If substantial flooding occurred on the Cedar River or South Fork Tolt River it could lead to high turbidity causing SPU to temporarily stop using that supply. For the Cedar, if major flooding occurred at the same time that Lake Youngs was at or below normal minimum operating levels, high turbidity could lead to a temporary shut down of that supply. In 1990 such an event occurred on the Cedar, when flooding exceeded the 100-year event. It should be noted that with the addition of filtration on the Tolt supply and the change in intake location on the Cedar supply, SPU's supply sources are much less vulnerable to impacts of turbidity than in the past.

SUPPLY AND DEMAND MANAGEMENT DURING NON-DROUGHT WATER EMERGENCIES

No single strategy can be created which will meet the needs of the department for all non-drought water emergency scenarios. Strategies for dealing with emergencies have been developed based on lessons learned from previous water utility events, and other utility experiences. The criteria listed in Section 1 of this WSCP create a framework for decision-making. The types of non-drought emergencies listed in this section initially require quick and immediate response. Once an assessment is made as to how long it will take to restore the system, the immediate response strategy may change if it appears that the repair process will be lengthy.

The strategy for most emergencies can be narrowed to measures having the most immediate impact on achieving water supply and consumption targets. All needed and available back up supplies would be activated during an emergency: interties, well-fields, off-loading wholesale customers who have other sources, etc.

Attachment A

Examples of Past Regional Drought Experiences

The droughts that the Seattle regional water system has experienced in recent history were very different types of droughts. While SPU has changed how it operates the system based on the lessons learned from the past, it is useful to be aware of these past drought events and the actions taken to successfully manage both supply and demand.

Summer/Fall Drought

In 1987, storage reservoirs were at normal levels on June 1, but the summer weather was unusually warm and dry. Higher than normal outdoor water use accelerated the drawdown of the storage reservoirs. To reduce demand, in early August lawn watering was restricted to no more than once every three days and customers were urged to voluntarily curtail other water uses. These actions reduced demand by approximately 10 percent. In early fall, an emergency pumping station was installed at the Chester Morse Lake reservoir to pump "dead storage" in case the reservoir level fell below the lake's natural outlet.

Throughout the fall, precipitation continued below normal; the water supply system was managed and adjusted to obtain the maximum supply available (e.g., relying on Lake Youngs more than normal). In November 1987 and January 1988, the Chester Morse reservoir was low enough to require pumping and it was not until February 1988 that rainfall began refilling the storage reservoirs.

Winter/Spring Drought

In 1992, the system experienced a very different type of drought. Because the winter was unusually warm, snowpack and flows into the storage reservoirs were at record low levels. In late February, it was evident that there was insufficient snowpack to fill the storage reservoirs and that the likelihood of recovery by June 1 due to rainfall was low. A number of measures were taken to maximize available supply (e.g., reducing system flushing, adjusting stream flow levels, etc.) and to reduce demand. In May, a number of mandatory curtailment actions were implemented in the Seattle service area, including a ban on lawn watering. This resulted in an average consumption reduction of 25 to 30 percent below normal throughout the summer. Tribes, state resource agencies and the Army Corps of Engineers played a significant role in cooperating to maximize available water supply. In addition, other measures were taken to increase available supply including initiating an intertie with Renton and accelerating the construction of a second pump plant for use of dead storage at Chester Morse Lake. The mandatory restrictions were rescinded in September as supply levels returned to normal with the onset of fall rains.

In 2005, SPU watersheds experienced the lowest snowpack in 60 years, one of the driest winters on record and warmer than normal winter temperatures. Water managers responded by activating the Advisory Stage of the WSCP, reducing system water use and maximizing the amount of water held in storage using the dynamic rule curve. As a result of this active management and nearly average rainfall in the spring, SPU was able to return to normal operations by summer that year.

Attachment B

Water Shortage Response Team and Water Shortage Advisory Group Memberships and Roles

Water Shortage Response Team

Purpose: SPU's internal team whose role is to evaluate conditions, advise the Director on supply and demand actions, and make assignments to SPU staff as needed to respond to the shortage.

Membership: The Team is appointed by the Director and may include the following members to fill the roles indicated; however, the actual composition may change at any time as requested by the Director:

- SPU Director – Overall direction on the response.
- Branch Directors – Input to Director for response.
- Lead for Shortage Response – Issue coordination, information gathering and dissemination, key support staff assignments, role clarification, and communication with broad array of interested parties.
- Drinking Water Division Director – Overall guidance on supply management, drinking water quality and operations, status of non-revenue water, issues related to potential alternative supplies, and opportunities for use of non-potable water.
- Cedar and Tolt Watershed Services Division Director – Provide guidance regarding watershed activities that may impact water supply.
- Water Resources Business Area Manager – Provide water supply condition reports, forecasts, demand pattern reports, operational needs, and modeling identification and oversight.
- Water Resources Management Staff Representative – Provide guidance regarding instream flows/fisheries, river analyses, river biological assessments, and coordinate with Cedar River Instream Flow Commission and Tolt Fisheries Advisory Committee.
- Resource Conservation Manager –Water use reduction measures management and messaging, cost estimates to achieve savings, and communication with landscapers, nurseries and large water users (commercial and residential).
- Communications Director and Staff Representative(s) – Messaging, customer relations, media relations, press releases, key contact for interagency Public Information Officers (PIOs), agency communication, and coordination with wholesale customers, cities of Everett and Tacoma and Central Puget Sound Water Suppliers' Forum.
- Finance Staff Representative – Cost estimates for supply alternatives, increased messaging needs and additional water use reduction measures, expected lost revenue estimates, budgets and charge number set-up for shortage-related activities, and process necessary to access revenue stabilization fund, if needed.

Note: If the Morse Lake Pumping Plants need to be readied for potential use, an additional staff member may participate in the Response Team to report on issues related to the plants.

Water Shortage Advisory Group

Purpose: To advise the SPU Water Shortage Response Team in defining messages and providing feedback on utility water shortage response actions and programs.

Membership: Group membership will be based on the type of water shortage and how widespread it is. The Director, or his/her designee, will send out invitations to potential members and agencies. The following is a list of potential members to be considered when forming the Group membership:

- Wholesale customer representative(s)
- State and federal resource agencies, such as the Army Corps of Engineers, Washington State Department of Ecology, etc.
- Landscape and/or nursery representative(s)
- Other potentially impacted industries and businesses (e.g., restaurants, hotels, car washes, etc.)
- Environmental representative
- Tribal representatives
- Water System Advisor committee representative
- Other City departments, such as Parks or Seattle City Light
- Other regional water suppliers, such as Tacoma Water or Everett Public Utilities
- SPU staff as appropriate.

Attachment C
Possible Demand Management Scenarios

Note: Information developed during spring 2005.

Scenarios	% Savings	Savings (in mgd)				Residential Indoor	Residential Outdoor	General Commercial	Commercial Outdoor
		Apr-May	Jun-July	Aug.	Sept-Oct				
Pre and Stage 1 Advisory	<1%	1	2	4	2	full clothes and dish washing machine loads, check and repair leaks	sweep driveways & sidewalks, water wisely, drought proof new plantings, top dress, aerate and grasscycle lawns, mulch all planting beds, use commercial car wash that recycles water	check and repair leaks, encourage employee suggestions, sweep driveways and sidewalks, voluntary City facility reductions	check systems and repair real time ET controllers, central controls for multi-control systems, rain shut-offs, soaker hose or drip alternatives, top dress, aerate, and grasscyle lawns, drought proof new plantings, mulch all planting beds
Stage 2 Voluntary Curtail-ment	5-10%	5	10	15	10	push above measures harder, 1 or more less minutes per shower, reduce toilet flushing, install efficient fixtures & appliances	push above measures harder, water only between 7 p.m and 10 a.m., allow lawn to go dormant, avoid draining hot tubs & pools, defer car washing, reduce landscape watering, water planting beds infrequently, new landscapes exempt	push above measures harder, mandatory City facility reductions, defer washing vehicles, inspect cooling towers, water at restaurants by request only, hotel linen change by request only, install efficient fixtures, cost-effectively invest in efficient technologies, use reclaimed water, if practical	push above measures harder, curtail fountain use, no make up water, suggest watering restrictions including time of day (new lawns exempt, sports fields partially exempt)

Scenarios (cont.)	% Savings	Savings (in mgd)				Residential Indoor	Residential Outdoor	General Commercial	Commercial Outdoor
		Apr-May	Jun-July	Aug.	Sept-Oct				
Stage 3 Mandatory Curtail-ment	10-20%	10	20	30	15	push above measures harder	push above measures harder, prohibit vehicle washing, prohibit sidewalk, driveway washing, watering restrictions including time and number of days, new landscapes still exempt, no pool or hot tub drain & filling, curtail power washing, no fountain make-up water	push above measures harder, prohibit vehicle washing, defer major uses if possible, use reclaimed water if practical	push above measures harder, prohibit sidewalk, driveway washing, ET limitations for auto irrigation use, prohibit fountain use, watering restrictions including time and number of days, sports fields may be partially exempt, new lawns may be partially exempt
Stage 4 Emergency Curtail-ment	>20%	20	30	40	20	push above measures harder	push above measures harder, lawn watering ban, new landscape watering restrictions/ban	push above measures harder, must use reclaimed water if practical	push above measures harder, lawn watering ban, no potable water for irrigation, new landscape watering restrictions/ban

Attachment D

Estimated Cumulative Costs and Revenue Losses for WSCP Stages (based on 2005 dollars)

Revenue & Cost Impacts	Stage 1 Advisory	Stage 2 Voluntary	Stage 3 Mandatory	Stage 4 Emergency
Revenue Loss	**$ 1,000,000**	**$ 5,000,000**	**$ 9,000,000**	**$ 13,000,000**
Cost	**$ 55,000**	**$ 1,485,500**	**$ 2,935,500**	**$ 3,285,500**
Demand Management				
customer outreach		250,000	650,000	650,000
customer incentives			950,000	950,000
enforcement			100,000	300,000
Cedar Pumping				
preparation		500,000	500,000	500,000
mobilization	30,000	354,500	354,500	354,500
pumping costs		81,000	81,000	81,000
Seattle wells	25,000	300,000	300,000	450,000
Total: Revenue loss & costs	**1,055,000**	**6,485,500**	**11,935,500**	**16,285,500**
Financial Tools Used to Mitigate Impacts (descriptions below table)				
Reprioritize Current Revenue	X	X	X	X
Reprioritize Expenses		X	X	X
Withdrawal from Revenue Stabilization Fund			X	X
Rate Surcharge			X*	X

Notes:

1) Estimates were created in spring of 2005 for 2005 event. Actual future costs would vary depending on the season, and specific actions taken in a given event. In 2005 SPU entered into Advisory Stage only.
2) Above are costs incurred for each stage. The costs for Stages 2 - 4 include the costs incurred in the previous stage(s). Estimated lost revenue follows the same approach.
3) Stage 4 revenue loss estimates here do not include funds that will be brought in by surcharges. Estimates for those surcharges have not been developed.

* The City may implement a rate surcharge in the Mandatory Stage.

Reprioritizing Current Revenue – This consists of reducing revenue contributions to the capital program and lowering the year end operating cash target. These are the most flexible resources to offset revenue and expenditure problems.

Reprioritize Expenses – Reducing planned operations and maintenance expenditures reduces demand on revenues or frees up money to meet unexpected needs.

Withdrawals from Revenue Stabilization Subfund – The City of Seattle has established a Revenue Stabilization Subfund for the water fund. The target balance is $9 million, which can serve as a source of revenue during moderate droughts. Withdrawals from the Subfund require Council approval.

Rate Surcharge – In emergency situations, rate surcharges send a strong signal to customers to reduce water use and also help to make-up revenues lost due to decreased demand.

Attachment E

CONTACT LIST FOR WATER SHORTAGE CONTINGENCY PLAN

A working list of contacts for easy reference in case of a drought or emergency should be developed and regularly updated by the Resource Conservation Section in consultation with others in the Department. In addition to the communication elements contained in the WSCP, the following will be contacted directly in the event of a drought or emergency to inform them and ask for their support and cooperation in reducing demand.

Customers
List of wholesale water customers
List of large irrigators, including those using alternate sources
List of large commercial and industrial customers

City of Seattle Contacts
Department Directors
Contacts for:
- Seattle Department of Parks and Recreation
- Seattle Transportation Department
- Seattle Center
- Fire Department
- Department of Executive Administration
- Fleets and Facilities

List of City owned, non-re-circulating and re-circulating fountains

Other public agencies with high visibility water use
State Department of Transportation
University of Washington
Army Corps of Engineers
King County Department of Natural Resources & Parks
Seattle Public Schools

Landscape Interests
King County Cooperative Extension
Washington State Nursery and Landscape Association
Irrigation Association
Washington Association of Landscape Professionals
American Society of Landscape Architects
Center for Urban Horticulture
Pacific Northwest Golf Course Superintendents' Association
Washington Irrigation Contractors Association
*Note: Resource Conservation maintains a database of over 400 landscape-related businesses and other contacts.

Business Groups
Seattle/King County Chamber of Commerce
Building Owners and Managers Association

Attachment F

POSSIBLE ADVISORY STAGE WATER CONSERVATION TIPS FOR CUSTOMERS

Conserve Inside

For most households, the vast majority of water is used indoors. Taking conservation actions and installing efficient fixtures help reduce your water use year-round. There are also ways to conserve water in outdoor uses and at work. Below are suggested actions:

- Fix leaking faucets and toilets.
- Wash only full loads in the dishwasher and clothes washer.
- Minimize faucet use when brushing your teeth, shaving and washing dishes.
- Don't pre-rinse dishes unless you need to. Most new dishwashers don't require pre-rinsing.
- Save luke warm water for watering plants, etc. while you wait for hot water in kitchens and showers.
- If you are buying a new toilet, look for a FlushStar model. Call us or visit us online if you have questions.
- If you are buying a new washing machine, WashWise rebates are available for qualified machines.

Conserve Outside

Make the most of the water you will use in the spring and summer:

- Aerate lawns in the spring to better absorb water.
- Mulch planting beds to decrease evaporation.
- Select the right plants for the right place – contact SPU or see our website for information.
- Tune-up and improve your irrigation system – rebates may be available.
- Wash your cars at locations that recycle their water.

Note: For more information on home water conservation tips for inside and out, visit www.savingwater.org or call 684-7283 (684-SAVE)

Conserve at Work

Businesses and institutions can reduce water use and lower utility costs by adopting conservation practices and replacing inefficient equipment or operations.

- Check for leaks.
- Use a broom, instead of a hose, to routinely clean driveways and sidewalks
- Turn off water-using equipment when not in use, including dishwashers, garbage disposals, and food troughs.
- Upgrade equipment efficiency – rebates may be available.
- Increase employee awareness of water conservation.
- Call (206) 343-8505 for technical assistance for work-related water-wise tips.

Attachment G

POSSIBLE VOLUNTARY STAGE CUSTOMER WATER SAVING ACTIONS

The following voluntary actions are being requested of all customers:

SET A GOAL: Such as use 10% less water
Most customers can easily save 10% by choosing several items from the menu of water saving actions below. If you routinely do outdoor watering, select those actions first. Set a goal to reduce your water use by 10% from the amount you used during the same billing period last year. Most utility bills contain your water consumption for each billing period. Much of the 10% can probably be achieved through conservation actions that are wise to do all the time. If that is not sufficient, then the special curtailment actions listed here can be implemented during the duration of the supply problem.

REDUCE OUTDOOR WATER USE

Conservation Actions:

- Avoid **watering** between 10 AM and 7 PM to reduce evaporation.
- **Stop obvious water waste** such as gutter flooding, sidewalk and street watering, and fix leaks.
- **Never leave a hose running,** always use a shut-off nozzle.
- **Use a broom** rather than a hose or pressure washer to clean sidewalks and driveways.

Curtailment Actions:

- **Reduce lawn watering** (twice a week or less if possible).
- **Let your lawn go dormant**. Customers who choose to not water their lawns should water deeply once each rainless month to keep grass roots alive. To avoid runoff when you water, if the water puddles, cycle your sprinkler on and off until water is absorbed.
- **Refrain from filling** empty pools and hot tubs.
- **Turn off water features** and fountains.
- **Wash vehicles only at car washes that recycle their water.**

REDUCE INDOOR WATER USE

Conservation Actions:

- **Install a water efficient FlushStar toilet.** These toilets have proven to perform well and give long-term water savings. Replacing a frequently used old toilet with a new efficient toilet can save most households up to $70 a year in utility bills *(based on data from 2005).* Check www.savingwater.org for FlushStar toilet models.
- **Install a high-efficiency clothes washer**. New washers are typically one-third more water efficient than old washers. Rebates are available from Seattle Public Utilities by calling (206) 684-SAVE.
- **Wash only full loads in the clothes washer and dishwasher,** or choose an appropriate load-size setting for the number of items in the washer.
- **Turn off the tap** while brushing your teeth, hand-washing dishes or shaving.
- **Fix leaky faucets and toilets**. Put several drops of food coloring in your toilet tank. After 20 minutes, if you have color in the bowl, you have a slow leak that over time can amount to a lot of water.

- **Install an efficient showerhead.** New showerheads work well and use much less water than old high-flow models.
- **Install an efficient faucet aerator.** Replace your older bathroom faucet nozzle (aerator) with one that uses one gallon per minute or less.

Curtailment Actions:

- **Spend one minute less in the shower.** Try to limit showers to five minutes or less.
- **Flush your toilet less often.** Toilet flushing is the largest water use inside the home. As the saying goes, "If it's yellow, let it mellow."

REDUCE WATER USE AT WORK

There are a wide variety of opportunities for businesses and agencies to reduce their water use and operating expenses.

Conservation Actions:

- **Check cooling towers.** Cooling towers - and the ways that they regulate water use – represent real opportunities for improving water efficiency.
- **Check for and fix leaks.** Toilet and urinal leaks are very common. Investigate obvious or suspected leaks.
- **Use a broom,** instead of a hose or pressure washer, to routinely clean driveways and sidewalks.
- **Turn off water-using equipment** when not in use, including open hoses, dishwashers, garbage disposals, and food troughs.
- **Check air conditioners, refrigerators, and ice machines.** If your company's air conditioners or refrigerators use water-cooled condensers, investigate air-cooled equipment for possible efficiencies. Rebates are available. Visit **www.savingwater.org.**
- **Install water-efficient toilets, urinals and faucets** in public and employee restrooms. Replacing old toilets, urinals, and faucet aerators with efficient ones can produce substantial savings. Rebates are available. Visit **www.savingwater.org.**
- **Reuse process water.** Water used in industrial and manufacturing processes should be reused as often as possible. Rebates are available. Visit **www.savingwater.org.**
- Hospitality businesses can offer guests the option of clean linens each day.
- **Increase employee awareness of water conservation** through management memos or newsletter messages. Install signs that encourage water conservation in restrooms or work areas where water is used. For additional work-related conservation tips, call (206) 343-8505.

Curtailment Actions:

- **Reduce outdoor watering** (twice a week or less if possible). Rebates are available for smart irrigation technologies. Visit **www.savingwater.org.**
- **Minimize vehicle washing**, defer or use a water recycling car wash.
- **Turn off** decorative water fountains.
- **Serve water only on request** at restaurants. Avoid thawing with running water.

For home water conservation tips, visit www.savingwater.org
or call (206) 684-7283 (684-SAVE)

Attachment H

POSSIBLE EXEMPTIONS FROM WATER USE RESTRICTIONS

New Lawns and Landscapes

If a lawn and/or landscape is installed prior to the date the watering restrictions were announced, and in the same calendar year, it may be watered for a limited duration on a daily basis for a specified number of days, e.g., 10 minutes per day for the first two weeks after its installation. After that period, some watering may still be allowed on a reduced basis. The watering may also be restricted to certain times of day. All details will be determined based on the time of year and severity of the shortage.

The utility will publicize the rules for exemptions to the lawn and landscape watering restrictions. The customer will need to contact the utility with name and address, stating that they meet the conditions and will be watering their lawn and/or landscape. This should be done in writing, either via email or other means. The utility reserves the right to spot check on site for compliance.

New lawns and landscapes may also be installed after the date of the restrictions. To receive a watering exemption the minimum requirements for soil preparation must be met and a signed affidavit provided to that effect. Minimum soil preparation consists of cultivating into the top six inches of existing soil at least two inches of organic soil amendment, such as composted yard waste. The same restrictions for watering as above would also apply.

For purposes of this exemption, "new lawn" refers to a lawn newly installed during the current year only. Overseeded or otherwise renovated lawns will not be exempt from the lawn watering restrictions.

Note: The utility will not guarantee continued watering. If the water supply situation worsens, any exemptions may be revoked. In the event that the shortage continues to worsen and the Emergency Curtailment Stage is activated, this exemption would be revoked.

Sports Fields and Golf Courses (greens and tees only)

Sports fields and golf courses (greens and tees only) can be watered according to an evapotranspiration (ET)-based schedule, provided at least the following:

- ☐ The irrigation system must be audited between 0 to 60 days prior to the effective date of the watering restrictions, by an Irrigation Association-certified Irrigation Auditor.
- ☐ The audit must find that the system's lowest quarter distribution uniformity is at least 70%.

- ☐ Watering is prohibited during the warmest time of day. Specific times will be announced by the utility.
- ☐ Water running to waste is to be avoided.

Other Exemptions

For purposes of dust control, water may be applied to construction areas or other areas needing to comply with air quality requirements. If reclaimed water is available, consider requiring or promoting that it be used for dust control, if practical.

Ballfields and playfields may be watered at the minimum rate necessary for dust control and safety purposes.

Appendix H
King County Water Reclamation Checklist

For questions, call Kristina Westbrook,
King County Reclaimed Water Program Manager at (206) 296-5279
www.kingcounty.gov/reclaimedwater

King County

Water Reclamation Evaluation Checklist
For Systems with 1,000 or more Connections

The County and State recognize that changing conditions could initiate a need to respond in new ways to future water quality standards, wastewater discharge requirements, take advantage of advances in treatment technologies and/or allow our region to be positioned to respond to changes associated with climate change and population growth.

In 2003, Chapter 90.46 of the Revised Code of Washington (RCW) was amended to require public water systems serving 1,000 or more connections to evaluate opportunities for reclaimed water when completing their water system plans. Please use this checklist to meet King County consistency requirements in responding to this legislation.

Please use this checklist, including the inventory template, to ensure that your water system plan includes sufficient information about opportunities for reclaimed water and your system's efforts to develop those opportunities. If a question is not applicable or the information is unavailable, then answer, "unknown" or "n/a." King County will consider the checklist completed if each answer is filled in with the best available information, even if the utility states that it is not aware of any reclaimed water opportunities within its service area.

Water System Name: City of Redmond Water System
Date: 7/25/2023
PWS ID# 71650 B
Contact: John Burtsche

1. **Identifying Potential Future Demand for Reclaimed Water:** King County maintains a database and map of potential reclaimed water users for evaluating future projects. Please use the template below, or similar table, to provide information to assist King County in further researching these potential uses.
   - **Large Utility Water Users** (choose one):
     - [x] Attached is an inventory of twenty large (above 20,000 gallons/month on average), non single-family residential, water users served by our utility that have a potential for reclaimed water use, or
     - [ ] Attached is an inventory of our utility's top twenty water users, or
     - [ ] The information requested is unknown or not available.

       Additional Comments: The attached materials are excerpts from other planning documents, pertaining to identification of potential reclaimed water uses within the City of Redmond.
   - **Large Self Suppliers** (choose one):
     - [ ] Attached is an inventory of large, self-supplied water users within our water utility's service boundaries - especially those near wastewater treatment plants, mainlines, outfalls, and pump stations or similar reclaimed water facilities), or
     - [x] The information requested is unknown or not available.

       Additional Comments: No large self suppliers within RSA
   - **Other** (choose one):
     - [x] Attached is an inventory of other water users (such as those that are clustered near one another and could be served by a single system) that may be likely candidates for reclaimed water use, or
     - [ ] The information requested is unknown or not available.

       Additional Comments: See attached materials for identification of potential reclaimed water uses.

2. **Environmental Commitment**: Are you a city/town, or providing water service to a city/town, that has made commitments within resource management plans, salmon recovery plans, or other environmental initiatives for which there is a potential opportunity for using reclaimed water to assist in meeting commitments? (choose one)

   ☑ Yes, here are plans that have potential for reclaimed water use in our service area to meet the above commitments:
   Environmental Sustainability Action Plan (September 2020)

   ☐ The information requested is unknown, not available.
   Additional Comments: _____

3. **Identifying Areas of Potential Use of Reclaimed Water for Environmental Benefit:**
   Below are ***examples*** of uses of reclaimed water ***that comply with State, Federal and other reclaimed water environmental, health and safety standards***. All of these uses are currently in effect somewhere in Washington State. To the best of your knowledge, are any of these potential uses for reclaimed water applicable to your area?

   River Augmentation (choose one):

   ☐ Yes, our water rights are limited by instream flows. For more information, King County may contact:

   ☑ The information requested is unknown, or not available.
   Additional Comments: Redmond does not have surface water rights

   Groundwater Recharge (choose one):

   ☑ Yes, we withdraw water from an aquifer that is in a groundwater management area, or from a declining aquifer, where water levels may need to be replenished or to maintain aquifer storage. For more information, King County may contact:
   Redmond-Bear Creek Valley GWMA (https://kingcounty.gov/en/legacy/services/environment/water-and-land/groundwater/management-areas/redmond-bear-cr-gwma.aspx)

   ☐ The information requested is unknown, or not available.
   Additional Comments: _____

   Water Rights Mitigation (choose one):

   ☐ Yes, our area is pursuing, or planning to pursue, new or additional water rights, and there may be an opportunity to use reclaimed water for mitigation of those new water rights. For more information, King County may contact:

   ☑ The information requested is unknown, or not available.
   Additional Comments: No additional water rights are being pursued.

   Potential Areas of Environmental Need (choose one):

   ☑ Yes, parts of our service area include potential environmental enhancement locations, such as wetlands enhancement, aquifer recharge, stream flow augmentation, that might be candidates for reclaimed water use. For more information, King County may contact:

   ☐ The information requested is unknown, or not available.
   Additional Comments: _____

4. **Local Reclaimed Water Legislation**: If water reclamation is mandated for this water system through local government agreement, contract, local regulations, ordinances, or other mechanisms, please provide a copy of the governing mechanism (choose one).

   ☐ Yes, local legislation exists in our area in support of reclaimed water use. The following relevant legislation is attached (please list titles of documents):

   _____

   _____

   ☑ No water reclamation legislation exists, or is known to exist, at a local level in our service area.

5. **Coordination with Local Wastewater Utility:** Include a brief description of your interactions with any wastewater or reclaimed water utility (King County or other) adjacent to your service area to evaluate any potential opportunities to develop reclaimed water (choose one).

   ☑ Describe if applicable:
   2017 MOU between King County and the City of Redmond regarding reclaimed water (2017 MOU); and development of a reclaimed water distribution feasibility study with Cascade and King County (2018).

   ☐ None. Additional Comments: See also Section 2.3.8 of the Water System Plan for detail regarding King County coordination on this topic.

Template for
Inventory of Water Users and Identification of Potential Reclaimed Water Users

Site Owner or Site Name	Site Address (for general mapping purposes)	Estimated Annual Water Use	Water uses not requiring potable water[1]	Is this a Potential Reclaimed Water Customer?

[1] See Washington State Reclamation and Reuse Standards, September 1997, Section 1, Articles 1-5 for allowable uses of reclaimed water. http://www.ecy.wa.gov/PROGRAMS/WQ/reclaim/standards.html

This and the following 11 pages are excerpts from the 2012 CWA TSP, related to identification of potential reclaimed water uses in the City of Redmond. Provided as reference in the Redmond 2023 Water System Plan Update.

CASCADE WATER ALLIANCE

Transmission and Supply Plan



July 2012

HDR

In association with

CDM

APPENDIX D

Reclaimed Water Opportunities

Reclaimed Water

Chapter 5 of the current TSP discusses Cascade's current outlook on current and potential future uses of reclaimed water in the Cascade service area. This appendix provides additional background information, drawn from Cascade's prior (2004) plan. While some of the specific sites for potential use of reclaimed water may have changed in the interim, the overall opportunities for reclaimed water remain similar at this time.

Reclaimed water is defined by Chapter 90.46 RCW as "effluent derived in any part from sewage from a wastewater treatment system that has been adequately and reliably treated, so that as a result of that treatment, it is suitable for a beneficial use or a controlled use that would not otherwise occur and is no longer considered wastewater."

Reclaimed water can be used for activities such as irrigation to aid water suppliers in meeting the needs of their customers by reducing the demands upon high-quality potable water supplies, especially during peak use times. The use of reclaimed water may also benefit the environment by decreasing the need for withdrawals from streams and groundwater, recharging aquifers that are in hydraulic continuity with streams, and potentially directly augmenting streamflows.

Sources of Reclaimed Water

Municipal wastewater treatment plants are the typical source of reclaimed water. The majority of water customers served by Cascade Members receive wholesale wastewater conveyance and treatment services provided by King County Department of Natural Resources and Parks, Wastewater Treatment Division (King County WTD). At this time King County WTD represents the sole potential generator of reclaimed water for use by Cascade Members. There are three categories of reclaimed water sources owned and operated by King County WTD, as described below.

South Treatment Plant

The South Treatment Plant, located in Renton (see Figure 6.1), is in close proximity to Tukwila and Skyway, and is therefore considered a logical source of reclaimed water supply for Cascade.

The South Treatment Plant's current design capacity for treating wastewater is 115 MGD on an average daily basis. Present flows average approximately 80 MGD. A planned expansion will increase plant capacity to 135 MGD by 2029.

A portion of the South Treatment Plant flows is currently treated to allow for reuse. One of Cascade's Members, the City of Tukwila, has been using Class A reclaimed water from this source since 1998. A supply line extends from the treatment plant to Fort Dent Park in Tukwila. The reclaimed water is used primarily for irrigation of ballfields at the park, as well as a few minor uses such as street sweeping. A delivery system has also been installed to the Foster Golf Links site for future use.

Brightwater

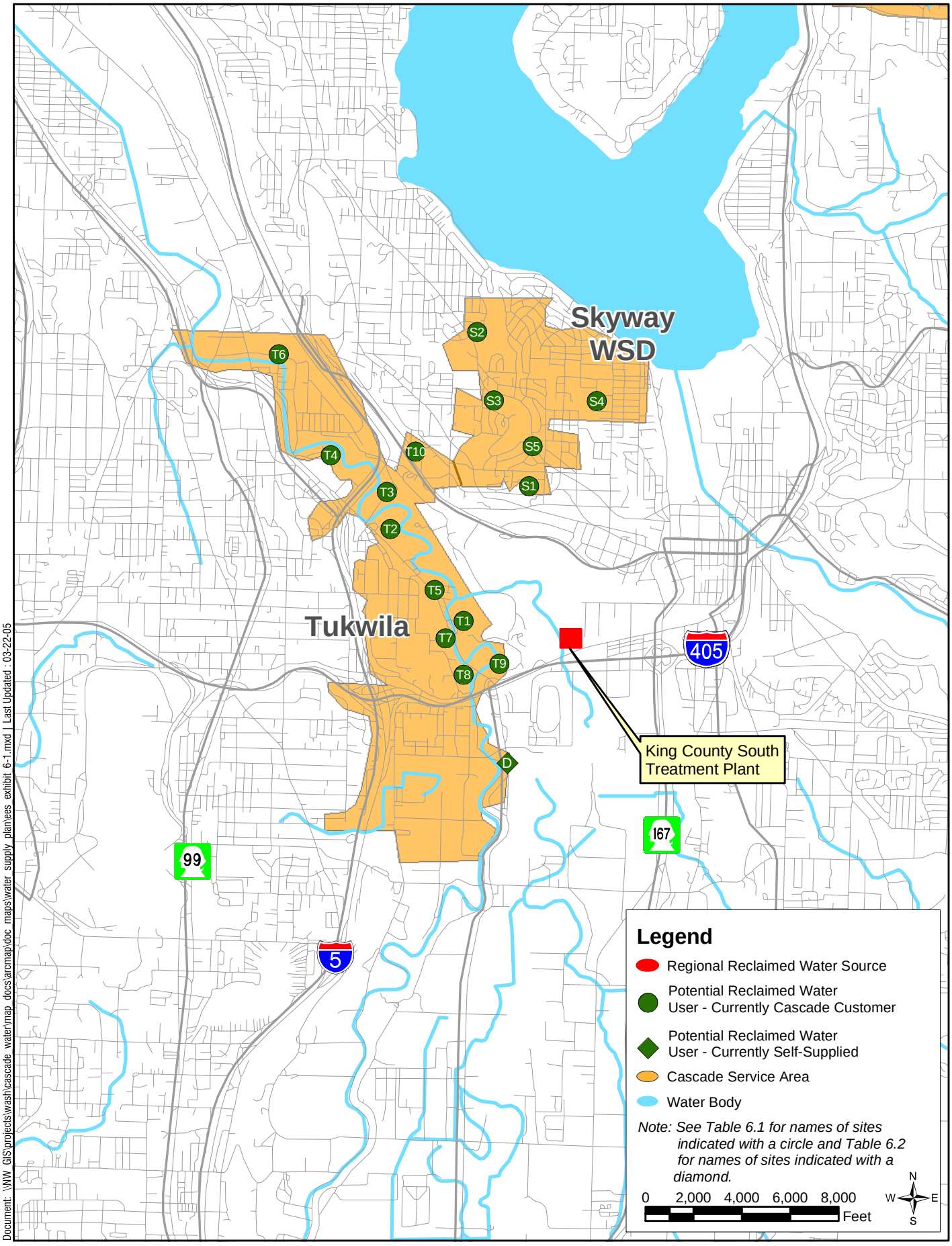
King County WTD recently developed the Brightwater Regional Treatment System, located in Snohomish County northeast of Woodinville (see Figure 6.2). Treatment plant start-up and operations began in September 2011, with the system scheduled to be completed in 2012.

The treatment capacity of Brightwater is anticipated to be 36 MGD, on an average daily basis. Plant expansions will increase capacity to 54 MGD by 2040.

A key feature of the Brightwater project is the planned additional treatment for a portion of the facility's flows, allowing for reuse at the plant site and throughout a sizeable service area. It is anticipated that approximately 10 MGD of reclaimed water will be available from the Brightwater facility. It is anticipated that this supply will be made available to the area west of the facility (along the Brightwater effluent corridor, which runs along the King/Snohomish County line to Puget Sound) and to the south (potentially into the Sammamish Valley). The area south of Brightwater includes the northern end of Cascade's service area.

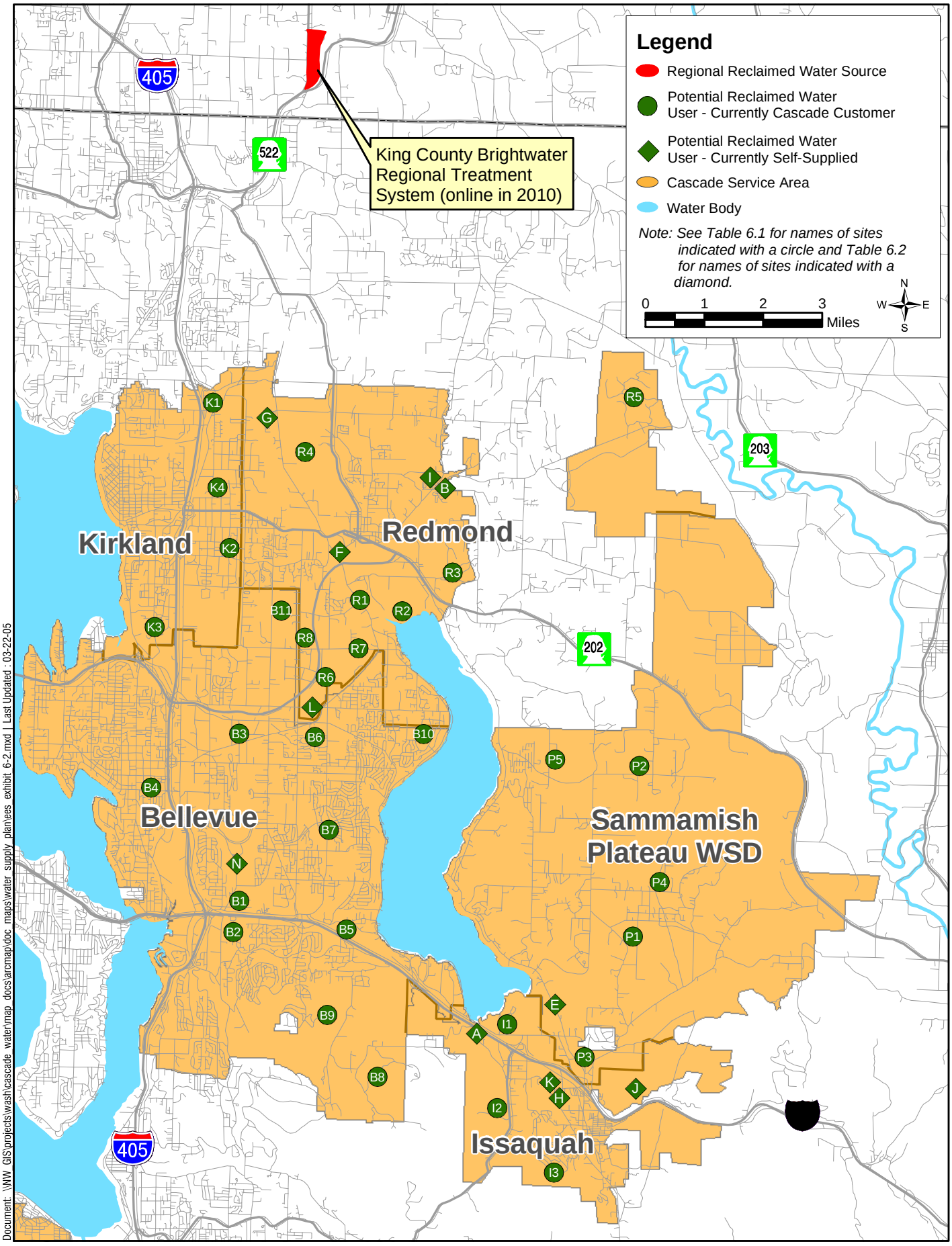
Satellite Facilities

King County WTD's South Treatment Plant and Brightwater Regional Treatment System are the two identified regional sources of reclaimed water supply. However, there is a potential for development of smaller, satellite reuse facilities designed to serve a more local need. King County has expressed a desire to explore the possibilities of constructing one or more satellite treatment plants in cooperation with local communities and/or water purveyors. One Cascade Member that has also shown interest in this concept is Covington Water District. Throughout 2007-2009, the District and the County jointly examined the feasibility of implementing a reuse system utilizing a satellite treatment facility. However, such a concept was determined to not be cost-effective for the near-term, and thus has not been advanced further.



Reclaimed Water Sources and Potential Users - Tukwila and Skyway WSD

FIGURE 6.1



Document: \\WW GIS\projects\wash\cascade water\map docs\arcmap\doc maps\water supply plan\ees exhibit 6-2.mxd | Last Updated: 03-22-05

Reclaimed Water Sources and Potential Users - North Cascade Members

FIGURE 6.2

Applications of Reclaimed Water

Water utility planning includes evaluating the cost-effectiveness of various supply options. The feasibility of new sources of supply is partially based on the cost of developing such supplies and examining how these costs compare to existing supplies. Implementation of a water reuse program must also be viewed through this utility management lens when evaluating the feasibility of reuse versus other sources of supply. From this perspective of cost and feasibility, there are two broad categories of reuse programs: 1) service to existing water-using facilities and retrofit of existing systems; and 2) service to new development.

For a utility serving a highly developed area (i.e., a service area that is at or near buildout), a water reuse program will be almost exclusively of the first type, with service to existing customers. While there may be customers for whom the use of reclaimed water seems logical, as they use large quantities of water for non-potable purposes, the cost of delivery may be so great as to make it infeasible. Costs include the extension of water reuse pipelines to such customers and retrofits to the customer's plumbing, which can sometimes be quite extensive.

Many times, a reuse program is more feasible for those utilities that anticipate serving new development. Feasibility increases when provision of reclaimed water can be included in the early planning stages of both the future customer's onsite plumbing and the utility's infrastructure improvements. Early planning and coordination of such activities drastically reduces costs and will make reuse a more feasible option for a utility.

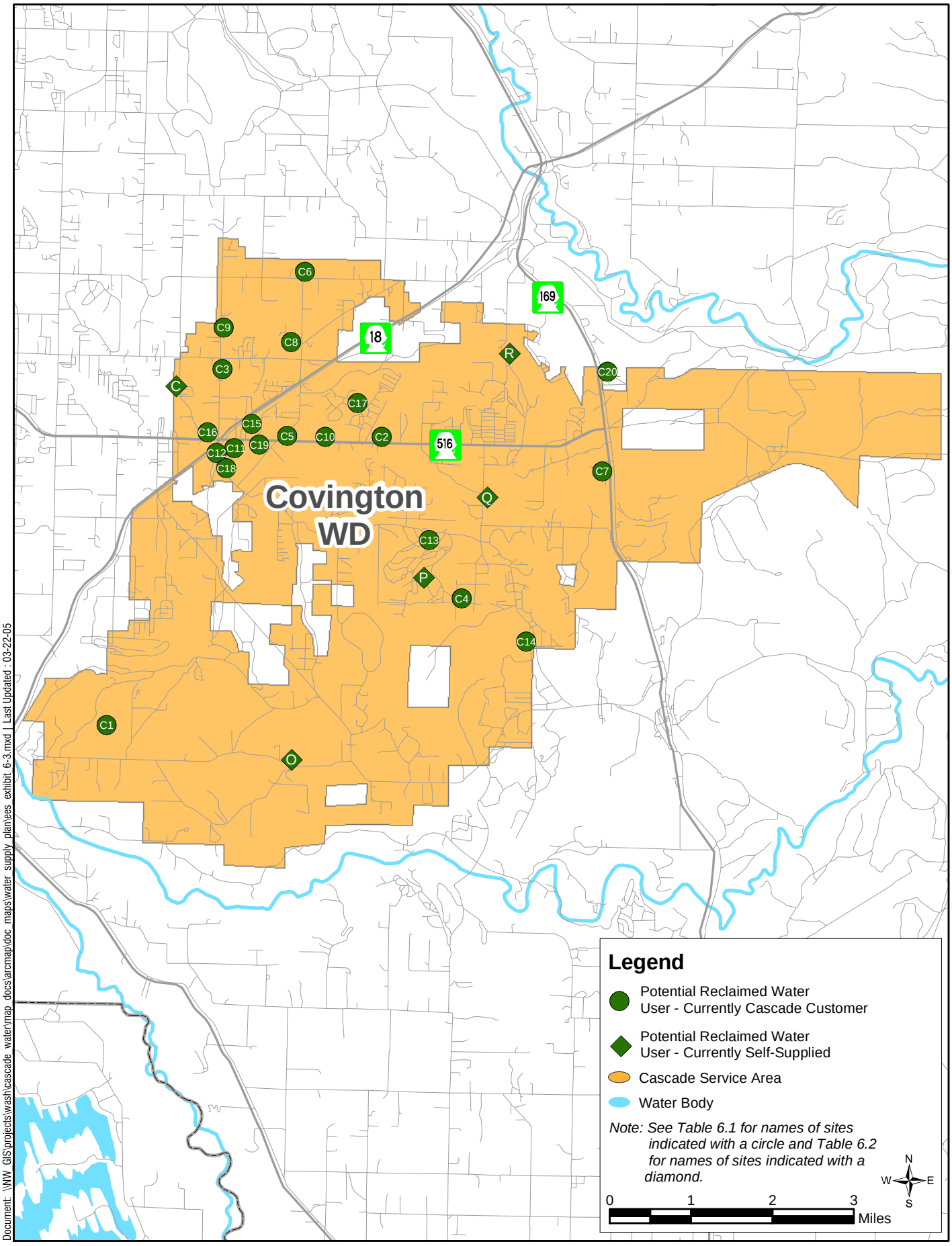
Cascade Members represent a blend of the above opportunities. This section identifies known and potential future applications of reclaimed water by existing Cascade customers. The primary applications of reclaimed water considered in this review are landscape irrigation and non-potable industrial use, as these constitute the largest components of municipal potable water demand that may be replaced by reclaimed water. Other, minor uses of reclaimed water are discussed where specifically identified by Cascade Members.

Application of reclaimed water service to new development is not specifically assessed, as it is challenging to estimate appropriate quantities of demand. However, new developments may also present opportunities for using reclaimed water.

This review is based primarily upon information provided by Cascade Members during preparation of Cascade's 2004 Transmission and Supply Plan, and supplemented by data contained in previous reuse marketing studies conducted by King County. Cascade Members were interviewed and asked to describe their water reuse planning activities, if any. This included identifying any reuse activities through 2004 as well as known planned opportunities or projects at that time. Furthermore, the Members were also asked to provide account information for their top ten largest water customers (i.e., historical usage). From these lists, those accounts were identified that represent irrigation or industrial uses suitable for consideration of reclaimed water. These represent the primary reuse opportunities that exist for Cascade over the next twenty years.

The information provided by the Members was then compared against previous studies performed by King County, in which potential reclaimed water application sites were identified. Where additional opportunities were identified, these are included.

Table 6.1 provides a summary of water demand information obtained for each identified site. Figure 6.1 through Figure 6.3 provide the location for each site specifically listed in the table. For further details of this review, see Chapter 6 of Cascade's 2004 TSP.



Reclaimed Water Sources and Potential Users - Covington WD

FIGURE 6.3

Table 6.1 Summary of Existing Sites with Potential for Reclaimed Water Application [1]					
Customer	**Map Key (see Fig 6.1-6.3)**	**2003 Total Consumption (ccf)[2]**	**2003 Total Consumption (gal)[3]**	**2003 Average Day Demand (gpd)[4]**	**2003 Peak Season Demand (gpd)[5]**
Bellevue					
Bellevue Community College	B1	4,571	3,419,108	9,367	28,025
Bentall Capital/Five Newport	B2	10,040	7,509,920	20,575	61,557
Foothill Commons Apts.	B3	4,062	3,038,376	8,324	24,905
Double Tree Inn	B4	5,251	3,927,748	10,761	32,195
Boeing Computer Services	B5	5,145	3,848,460	10,544	31,545
Central Park East Apts.	B6	5,332	3,988,336	10,927	32,691
Colony Woods Apts.	B7	6,223	4,654,804	12,753	38,154
Montreux-Glacier Ridge	B8	14,413	10,780,924	29,537	88,368
Overlook at Lakemont	B9	4,023	3,009,204	8,244	24,666
Tam O'Shanter Golf Course	B10	10,066	7,529,368	20,628	61,716
Bellevue Municipal Golf Course[10]	B11	N/A	N/A	N/A	61,716
Subtotal - Bellevue		69,126	51,5076,248	141,661	485,538
Covington					
Washington National	C1	72,024	53,873,952	147,600	441,590
Cedar Heights Jr. High	C2	9,876	7,387,248	20,239	60,551
Kentwood High School	C3	5,968	4,464,064	12,230	36,591
Kentlake High School	C4	5,124	3,832,752	10,501	31,416
Covington Medical Park	C5	4,704	3,518,592	9,640	28,841
Tahoma school district #4	C6	3,554	2,658,392	7,283	21,790
Glacier Park Elementary	C7	3,336	2,495,328	6,837	20,454
Crestwood Elementary	C8	3,289	2,460,172	6,740	20,165
Mattson Jr. High	C9	2,922	2,185,656	5,988	17,915
Jenkins Creek Elementary	C10	2,480	1,855,040	5,082	15,205
Covington Retail Assoc.	C11	2,474	1,850,552	5,070	15,168
Chevron - Carwash	C12	2,242	1,677,016	4,595	4,595
Remington Homeowners Assoc.	C13	1,861	1,392,028	3,814	11,410
Sawyer Woods Elementary	C14	1,771	1,324,708	3,629	10,858
Covington Apartments LLC	C15	1,632	1,220,736	3,344	10,006
King County Library System	C16	1,511	1,130,228	3,097	9,264
Cedar Valley Elementary	C17	1,416	1,059,168	2,902	8,682
Fred Meyer	C18	1,337	1,000,076	2,740	8,197
Covington Square N.E.	C19	1,075	804,100	2,203	6,591
Rock Creek Elementary	C20	1,064	795,872	2,180	6,524
Subtotal - Covington		129,660	96,985,680	265,714	785,813
Issaquah					
Port Blakely Communities	I1	13,716	10,259,568	28,108	84,095
Talus Residential Property	I2	4,645	3,474,460	9,519	28,479
Darigold	I3	50,000	37,400,000	102,466	102,466
Subtotal - Issaquah		68,361	51,134,028	140,093	215,040
Kirkland					
Lake Washington Technical College	K1	3,682	2,754,136	7,546	22,575
Rose Hill Car Wash	K2	3,657	2,735,436	7,494	7,494
Carillon Properties	K3	14,194	10,617,112	29,088	87,026
Costco	K4	5,725	4,282,300	11,732	35,101
Subtotal - Kirkland		27,258	20,388,984	55,860	152,196
Redmond					
Marymoor Park	R1	ND	ND	ND	1,100,000
TTM Technologies	R2	49,834	37,275,832	102,126	305,540
Genie Industries	R3	27,631	20,667,988	56,625	169,410
Willows Run Golf Course[9]	R4	NA	NA	NA	320,000
Trilogy Golf Course	R5	45,165	33,783,420	92,557	276,913
Honeywell International	R6	23,492	17,572,016	48,143	144,033
Microsoft	R7	284,811	213,038,628	583,667	1,746,218
Nintendo	R8	10,982	8,214,536	22,506	67,332
Subtotal - Redmond		441,915	330,552,420	905,623	4,129,446

Table 6.1 Summary of Existing Sites with Potential for Reclaimed Water Application [1] (cont.)

Customer	Map Key (see Fig 6.1-6.3)	2003 Total Consumption (ccf) [2]	2003 Total Consumption (gal) [3]	2003 Average Day Demand (gpd) [4]	2003 Peak Season Demand (gpd) [5]
Sammamish Plateau					
Issaquah School District, Skyline	P1	5,316	3,976,368	10,894	32,593
Inglewood Junior High	P2	5,289	3,956,172	10,839	32,428
Timbers 3169, Simpson Housing	P3	4,644	3,473,712	9,517	28,473
Beaver Lake Ballfields	P4	4,238	3,170,024	8,685	25,984
East Sammamish Park	P5	3,318	2,481,864	6,800	20,343
Subtotal - Sammamish Plateau		22,805	17,058,140	46,735	139,821
Skyway					
King County Parks	S1	2,371	1,773,508	4,859	14,537
The Lakeshore	S2	2,290	1,712,920	4,693	14,040
Campbell Hill Elementary	S3	1,822	1,362,856	3,734	11,171
Dimmitt Middle School	S4	1,698	1,270,104	3,480	10,411
Bryn Mawr Elementary	S5	1,051	786,148	2,154	6,444
Subtotal - Skyway		9,232	6,905,536	18,919	56,603
Tukwila					
Fort Dent Park (6)	T1	ND	ND	ND	20,000
Foster Golf Links (7)	T2	ND	ND	ND	100,000
Seattle Rendering Plant (8)	T3	ND	ND	ND	60,000
Jorgesen Forge	T4	8,927	6,677,396	18,294	54,733
Boeing PSAM 12-0380	T5	19,770	14,787,960	40,515	121,213
Boeing PSAM 12-0370	T6	18,148	13,574,704	37,191	111,268
Fairway Center Office Park	T7	ND	ND	ND	ND
A.K. Pacific Erect Inc.	T8	ND	ND	ND	ND
Eriks West	T9	ND	ND	ND	ND
Towne and Country Suites	T10	ND	ND	ND	ND
Subtotal - Tukwila		46,845	35,040,060	96,000	467,214

Notes:

ND = No Data Provided or Available; NA = Not Applicable

1. These sites represent either planned opportunities (where specifically noted) or potential opportunities based on analysis of the largest current irrigation and industrial water customers for each purveyor.
2. From Cascade Member billing records, except where noted.
3. Converted from ccf to gpd.
4. Annual amount divided by 365 days per year.
5. Converted from annual amount to average day demand during peak season. The following assumptions are made:

   Irrigation sites - Peak season use only. Peak season assumed to be 122 days (4 months) long.

   Industrial sites - Annual use divided by 365 days (full year).
6. Currently served customer.
7. Tukwila plans to provide reclaimed water to the golf course by 2010. The use of reclaimed water by the golf course will help offset demand from its water right on the Green River. As this will not reduce Tukwila's potable water demand, the amount associated with the golf course is not included in the reclaimed water demand forecast presented in Table 6.3.
8. Tukwila plans to provide reclaimed water to the rendering plant by 2010.
9. Willows Run Golf Course obtains some water from Redmond, though a majority of irrigation water used is obtained from its own Sammamish River supply.

   The peak season demand shown here is obtained from the Brightwater Final Environmental Impact Statement – Appendix 3-D, Reclaimed Water Technology Review and Evaluation of Potential Water Reuse Opportunities (September 2003).
10. Bellevue Municipal Golf Course obtains irrigation from a City-owned well that has a 100 gpm instantaneous water. No meter records were available for review. Therefore, peak season demand is assumed to be equal to that of Tam O'Shanter Golf Course, for purposes of this analysis

Potential Opportunities with Self-Supplied Water Users

A review of self-supplied water users located within Cascade Members' service areas was also conducted for the 2004 TSP to determine if there are large irrigation or industrial water uses not

presently served by Cascade that might benefit from use of reclaimed water. This is of interest to King County because of the possibility of reducing well withdrawals that might have local impacts on nearby streams. There may be an opportunity for Cascade Members to convey and deliver reclaimed water to new customers currently obtaining water from their own sources of supply.

To investigate the reclaimed water potential associated with self-supplied water users, an analysis of water right information was performed. Data contained within the Department of Ecology's Water Rights Application Tracking System (WRATS) database were reviewed for the areas served by Cascade Members. Only those irrigation and industrial water rights translating to potential water uses of 50,000 gpd or greater were considered. For landscape irrigation, this translates to water rights with instantaneous quantities greater than 100 gallons per minute (gpm) for groundwater rights and 0.23 cubic feet per second (cfs) for surface water rights, assuming maximum daily pumping/diversion times of 8 hours. In terms of industrial water rights, which are typically exercised year-round, this translates to an annual water right quantity of 56 acre-feet or greater.

Based upon the above criteria, the water rights review revealed that there are 41 records associated with irrigation water rights having points of diversion/withdrawal within Cascade Members' service areas. Thirty of these are surface water rights, with an associated total instantaneous quantity of 17.77 cfs. The remaining 11 rights are groundwater rights with an associated total instantaneous quantity of 4,112 gpm. In addition, there are water rights of 4.0 cfs and 160 gpm associated with a golf course located outside of, but adjacent to, the service area boundary of the Sammamish Plateau Water and Sewer District.

The review also indicated that there are 14 commercial/industrial water rights located within the area of interest. One of these is a surface water right for 5.2 cfs, while the others are groundwater rights with an associated total instantaneous quantity of 5,820 gpm.

For clarity purposes, only the largest of the identified self-supplied users are depicted on Figure 6.1. This includes surface water rights greater than 1.0 cfs, and groundwater rights greater than 500 gpm. Also included are four golf courses located within the Covington service area. Although these sites did not meet the criteria described above for mapping, they are included because they may become pertinent to the satellite reuse program that Covington is considering.

Table 6.2 provides information regarding those sites depicted on Figures 6.1 to 6.3.

Table 6.2 Summary of Largest Currently Self-Supplied Water Users Located Within Cascade Member Service Areas

Surface Water Rights [1]		
Map Key (see Fig 6.1-6.3)	**Name of Water Right Holder**	**Qi (cfs)** [2]
A	King County Dept. of Natural Resources	5.2
B	Private Landowner (irrigation)	1.1
C	Private Landowner (irrigation)	1.0
D	Private Landowner (irrigation)	1.0
E	Private Landowner (irrigation)	1.0
F	Dickey Farms, Inc.	1.0
G	Private Landowner (irrigation)	1.0
Groundwater Rights [1]		

Map Key (see Figure 6.1-6.3)	Name of Water Right Holder	Qi (gpm) [2]
H	Consolidated Dairy	1,100
I	Cadman Gravel Co.	1,000
J	Lakeside Gravel	1,500
K	Issaquah Creamery	500
L	United Control Corp.	1,000
M	Willows Run Golf Course [3]	715
N	Sunset Hills Memorial Park	500
Self-Supplied Golf Courses Located within Covington Service Area [4]		
Map Key (see Figure 6.3)	**Name of Golf Course**	**Qi (gpm)**
O	Jade Green	N/A
P	Druids Glen	N/A
Q	Elk Run	N/A
R	Lake Wilderness	N/A

Notes:

1. Based on analysis of water right information, as obtained from Department of Ecology's Water Rights Application Tracking System (WRATS), November 2004.
2. Qi = Maximum allowed withdrawal on an instantaneous basis. Only those water rights having Qi greater than or equal to 1.0 cfs (for surface water) or 500 gpm (for groundwater) are shown.
3. This site is shown on Figure 6.1 as item R4 (see Table 6.1), as the site also receives water from Redmond.
4. Information provided by Covington.

This and the following 14 pages are excerpts from the 2018 CWA/ King County reclaimed water study, related to identification of potential reclaimed water uses in the City of Redmond. Provided as reference in the Redmond 2023 Water System Plan Update.

Reclaimed Water Feasibility Study for the Cascade Water Alliance and King County

Demand Analysis and Cost Evaluation

King County, Washington
September 13, 2018

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Appendix B. Detailed Cost Estimates B-1

1 Introduction

King County (County) and the Cascade Water Alliance (Cascade) desire to explore opportunities within designated areas of Cascade Water Alliance's Service Area to distribute Class A reclaimed water produced at the County's Brightwater Wastewater Treatment Plant. King County's Wastewater Treatment Division currently delivers reclaimed water to several customers in the Sammamish Valley and to a variety of King County facilities.

This study represents an initial stage of exploring water reuse distribution opportunities within the study area. The two parties will evaluate the results of this work to determine the next steps, which may include cost-effectiveness analyses and continued distribution infrastructure planning.

Key elements of this study, aimed at providing information to support further reclaimed water planning and design, include:

- An assessment of the potential water reuse market within the study area, including identification of potential water reuse customers and their associated water demands.
- Identification of water reuse delivery alternatives, including facilities required to pump, store, and convey reuse water to end users.
- High level estimates of project costs associated with implementation of the infrastructure alternatives.

The study area for this report includes: (1) the City of Kirkland water service area with a focus on the portion of Kirkland's service area that is located in proximity to potential large customers of reuse water and near the Cross Kirkland Corridor (CKC), which represents a potential corridor for water reuse transmission piping; (2) the City of Redmond outside the City's Critical Aquifer Recharge Area (CARA); and (3) the northern portion of the City of Bellevue (see Figure 1).

2 Potential Reclaimed Water Demands

2.1 General Approach

This section summarizes potential reclaimed water applications, use locations, and demands within the evaluation area which includes the City of Redmond, City of Kirkland, and the northern portion of the City of Bellevue (collectively referred to as the Cities). The purpose of this evaluation is to identify the largest potential reclaimed water uses and their locations. As such, it is not exhaustive in its identification of all potential uses; rather, the focus is upon large-scale uses for which it may be most cost-effective to develop distribution infrastructure in support of.

Potential reclaimed water demands and locations were determined for both existing water customers of the Cities and future developments/redevelopments within the evaluation area. Two primary methodologies were used for estimating water demands:

one for existing potential uses and the other for potential uses associated with future development/redevelopment. The detailed calculations used with the two methodologies are described in Sections 2.2.1 and 2.3.1.

For determining demands of existing potential customers, utility billing information for the largest water customers was utilized. The uses of water considered for this portion of the analysis include irrigation and cooling tower use.

For determining demands associated with future developments/redevelopments, information from city planning departments on planned developments (number of employees, acres of development, number of dwellings, etc.) was used to estimate the future potential reclaimed water demands. The uses of water considered for this portion of the analysis include irrigation and toilet flushing. (Note: The latter use is not considered with respect to the existing customer base due to the high cost of retrofitting existing buildings to accommodate this use in that context.)

Additionally, information from a 2016 draft reclaimed water feasibility study for the City of Kirkland/King County was used as a basis for future potential reclaimed water demands and was updated using recent numbers from the City of Kirkland's planning department.

2.2 Existing Cascade Member Customers with Large Non-Potable Demand

2.2.1 Potential Demand Calculation Methodology

City of Kirkland Data

The City of Kirkland provided bi-monthly metered demand for the 20 highest-water using customer accounts and the top 10 accounts classified as irrigation based on 2016 demand. Since two of the top irrigation accounts were also included in the list of the top 20 water accounts, a total of 28 unique accounts were provided. The bi-monthly metered data included demands from 2014 through 2016 (see Table 1 for customers).

For irrigation customers, the following calculation methodologies were used to analyze previous water consumption:

- Average demand based on 2014-2016 data for each bi-monthly period was determined.
- Total average annual demand = Sum of average bi-monthly demands.
- Average day demand (gpd) = Total average annual demand (gal) / 365.
- Peak season demand (gpd) = Calculated as the average day demand throughout the peak season considered as June through September (total demand during peak season divided by 122 days). For some bi-monthly billing information, a billing cycle of July through October was used.
- Maximum day demand (gpd) = Maximum bi-monthly demand (gal) / 36 (assumes 18 irrigation days per month or 36 irrigation days per bi-monthly period).
- Instantaneous demand (gpm) = Maximum day demand (gal) / (8 × 60) (assumes 8 hours of irrigation during maximum day).

For water customers (where demand is used for both irrigation and potable uses), the following calculation methodologies were used to determine irrigation use:

- Average demand based on 2014-2016 data for each bi-monthly period was determined.
- Total winter consumption was determined as the sum of bi-monthly demands from November through April or October through March depending on the timeframe of bi-monthly meter reads.
- The average bi-monthly winter consumption was determined by dividing the total winter consumption by 3 (number of bi-monthly periods during winter period).
- The average bi-monthly winter consumption was assumed to be comprised of non-irrigation demands. Any demands above the average winter consumption in the summer months is assumed to be an irrigation demand. The bi-monthly irrigation demand is then found by subtracting the average winter consumption from the total bi-monthly consumption.
- Total average annual demand = Sum of average bi-monthly irrigation demands.
- Average day demand (gpd) = Total average annual demand (gal) / 365.
- Peak season demand (gpd) = Calculated as the average day demand throughout the peak season considered as June through September (total demand during peak season divided by 122 days). For some bi-monthly billing information, a billing cycle of July through October was used.
- Maximum day demand (gpd) = Maximum bi-monthly irrigation demand (gal) / 36 (assumes 18 irrigation days per month or 36 irrigation days per bi-monthly period).
- Instantaneous demand (gpm) = Maximum day demand (gal) / (8 × 60) (assumes 8 hours of irrigation during maximum day).

For six of the top 20 water customers, the metered water consumption did not show a clear seasonal demand pattern with a peak in summer months. For these six customers, it is assumed that there was a negligible irrigation demand.

City of Redmond Data

The City of Redmond provided monthly metered demand for the 9 highest water-using irrigation accounts and the four highest water-using accounts associated with cooling towers. The data provided was for January through December of 2017 (see Table 1 for customers).

For the irrigation customers, the following calculation methodologies were used:

- Average day demand (gpd) = Total annual demand (gal) / 365.
- Peak season demand (gpd) = Average day demand throughout the peak season considered as June through September (total demand during peak season divided by 122 days).
- Maximum day demand (gpd) = Maximum month demand (gal) / 18 (assumes 18 irrigation days in the month).

- Instantaneous demand (gpm) = Maximum day demand (gal) / (8 × 60) (assumes 8 hours of irrigation during maximum day).

For the cooling tower customers, the following calculation methodologies were used:

- Average day demand (gpd) = Total annual demand (gal) / 365.
- Peak season demand (gpd) = Average day demand throughout the peak season considered as June through September (total demand during peak season divided by 122 days).
- Maximum day demand (gpd) = Maximum month demand (gal) / days in month.
- Instantaneous demand (gpm) = Maximum day demand (gal) / (24 × 60) (assumes constant 24 hours of demand during maximum day).

City of Bellevue Data

The City of Bellevue conducted a review of its largest water-using accounts, and identified one of its 10 largest customers as being located within the study area (i.e., within the northern portion of the City). However, the water use at this location is predominantly of a potable nature, with minimal to no opportunity for application of reclaimed water. The City's data review did identify that three of its largest irrigation accounts, which may represent potential reclaimed water uses, are located within approximately three miles of the southern extent of the study area, including one golf course. Similarly, a self-supplied golf course is also located south of the study area. These specific locations are not included in the summary of potential demands from existing water customers, due to their distance from the study area. However, the general potential for uses further to the south in Bellevue are contemplated in the form of the Additional Unspecified Demands included in Table 3 (see Section 2.4).

2.2.2 Summary of Potential Demands from Existing Water Customers

A summary of the calculated potential reclaimed water demands from the largest existing water utility customers are provided in Table 1. The locations of the potential reclaimed water uses are shown in Figure 1.

Table 1. Potential Reclaimed Water Demands from Existing Water Customers

User ID	Customer Type or Name	Water Use	Total Annual Demand (gal) [a]	Average Day Demand (gpd) [b]	Peak Season Demand (gpd) [c]	Maximum Day Demand (gpd) [d]	Instant-aneous Demand (gpm) [e]
City of Kirkland Potential Customers							
K-1	Lake Washington High School	Irrigation	4,281,595	11,730	28,493	48,928	102
K-2	Northwest University	Irrigation	3,458,739	9,476	25,563	49,912	104
K-3	Linbrook Bldgs LLC	Irrigation	2,628,153	7,200	16,747	37,680	78
K-4	Srmkii LLC	Irrigation	2,399,997	6,575	14,726	30,448	63
K-5	Peter Kirk Park	Irrigation	2,241,161	6,140	15,948	35,934	75

Table 1. Potential Reclaimed Water Demands from Existing Water Customers

User ID	Customer Type or Name	Water Use	Total Annual Demand (gal) [a]	Average Day Demand (gpd) [b]	Peak Season Demand (gpd) [c]	Maximum Day Demand (gpd) [d]	Instant-aneous Demand (gpm) [e]
K-6	Gsic Forbes Creek Reit Inc Apt (Sprinkler)	Irrigation	2,233,307	6,119	16,132	38,338	80
K-7	LMJ Enterprises	Irrigation	2,167,852	5,939	15,813	28,717	60
K-8	Peter Kirk Park	Irrigation	2,021,234	5,538	13,532	26,819	56
K-9	Crestwoods Park	Irrigation	1,938,948	5,312	13,275	29,964	62
K-10	Everest Park	Irrigation	1,902,543	5,212	14,518	36,620	76
K-11	Gsic Forbes Creek Reit Inc Apts	Irrigation	1,895,561	5,193	13,965	32,613	68
K-12	Skinner Mgmt Company	Irrigation	1,472,913	4,035	11,801	21,790	45
K-13	Portsmith Condominiums	Irrigation	727,937	1,994	4,950	10,309	21
K-14	Costco Wholesale Corp	Irrigation	699,677	1,917	5,688	10,189	21
K-15	La Quinta Motor Inn #676	Irrigation	369,039	1,011	2,900	6,104	13
K-16	Cascade Medical Investors Ltd	Irrigation	198,898	545	444	4,020	8
K-17	Boulevard	Irrigation	154,930	424	865	2,027	4
K-18	Essex Portfolio Lp	Irrigation	101,735	279	497	1,683	4
K-19	128 State Street LLC	Irrigation	81,704	224	518	1,755	4
K-20	Plum Court Assoc	Irrigation	68,571	188	412	1,397	3
K-21	SSR Western MTF/TERA Apartment	Irrigation	30,171	83	162	302	1
K-22	Kirkland Central Coa	Irrigation	24,769	68	203	688	1
K-23	Totem Lake Holdings LLC [f]	Irrigation	0	0	0	0	0
K-24	Hotel Kirkland LLC [f]	Irrigation	0	0	0	0	0
K-25	GSIC Forbes Creek Reit Inc Apts [f]	Irrigation	0	0	0	0	0
K-26	Lochshire Condo Assn [f]	Irrigation	0	0	0	0	0
K-27	Kirkland Crossings Llc [f]	Irrigation	0	0	0	0	0
K-28	Safeway Inc #1142 [f]	Irrigation	0	0	0	0	0
	Kirkland Total		**31,099,435**	**85,204**	**217,152**	**456,236**	**950**
	City of Redmond Potential Customers						
R-1	Apartments	Irrigation	3,609,347	9,889	27,230	60,551	126
R-2	Park	Irrigation	3,525,565	9,659	28,083	71,896	150
R-3	Church	Irrigation	2,992,204	8,198	21,289	119,896	250
R-4	Office	Irrigation	2,538,885	6,956	20,118	50,286	105

Table 1. Potential Reclaimed Water Demands from Existing Water Customers

User ID	Customer Type or Name	Water Use	Total Annual Demand (gal) [a]	Average Day Demand (gpd) [b]	Peak Season Demand (gpd) [c]	Maximum Day Demand (gpd) [d]	Instant-aneous Demand (gpm) [e]
R-5	Nursery	Irrigation	2,298,013	6,296	14,470	31,210	65
R-6	Office	Irrigation	2,089,307	5,724	14,103	40,727	85
R-7	Office	Irrigation	2,066,865	5,663	15,721	43,179	90
R-8	Office	Irrigation	2,032,455	5,568	16,659	98,119	204
R-9	School	Irrigation	1,784,850	4,890	14,207	37,029	77
R-10	Office	Cooling	1,523,032	4,173	3,170	18,452	13
R-11	Office	Cooling	1,508,819	4,134	8,425	35,075	24
R-12	Office	Cooling	385,994	1,058	2,551	6,816	4.7
R-13	Office	Cooling	26,182	72	74	249	0.17
	Redmond Total		**26,381,518**	**72,278**	**186,099**	**613,485**	**1,194**
	OVERALL TOTAL		**57,480,953**	**157,482**	**403,251**	**1,069,721**	**2,144**

[a] Average yearly irrigation or cooling use per city-provided water utility billing data.

[b] Average Day Demand is calculated as annual average divided by 365 days.

[c] Peak season demand calculated as the average day demand throughout the peak season considered as June through September (total demand during peak season divided by 122 days). For some bi-monthly billing information, a billing cycle of July through October was used.

[d] Maximum Day Demand is assumed to occur in July and August. Irrigation use is calculated as total maximum monthly usage divided by 18 irrigation days per month. Cooling use assumes the maximum monthly usage divided by the days in the maximum month.

[e] For irrigation use, maximum instantaneous demand calculation assumes 8 hours of irrigation per day. For cooling use, maximum instantaneous demand calculation assumes 24 hours of use per maximum day.

[f] Customer demands provided by utility; however, irrigation demands assumed to be negligible. Customer locations not shown on Figure 1.

2.3 Development/Redevelopment Potential of Service Area

2.3.1 Potential Demand Calculation Methodology

City of Kirkland

This part of the potential reclaimed water demand estimate focuses on opportunities associated with redevelopment of the commercial/industrial and multi-family zoned areas within the study area. It is often more feasible to incorporate water reuse into a facility or property when it is redeveloped, rather than to retrofit an existing building.

The City of Kirkland has conducted a detailed parcel-based analysis of redevelopment potential throughout the City, in support of the December 2015 update to the City of Kirkland's Comprehensive Plan. That information, organized according to City of Kirkland neighborhoods was utilized to support the associated demand estimate. This

redevelopment is planned to occur between 2020 and 2035, consistent with Kirkland 2035 (the City of Kirkland's most recent comprehensive plan update).

In a draft 2016 Kirkland/King County reclaimed water feasibility study, the study area within Kirkland was defined as the entire Totem Lake neighborhood (the majority of which is served water by Northshore Utility District) plus a 2,000-ft buffer area around the Cross Kirkland Corridor (CKC) throughout the rest of the City of Kirkland. For this analysis, only the portion of these redevelopment areas within the City of Kirkland's water service area were considered. The commercial/industrial and multi-family redevelopment potential of all parcels within this area was identified and translated into potential water demands that could be met by water reuse. The specific applications of reuse water considered for such future redevelopment, and key assumptions used in determining their water reuse demand potential, were:

- **Irrigation.** While the majority of the land area considered in the redevelopment potential is assumed to be associated with buildings and facilities, by the very definition of "redevelopment potential", there will be some portion of many redevelopments that may contain irrigated green space. For the purpose of this analysis, five percent of the total area of redevelopable parcels is assumed to potentially be irrigated. Irrigation volumes were estimated by applying local published irrigation needs to those areas. Based on precipitation data from the Western Regional Climate Center (Everett Station, years 1998-2008) and evapotranspiration data from the Washington Irrigation Guide (West of Cascades, Turf), the following irrigation needs were used:
    - Total annual irrigation need = 13.66 inches
    - Maximum month (July) irrigation need = 4.3 inches
- **Toilet flushing in commercial/industrial facilities.** Indoor toilet flushing in commercial buildings is included in this analysis, based upon the potential for new employees associated with redevelopment. Water use volumes are predicated on an average use for toilet flushing of 4.2 gpd/employee.
- **Toilet flushing in multi-family residential facilities.** Indoor toilet use in multi-family buildings is also included. Water use volumes are based on an average use for toilet flushing of 8.0 gpd/person, and assuming there are on average 2 people per multi-family household for a total of 16 gpd per multi-family household.

The above calculation assumptions were applied to the raw redevelopment data regarding acreage, new employees, and new multi-family households, as provided in GIS format by City of Kirkland Planning staff for the draft 2016 study. However, the demands associated with toilet flushing assume that new buildings / redevelopment will be dual-plumbed to allow use of reclaimed water which is consistent with current regulations in order to meet reliability for public water supply. However, the demand may be on the upper range of potential indoor reclaimed water use if a portion of new / redeveloped buildings do not incorporate dual plumbing.

To update the numbers from the draft 2016 study for the purpose of this evaluation, City of Kirkland Planning staff provided a list of major development projects taking place in the city and which phase each project is currently in (under construction, in review, pre-permit, etc.). Depending on the land use, the list provided for each development the

number of housing units, office square footage, commercial square footage, institutional square footage, or number of hotel rooms. The potential demands for projects in this list which are within the draft 2016 study area and are in the phases of currently under construction or have been issued a building permit, were then subtracted from the demands in the draft 2016 report (based on the assumption that those projects are too far along in the permitting/construction process to consider incorporation of reclaimed water infrastructure). Additionally, it was decided to only include demands within Kirkland's water service area. Because the neighborhood of Totem Lake resides both inside and outside of the service area, it was assumed that one-third of the potential reclaimed water demand resided within the water service area. Other neighborhoods that were part of the draft 2016 study but completed outside of the water service area were excluded from this analysis. A summary of the demands is given in Table 2.

City of Redmond

City of Redmond Planning staff identified the Overlake Village Urban Center as an area of redevelopment within the City that represents potential use areas for reclaimed water. For this area, City staff provided the total redevelopment area, the estimated number of employees, and the estimated number of residential dwellings that are planned to exist by 2030. Given this information, the potential water demand for irrigation and toilet flushing (for both commercial/industrial facilities and multi-family residential facilities) was determined using similar assumptions as presented for the City of Kirkland. A summary of the demands is given in Table 2.

City of Bellevue

City of Bellevue permitting and development staff indicated that there are no major redevelopment projects planned for the portion of the City within the study area. This northern portion of the City is largely low density residential, with a small portion comprised of multi-family and professional office building use.

2.3.2 Summary of Potential Demands from Development/ Redevelopment

A summary of the calculated potential reclaimed water demands for future developments and redevelopments is provided in Table 2. Additional details can be found in Tables A-1 and A-2 in Appendix A.

Table 2. Potential Reclaimed Water Demands from Development/Redevelopment

Location	Total Annual Demand (gal)	Average Day Demand (gpd)	Peak Season Demand (gpd)	Maximum Day Demand (gpd)	Instantaneous Demand (gpm)
City of Kirkland (by neighborhood)					
Central Houghton	932,001	2,553	5,524	12,472	24
Everest	2,928,178	8,022	12,248	19,487	25
Highlands	603,842	1,654	3,870	9,182	19

Table 2. Potential Reclaimed Water Demands from Development/Redevelopment

Location	Total Annual Demand (gal)	Average Day Demand (gpd)	Peak Season Demand (gpd)	Maximum Day Demand (gpd)	Instantaneous Demand (gpm)
Lakeview	4,933,298	13,516	18,590	27,965	33
Moss Bay	5,884,763	16,123	19,619	22,188	9
Norkirk	838,395	2,297	4,429	8,367	14
North Rose Hill	6,743,927	18,477	24,239	30,121	21
South Juanita	770,425	2,111	5,338	12,979	27
South Rose Hill	135,156	370	708	1,480	3
Totem Lake	9,269,581	25,396	29,467	33,409	14
City of Kirkland Total	**33,039,566**	**90,519**	**124,031**	**177,650**	**188**
City of Redmond (by neighborhood)					
Overlake Village Urban Center	56,091,197	153,675	200,781	349,641	437
City of Redmond Total	**56,091,197**	**153,675**	**200,781**	**349,641**	**437**
OVERALL TOTAL	**89,130,763**	**244,194**	**324,812**	**527,291**	**625**

2.4 Summary of Potential Reclaimed Water Demands

A summary of the potential reclaimed water demands identified in this analysis (Table 1 and Table 2) is provided in Table 3. The total potential identified demand is approximately 0.6 mgd on an average day basis, 1.1 mgd on a peak season basis, and 2.7 mgd on a maximum day basis.

This summary is not based on an exhaustive inventory of all potential reclaimed water uses within the evaluation area. Rather, it is focused on the largest potential uses and those for which distribution infrastructure may likely be the most cost-effective. To reflect the existence of other potential uses of reclaimed water, which may be smaller than those specifically identified in this evaluation or that may be located outside of the study area (e.g., further to the south in Bellevue), a category of “Additional Unspecified Demands” is included in this summary.

Table 3. Summary of Potential Reclaimed Water Demands

Location	Total Annual Demand (gal)	Average Day Demand (gpd)	Peak Season Demand (gpd)	Maximum Day Demand (gpd)	Instantaneous Demand (gpm)
City of Kirkland					
Existing Potential Large Non-Potable Demands	31,099,435	85,204	217,152	456,236	950
Future Potential Development/ Redevelopment Demands	33,039,566	90,519	124,031	177,650	188

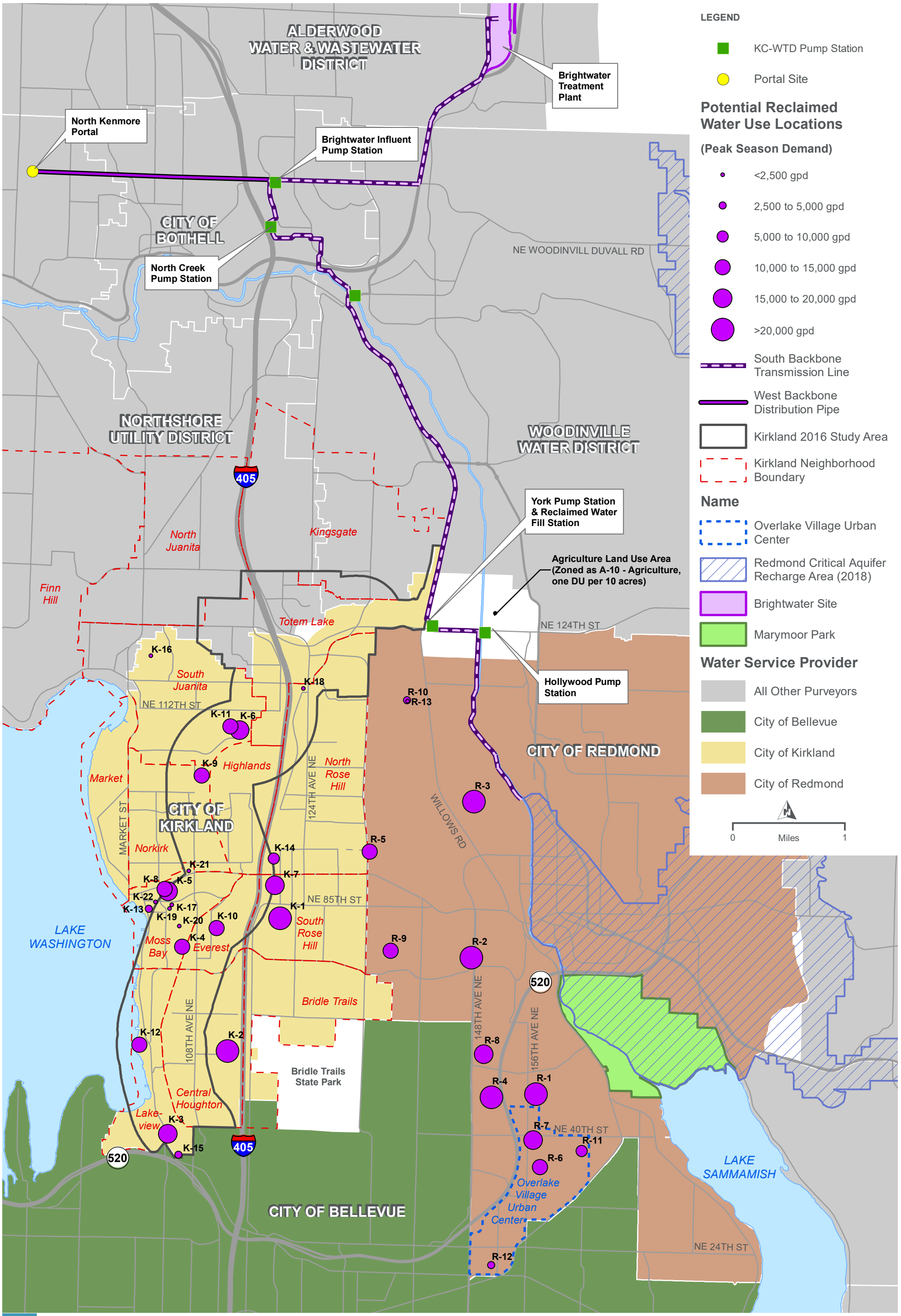
Table 3. Summary of Potential Reclaimed Water Demands

Location	Total Annual Demand (gal)	Average Day Demand (gpd)	Peak Season Demand (gpd)	Maximum Day Demand (gpd)	Instantaneous Demand (gpm)
Additional Unspecified Demands [a]	31,100,000	85,200	217,000	456,000	950
Total	**95,239,001**	**260,923**	**558,183**	**1,089,886**	**2,088**
Cities of Redmond/Bellevue [b]					
Existing Potential Large Non-Potable Demands	26,381,518	72,278	186,099	613,485	1,194
Future Potential Development/ Redevelopment Demands	56,091,197	153,675	200,781	349,641	437
Additional Unspecified Demands [a]	26,400,000	72,300	186,000	613,000	1,200
Total	**108,872,715**	**298,253**	**572,880**	**1,576,126**	**2,831**
OVERALL TOTAL	**204,111,716**	**559,176**	**1,131,063**	**2,666,012**	**4,919**

[a] Assumed to be approximately equal to the identified potential large non-potable demands. This would include demands of smaller potential non-potable customers not identified in the largest customer dataset.

[b] The additional unspecified demands reflect additional potential reclaimed water demands within both Redmond and the northern portion of Bellevue, including potential uses just to the south of the study area.

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POTENTIAL RECLAIMED WATER USE LOCATIONS

CASCADE NORTH SERVICE AREA

FIGURE 1

PATH: G:\PROJECTS\WASHINGTON\KING_COUNTY_000\DRESGS_RECOVERY_SRT_100324\73\7.2_WP\MAP_DOCS\FIGURE 1 - LOCATIONS OF POTENTIAL CUSTOMERS.MXD - USER: DHUNS - DATE: 7/25/2018

RECLAIMED WATER FEASIBILITY STUDY FOR THE COMO AND KING COUNTY

Appendix I
Water Quality Monitoring Schedule

Water Quality Monitoring Schedule

System: REDMOND WATER SYSTEM CITY OF **PWS ID: 71650 B** **Region: NORTHWEST**
Contact: John R Burtsche **Group: A - Comm** **County: KING**

NOTE: To receive credit for compliance samples, you must fill out laboratory and sample paperwork completely, send your samples to a laboratory accredited by Washington State to conduct the analyses, AND ensure the results are submitted to DOH Office of Drinking Water. There is often a lag time between when you collect your sample, when we credit your system with meeting the monitoring requirement, and when we generate the new monitoring requirement.

Coliform Monitoring Requirements

	Mar 2023	Apr 2023	May 2023	Jun 2023	Jul 2023	Aug 2023	Sep 2023	Oct 2023	Nov 2023	Dec 2023	Jan 2024	Feb 2024
Coliform Monitoring Population	123524	123537	123524	123537	123524	123524	123537	123524	123537	123524	123524	123565
Number of Routine Samples Required	100	100	100	100	100	100	100	100	100	100	100	100

- Collect samples from representative points throughout the distribution system.
- Collect required repeat samples following an unsatisfactory sample. In addition, collect a sample from each operating groundwater source.
- For systems that chlorinate, record chlorine residual (measured when the coliform sample is collected) on the coliform lab slip.

Chemical Monitoring Requirements

Distribution Monitoring

Water Quality Monitoring Schedule

Test Panel/Analyte	# Samples Required	Compliance Period	Frequency	Last Sample Date	Next Sample Due	
Lead and Copper	50	Jan 2022 - Dec 2024	standard - 3 year	06/07/2021	Jun 2024	
Asbestos	1	Jan 2020 - Dec 2028	standard - 9 year	08/08/2018	Aug 2027	
Total Trihalomethane (THM)	8	Jan 2023 - Mar 2023	standard - quarterly	01/03/2023		
Total Trihalomethane (THM)	8	Apr 2023 - Jun 2023	standard - quarterly	01/03/2023	***Apr 2023***	
Total Trihalomethane (THM)	8	Jul 2023 - Sep 2023	standard - quarterly	01/03/2023	***Jul 2023***	
Total Trihalomethane (THM)	8	Oct 2023 - Dec 2023	standard - quarterly	01/03/2023	***Oct 2023***	
Halo-Acetic Acids (HAA5)	8	Jan 2023 - Mar 2023	standard - quarterly	01/03/2023		
Halo-Acetic Acids (HAA5)	8	Apr 2023 - Jun 2023	standard - quarterly	01/03/2023	***Apr 2023***	
Halo-Acetic Acids (HAA5)	8	Jul 2023 - Sep 2023	standard - quarterly	01/03/2023	***Jul 2023***	
Halo-Acetic Acids (HAA5)	8	Oct 2023 - Dec 2023	standard - quarterly	01/03/2023	***Oct 2023***	

Notes on Distribution System Chemical Monitoring

For *Lead and Copper*:
- Collect samples from the COLD WATER side of a KITCHEN or BATHROOM faucet that is used daily.
- Before sampling, make sure the water has sat unused in the pipes for at least 6 hours, but no more than 12 hours (e.g. overnight).
- If you are sampling from a faucet that has hot water, make sure cold water is the last water to run through the faucet before it sits overnight.
- If your sampling frequency is annual or every 3 years, collect samples between June 1 and September 30.

For *Asbestos:* Collect the sample from one of your routine coliform sampling sites in an area of your distribution system that has asbestos concrete pipe.

For *Disinfection Byproducts (HAA5 and THM):* Collect the samples at the locations identified in your Disinfection Byproducts (DBP) monitoring plan.

Source Monitoring

- Collect 'source' chemical monitoring samples from a tap after all treatment (if any), but before entering the distribution system.
- Washington State grants monitoring waivers for various test panels /analytes. Please note that we may require some monitoring as a condition of some waivers. We have granted complete waivers for dioxin, endothal, glyphosate, diquat, and insecticides.
- Nitrate, arsenic, iron, and other individual inorganics are included as part of a Complete Inorganic (IOC) analysis when it is collected.

Source S03 *Well 3 ABR043* *Well* *Use - Permanent* *Susceptility - High*

Test Panel/Analyte	# Samples Required	Compliance Period	Frequency	Last Sample Date	Next Sample Due
Nitrate	1	Jan 2023 - Dec 2023	standard - 1 year	04/27/2022	***Apr 2023***

Water Quality Monitoring Schedule

Source Monitoring

- Collect 'source' chemical monitoring samples from a tap after all treatment (if any), but before entering the distribution system.
- Washington State grants monitoring waivers for various test panels /analytes. Please note that we may require some monitoring as a condition of some waivers. We have granted complete waivers for dioxin, endothal, glyphosate, diquat, and insecticides.
- Nitrate, arsenic, iron, and other individual inorganics are included as part of a Complete Inorganic (IOC) analysis when it is collected.

Source S03 *Well 3 ABR043* *Well* *Use - Permanent* *Susceptility - High*

Test Panel/Analyte	*# Samples Required*	*Compliance Period*	*Frequency*	*Last Sample Date*	*Next Sample Due*
Complete Inorganic (IOC)	1	Jan 2020 - Dec 2028	waiver - 9 year	05/03/2017	May 2026
Volatile Organics (VOC)	1	Jan 2020 - Dec 2025	waiver - 6 year	07/09/2019	Jul 2025
Herbicides	1	Jan 2023 - Dec 2031	waiver - 9 year	07/27/2022	Jul 2031
Pesticides	0	Jan 2023 - Dec 2025	waiver - 3 year	10/30/2002	
PFAS	1	Jan 2023 - Dec 2025	standard - 3 year		***Nov 2023***
Soil Fumigants	0	Jan 2023 - Dec 2025	waiver - 3 year		
Gross Alpha	1	Jan 2020 - Dec 2025	standard - 6 year	06/19/2019	Jun 2025
Radium 228	1	Jan 2020 - Dec 2025	standard - 6 year	06/19/2019	Jun 2025

Source S04 *Well 4 ACJ523* *Well* *Use - Permanent* *Susceptility - High*

Test Panel/Analyte	*# Samples Required*	*Compliance Period*	*Frequency*	*Last Sample Date*	*Next Sample Due*
Nitrate	1	Jan 2023 - Dec 2023	standard - 1 year	09/02/2021	***Mar 2023***
Complete Inorganic (IOC)	1	Jan 2020 - Dec 2028	waiver - 9 year	05/03/2017	May 2026
Manganese	1	Jan 2023 - Dec 2025	standard - 3 year	09/02/2021	Sep 2024
Volatile Organics (VOC)	1	Jan 2023 - Dec 2025	standard - 3 year	09/02/2021	Sep 2025
Herbicides	1	Jan 2023 - Dec 2025	standard - 3 year	07/11/2013	Mar 2024
Herbicides	1	Jan 2023 - Dec 2025	standard - 3 year	07/11/2013	Sep 2025
Pesticides	0	Jan 2023 - Dec 2025	waiver - 3 year	05/19/2000	
PFAS	1	Jan 2023 - Dec 2025	standard - 3 year		***Nov 2023***
Soil Fumigants	0	Jan 2023 - Dec 2025	waiver - 3 year		
Gross Alpha	1	Jan 2020 - Dec 2025	standard - 6 year	06/19/2019	Jun 2025

Water Quality Monitoring Schedule

Source Monitoring

- Collect 'source' chemical monitoring samples from a tap after all treatment (if any), but before entering the distribution system.
- Washington State grants monitoring waivers for various test panels /analytes. Please note that we may require some monitoring as a condition of some waivers. We have granted complete waivers for dioxin, endothal, glyphosate, diquat, and insecticides.
- Nitrate, arsenic, iron, and other individual inorganics are included as part of a Complete Inorganic (IOC) analysis when it is collected.

Source S04	*Well 4 ACJ523*	*Well*	*Use - Permanent*	*Susceptility - High*	
Test Panel/Analyte	*# Samples Required*	*Compliance Period*	*Frequency*	*Last Sample Date*	*Next Sample Due*
Radium 228	1	Jan 2020 - Dec 2025	standard - 6 year	06/19/2019	Jun 2025

Source S07	*Well 5 ABR041*	*Well*	*Use - Permanent*	*Susceptility - High*	
Test Panel/Analyte	*# Samples Required*	*Compliance Period*	*Frequency*	*Last Sample Date*	*Next Sample Due*
Nitrate	1	Jan 2023 - Dec 2023	standard - 1 year	04/27/2022	***Apr 2023***
Complete Inorganic (IOC)	1	Jan 2020 - Dec 2028	waiver - 9 year	05/03/2017	May 2026
Volatile Organics (VOC)	1	Jan 2023 - Dec 2025	standard - 3 year	07/27/2022	Jul 2025
Herbicides	1	Jan 2023 - Dec 2031	waiver - 9 year	07/27/2022	Jul 2031
Pesticides	0	Jan 2023 - Dec 2025	waiver - 3 year	10/30/2002	
PFAS	1	Jan 2023 - Dec 2025	standard - 3 year		***Nov 2023***
Soil Fumigants	0	Jan 2023 - Dec 2025	waiver - 3 year		
Gross Alpha	1	Jan 2020 - Dec 2025	standard - 6 year	06/19/2019	Jul 2025
Radium 228	1	Jan 2020 - Dec 2025	standard - 6 year	06/19/2019	Jul 2025

Source S14	*Well 1R & 2R*	*Well Field*	*Use - Permanent*	*Susceptility - Moderate*	
Test Panel/Analyte	*# Samples Required*	*Compliance Period*	*Frequency*	*Last Sample Date*	*Next Sample Due*
Nitrate	1	Jan 2023 - Dec 2023	standard - 1 year	04/27/2022	***Apr 2023***
Complete Inorganic (IOC)	1	Jan 2020 - Dec 2028	waiver - 9 year	05/03/2017	May 2026
Volatile Organics (VOC)	1	Jan 2023 - Dec 2028	waiver - 6 year	07/09/2019	Jul 2025
Herbicides	1	Jan 2023 - Dec 2031	waiver - 9 year	07/27/2022	Jul 2031
Pesticides	0	Jan 2023 - Dec 2025	waiver - 3 year	08/31/2010	

Water Quality Monitoring Schedule

Source Monitoring

- Collect 'source' chemical monitoring samples from a tap after all treatment (if any), but before entering the distribution system.
- Washington State grants monitoring waivers for various test panels /analytes. Please note that we may require some monitoring as a condition of some waivers. We have granted complete waivers for dioxin, endothal, glyphosate, diquat, and insecticides.
- Nitrate, arsenic, iron, and other individual inorganics are included as part of a Complete Inorganic (IOC) analysis when it is collected.

Source S14 *Well 1R & 2R* *Well Field* *Use - Permanent* *Susceptility - Moderate*

Test Panel/Analyte	*# Samples Required*	*Compliance Period*	*Frequency*	*Last Sample Date*	*Next Sample Due*
PFAS	1	Jan 2023 - Dec 2025	standard - 3 year		***Nov 2023***
Soil Fumigants	0	Jan 2023 - Dec 2025	waiver - 3 year		
Gross Alpha	1	Jan 2020 - Dec 2025	standard - 6 year	06/19/2019	Jun 2025
Radium 228	1	Jan 2020 - Dec 2025	standard - 6 year	06/19/2019	Jun 2025

Water Quality Monitoring Schedule

Other Information

Other Reporting Schedules	*Due Date*
Measure chlorine residuals and submit monthly reports if your system uses continuous chlorination:	monthly
Submit Consumer Confidence Report (CCR) to customers and ODW (Community systems only):	07/01/2023
Submit CCR certification form to ODW (Community systems only):	10/01/2023
Submit Water Use Efficiency report online to ODW and to customers (Community and other municipal water systems only):	07/01/2023
Send notices of lead and copper sample results to the customers sampled:	30 days after you receive the laboratory results
Submit Certification of customer notification of lead and copper results to ODW:	90 days after you notify customers

Special Notes

None

Northwest Regional Water Quality Monitoring Contacts

For questions regarding chemical monitoring:	Steve Hulsman: (253) 395-6777 or Steve.Hulsman@doh.wa.gov
For questions regarding DBPs:	Steve Hulsman: (253) 395-6777 or Steve.Hulsman@doh.wa.gov
For questions regarding coliform bacteria and microbial issues:	Ingrid Salmon: (253) 395-6754 or ingrid.salmon@doh.wa.gov

Additional Notes

The information on this monitoring schedule is valid as of the date in the upper left corner on the first page. However, the information may change with subsequent updates in our water quality monitoring database as we receive new data or revise monitoring schedules. There is often a lag time between when you collect your sample and when we credit your system with meeting the monitoring requirement.

We have not designed this monitoring schedule to display all compliance requirements. The purpose of this schedule is to assist water systems with planning for most water quality monitoring, and to allow systems to compare their records with DOH ODW records. Please be aware that this monitoring schedule does not include constituents that require a special monitoring frequency, such as monitoring affiliated with treatment.

Any inaccuracies on this schedule will not relieve the water system owner and operator of the requirement to comply with applicable regulations.

If you have any questions about your monitoring requirements, please contact the regional office staff listed above.

Appendix J
Coliform Monitoring Plan

Coliform Monitoring Plan for: City of Redmond

A. System Information

Plan Date: 7/17/2023

Water System Name City of Redmond	**County** King	**System I.D. Number** 71650 B
Name of Plan Preparer Dylan Herndon	**Position** Water Quality Analyst	**Daytime Phone** **425-588-5228**
Sources: DOH Source Number, Source Name, Well Depth, Pumping Capacity	**S14 (S15/S16)** – Wells 1R & R2: #1R, 77.6' 900gpm / #2R, 79.4' 500gpm (1400gpm Total) **S03** – Well 3: 73.9' 435gpm **S04** – Well 4: 54.1' 578gpm **S07** – Well 5: 45.2' 1000gpm **S05 –** Intertie: Kirkland/42250T (975gpm) - Permanent **S06 –** Intertie: Bellevue/05575B - Permanent **S08 –** Intertie: Seattle (2)/77050Y (7600gpm) - Season **S09 –** Intertie: Seattle (2)/77050Y - Permanent **S10 –** Intertie: Union Hill (3)/90260 - Emergency **S11 –** Intertie: Woodinville (2)/41600 - Emergency **S12 –** Intertie: Sammamish Plateau (1)/40900 - Emer **S13 –** Intertie: NE Sammamish (1)/75265 - Emergency	
Storage: List and Describe	• Education Hill Reservoirs (**2 & 3 MG**) 171st St & 104th – ZONE 470 • Reservoir Park (**4 MG**) 163rd Ave NE & NE 95th St – ZONE 238 • Southeast Redmond Reservoir (**4.5 MG**) – ZONE 238 • Perrigo (**0.5 MG**) – ZONE 238 • Novelty Hill Tank #1 (**3.4 MG**) – ZONE 610 • Novelty Hill Tank # 2 (**5.5 MG**) – ZONE 610 • Bel-Red & 40th (BELLEVUE) (**6 MG**) – ZONES 520, 415, 335 • Rose Hill North (KIRKLAND) (**14.3 MG**) – ZONE 450 • Rose Hill South (KIRKLAND) (**11.2 MG**) - ZONE 545	

Treatment: Source Number & Process	**S14** – CHLORINATION, ON-SITE GENERATION (Disinfection) / FLOURIDATION (Dental Health) / AERATION, PACKED TOWER (Corrosion Control) **S03** – CHLORINATION, ON-SITE GENERATION (Disinfection) / FLOURIDATION (Dental Health) / AERATION, PACKED TOWER (Corrosion Control) **S04** – CHLORINATION, ON-SITE GENERATION (Disinfection) / FLOURIDATION (Dental Health) / pH – ALK ADJUST, CAUSTIC SODA (Corrosion Control), SEQUESTRATION (Iron & Manganese Removal) **S07** – CHLORINATION, ON-SITE GENERATION (Disinfection) / FLOURIDATION (Dental Health) / AERATION, PACKED TOWER (Corrosion Control)
Pressure Zones: Number and name	• **238** (Well Service Area & Washington Cathedral-Wood-Red & NE 124th St) • **285** (Below Perrigo Tank & lower Willows Road) • **300** (SE Redmond Reservoir and Millennium) • **315** (Red-Wood Road east of Reservoir Park) • **335** (East side of Westlake) • **350** (Fischer Village & Avalon at Bear Creek) • **390** (Red-wood North of Tolt Pipeline to NE 116th St) • **415** (NE 40th St between PRV 14 & 15) • **425** (North of 51st St & east side of 520, under 520 and north to 132nd Ave NE (The Point), Upper Willows from Kirkland (100th St) • **435** (Far South at Bellevue border NE 19th Pl) • **465** (The Onyx at 40th and 156th Ave NE) • **470** (Most of the top of Ed Hill & North to Woodinville Border) • **520** (Overlake Area) • **545** (132nd Ave NE from City of Kirkland) • **565** (Ed Hill Booster to Nike & across 104th Ave NE) • **625** (North side of Trilogy) • **670** (South side of Trilogy) • **730** (Novelty Hill tanks and all of Redmond Ridge)

Population by Pressure Zone Full-Time Residential – 69900 Temporary & Transient – 11840 Regular Non-Residential – 53242 **TOTAL – 133982**	• 238 – Connections: **1648** • 285 – Connections: **601** • 300 – Connections: **512** • 315 – Connections: **97** • 335 – Connections: **1981** • 350 – Connections: **1033** • 390 – Connections: **390** • 415 – Connections: **229** • 425 – Connections: **2032** • 435 – Connections: **126** • 465 – Connections: **4** • 470 – Connections: **2887** • 520 – Connections: **482** • 545 – Connections: **1684** • 565 – Connections: **434** • 625 – Connections: **456** • 670 – Connections: **692** • 730 – Connections: **2352**
Number of Routine Samples Required Monthly by Regulation:	100
Number of Sample Sites Needed to Represent the Distribution System:	26
Request DOH Approval of Triggered Source Monitoring Plan?	**Yes** ☐ **No** ☒

B. Laboratory Information

Laboratory Name AmTest Laboratories	**Office Phone 425-885-1664** **After Hours Phone 206-387-8722**
Address 13600 NE 126TH Pl, Suite C, Kirkland, WA 98034	**Cell Phone - -** **Email micro@amtestlab.com**
Hours of Operation Monday-Friday 8am-5pm	
Contact Name Seth Farb - **sethf@amtestlab.com**	
Emergency Laboratory Name EDGE Analytical Laboratories	**Office Phone 360-757-1400** **After Hours Phone - -**
Address 1620 S. Walnut Street, Burlington, WA 98233	**Cell Phone - -** **Email lab@edgeanalytical.com**
Hours of Operation Monday-Friday 8am-5pm	
Contact Name Larry Henderson - **lhenderson@edgeanalytical.com**	

C. Wholesaling of Groundwater

	Yes	No
We are a consecutive system and purchase groundwater from another water system.	☐	☒
We sell groundwater to other public water systems.	☒	☐
If yes, Water System Name: **Union Hill Water Association Inc / 90260** Contact Name: **Teresa Fowlkes** Telephone Numbers Office **425-497-1812** After Hours **425-497-1812**		
If yes, Water System Name: **Woodinville Water District / 41600** Contact Name: **Patrick Sorensen** Telephone Numbers Office **425-487-4103** After Hours **425-487-4100**		
If yes, Water System Name: **Sammamish Plateau Water & Sewer / 40900** Contact Name: **Andrew Tuchsherer** Telephone Numbers Office **425-295-3207** After Hours **425-392-6256**		
If yes, Water System Name: **NE Sammamish / 75265** Contact Name: **Laura Keough** Telephone Numbers Office **425-868-1144** After Hours **206-390-8214**		

D. Routine, Repeat, and Triggered Source Sample Locations*

Location/Address for **Routine Sample Sites**	Location/Address for **Repeat Sample Sites**	Groundwater Sources for **Triggered Sample Sites****
R1. IDYLWOOD PARK SS	**R1-1. 3834 175TH AVE NE (SS)**	**N/A – INTERTIES**
	R1-2. 17464 NE 38TH ST - B	
	R1-3. 17502 NE 38TH CT	
R2. 24TH ST SS	**R2-1. 18440 NE 24TH ST**	
	R2-2. 2401 185TH PL NE	
	R2-3. 2325 184TH AVE NE	
R3. OVERLAKE VILLAGE SS	**R3-1. 15550 NE TURING AVE**	**N/A – INTERTIES**
	R3-2. 2710 TAGORE AVE NE	
	R3-3. 2870 156TH AVE NE	
R4. 51ST ST SS	**R4-1. 15430 NE 51ST ST**	**N/A – INTERTIES**
	R4-2. 15422 NE 52ND CT	
	R4-3. 15504 NE 52ND ST	
R5. OLD RED ROAD SS	**R5-1. 14000 OLD REDMOND RD**	**N/A – INTERTIES**
	R5-2. 6636 140TH PL NE	
	R5-3. 6804 141ST CT NE	
R6. WILLOWS SS	**R6-1. 9320 151ST AVE NE (SS)**	**N/A – INTERTIES**
	R6-2. 9320 151ST AVE NE	
	R6-3. 9289 151ST AVE NE	
R7. REDMOND RIDGE SS	**R7-1. 9561 227TH WAY NE**	**N/A – INTERTIES**
	R7-2. 22640 NE 96TH ST	
	R7-3. 9542 227TH WAY NE	

R8. ELLISTON PARK SS	R8-1. 23650 NE 108TH PL NE	N/A – INTERTIES
	R8-2. 23701 NE 108TH PL	
	R8-3. 10812 MUIRWOOD WAY NE	
R9. BIG LEAF SS	R9-1. 12135 BIG LEAF WAY	N/A – INTERTIES
	R9-2. 12115 BIG LEAF WAY	
	R9-3. 12204 BIG LEAF WAY	
R10. AEROJET	R10-1. 11441 WILLOWS RD (SS)	N/A – INTERTIES
	R10-2. 13422 NE 115TH CT	
	R10-3. 11411 WILLOWS RD	
R11. BEE FIELD SS	R11-1. 14000 NE 87TH ST	N/A – INTERTIES
	R11-2. 14007 NE 87TH ST	
	R11-3. 8701 140TH CT NE	
R12. SPRITIBROOK	R12-1. 6500 151ST AVE NE	N/A – INTERTIES
	R12-2. 6409 151st AVE NE	
	R12-3. 6605 151ST AVE NE	
R13. ADAIR	R13-1. 13018 243RD PL NE (SS)	N/A – INTERTIES
	R13-2. 24252 NE 130TH PL	
	R13-3. 13018 243RD PL NE	
R14. WOODBRIDGE SS	R14-1. 19102 NE 64TH WAY	S03 – WELL 3 ABR043
	R14-2. 19106 NE 64TH WAY	S07 – WELL 5 ABR041
	R14-3. 6443 191ST PL NE	S15 – WELL 1R
		S16 – WELL 2R

R15. DOWNTOWN SS	**R15-1. 7662 159TH PL NE (SS)**	**S03 – WELL 3 ABR043**
	R15-2. 7662 159TH PL NE	**S07 – WELL 5 ABR041**
	R15-3. 15814 BEAR CREEK PARKWAY	**S15 – WELL 1R**
		S16 – WELL 2R
R16. AVIGNON SS	**R16-1. 10101 160TH AVE NE**	**S03 – WELL 3 ABR043**
	R16-2. 15776 NE 101ST CT	**S07 – WELL 5 ABR041**
	R16-3. 15664 NE 102ND WAY	**S15 – WELL 1R**
		S16 – WELL 2R
R17. PENNY LANE SS	**R17-1. 7990 170TH AVE NE**	**S03 – WELL 3 ABR043**
	R17-2. 16920 NE 80TH ST	**S07 – WELL 5 ABR041**
	R17-3. 1950 PENNY LN	**S15 – WELL 1R**
		S16 – WELL 2R
R18. 171ST ST SS	**R18-1. 9900 171ST AVE NE**	**S03 – WELL 3 ABR043**
	R18-2. 9808 171ST AVE NE	**S07 – WELL 5 ABR041**
	R18-3. 9917 171ST AVE NE	**S15 – WELL 1R**
		S16 – WELL 2R
R19. RESERVIOR PARK SS	**R19-1. 16317 NE 95TH ST**	**S03 – WELL 3 ABR043**
	R19-2. 9505 163RD PL NE	**S07 – WELL 5 ABR041**
	R19-3. 9503 164TH AVE NE	**S15 – WELL 1R**
		S16 – WELL 2R
R20. MEADOW PARK SS	**R20-1. 10710 160TH AVE NE**	**S03 – WELL 3 ABR043**
	R20-2. 10818 160TH AVE NE	**S07 – WELL 5 ABR041**
	R20-3. 15924 NE 107TH WAY	**S15 – WELL 1R**
		S16 – WELL 2R

R21. KENSINGTON SS	**R21-1. 12040 157TH CT NE (SS)**	**S03 – WELL 3 ABR043**
	R21-2. 15745 NE 120TH WAY	**S07 – WELL 5 ABR041**
	R21-3. 12040 157TH CT NE	**S15 – WELL 1R**
		S16 – WELL 2R
R22. FISCHER VILLAGE SS	**R22-1. 17688 NE 122ND ST**	**S03 – WELL 3 ABR043**
	R22-2. 17691 NE 122ND ST	**S07 – WELL 5 ABR041**
	R22-3. 17687 NE 122ND ST	**S15 – WELL 1R**
		S16 – WELL 2R
R23. ABBEY ROAD SS	**R23-1. 11020 NE 169TH PL NE**	**S03 – WELL 3 ABR043**
	R23-2. 11028 NE 169TH PL NE	**S07 – WELL 5 ABR041**
	R23-3. 11012 NE 169TH PL NE	**S15 – WELL 1R**
		S16 – WELL 2R
R24. MARYMOOR SS	**R24-1. 17601 NE 67TH CT**	**S03 – WELL 3 ABR043**
	R24-2. 17595 NE 70TH ST (N)	**S07 – WELL 5 ABR041**
	R24-3. 17619 NE 67TH CT (W)	**S15 – WELL 1R**
		S16 – WELL 2R
R25. FAIRWINDS	**R25-1. 9988 AVONDALE RD NE (SS)**	**S03 – WELL 3 ABR043**
	R25-2. 9983 AVONDALE RD	**S07 – WELL 5 ABR041**
	R25-3. 9988 AVONDALE RD	**S15 – WELL 1R**
		S16 – WELL 2R
R26. TYLER CREEK	**R26-1. 18200 NE 110TH ST (SS)**	**S03 – WELL 3 ABR043**
	R26-2. 10942 182ND AVE NE	**S07 – WELL 5 ABR041**
	R26-3. 18200 NE 110TH ST	**S15 – WELL 1R**
		S16 – WELL 2R

**** When you collect the repeats, you must sample every groundwater source that was in use when the original routine sample was collected.**

Important Notes for Sample Collector:

- Samples routinely collected every **Tuesday.**
- Sample stations are continuously flowing. If station is not flowing, leaking, or damaged – do not sample and report for repair.
- Ensure sample station tap is free of any environmental contaminants (spiderwebs, insects, debris, etc.)
- Disinfect sample tap with mild bleach solution spray prior to sample collection. Allow ~2 minutes contact time.
- Fill sample bottle by holding cap and unthreading bottle, avoiding contact with inside of cap or threads; fill the bottle to the shoulder and quickly cap. If a bottle or cap is dropped, discard, and use a new sterile bottle.
- Test and record free chlorine residual on lab slip.
- **Repeat Sampling:** Collect **3** compliance distribution samples according to sample sites listed in the table above (center column). In addition, it is recommended to collect extra investigative samples from each storage reservoir(s) supplying the affected zone.
- **Ground Water Rule:** For repeat sampling for Well Supply zones, raw water samples must be collected from each source in operation when the original routine sample was collected. Raw sample IDs are listed in the table above (right column). Raw water taps are located at sinks in well facilities 3, 4 and 5. Wells 1 and 2 must be sampled individually at each well house in Anderson Park.

E. Routine Sample Rotation Schedule

Month	Routine Site(s)	Month	Routine Site(s)
January	R1-R26	July	R1-R26
February	R1-R26	August	R1-R26
March	R1-R26	September	R1-R26
April	R1-R26	October	R1-R26
May	R1-R26	November	R1-R26
June	R1-R26	December	R1-R26

F. Level 1 and Level 2 Assessment Contact Information

Name **Dylan Herndon**	**Office Phone 425-556-2850** **After Hours Phone 425-588-5228**
Address **18080 NE 76th Street, Redmond, WA 98073**	**Email dherndon@redmond.gov**
Name **Gaby Wolff**	**Office Phone 425-556-2763** **After Hours Phone 425-588-5936**
Address **18080 NE 76th Street, Redmond, WA 98073**	**Email gwolff@redmond.gov**

G. *E. coli*-Present Sample Response

Distribution System *E. coli* Response Checklist				
Background Information	**Yes**	**No**	**N/A**	**To Do List**
We inform staff members about activities within the distribution system that could affect water quality.	☒	☐	☐	☐
We document all water main breaks, construction & repair activities, and low pressure and outage incidents.	☒	☐	☐	☐
We can easily access and review documentation on water main breaks, construction & repair activities, and low pressure and outage incidents.	☒	☐	☐	☐
Our Cross-Connection Control Program is up-to-date.	☒	☐	☐	☐
We test all cross-connection control devices annually as required, with easy access to the proper documentation.	☒	☐	☐	☐
We routinely inspect all treatment facilities for proper operation.	☒	☐	☐	☐
We identified one or more qualified individuals who are able to conduct a Level 2 assessment of our water system.	☒	☐	☐	☐
We have procedures in place for disinfecting and flushing the water system if it becomes necessary.	☒	☐	☐	☐
We can activate an emergency intertie with an adjacent water system in an emergency.	☒	☐	☐	☐
We have a map of our service area boundaries.	☒	☐	☐	☐
We have consumers who may not have access to bottled or boiled water.	☐	☐	☐	☒
There is a sufficient supply of bottled water immediately available to our customers who are unable to boil their water.	☐	☐	☐	☒
We have identified the contact person at each day care, school, medical facility, food service, and other customers who may have difficulty responding to a Health Advisory.	☐	☐	☐	☒
We have messages prepared and translated into different languages to ensure our consumers will understand them.	☒	☐	☐	☐
We have the capacity to print and distribute the required number of notices in a short time period.	☒	☐	☐	☐
Policy Direction	**Yes**	**No**	**N/A**	**To Do List**
We have discussed the issue of *E. coli*-present sample results with our policy makers.	☐	☐	☐	☒
If we find *E. coli* in a routine distribution sample, the policy makers want to wait until repeat test results are available before issuing advice to water system customers.	☐	☐	☐	☒
(Cont.)				

Distribution System *E. coli* Response Checklist				
Potential Public Notice Delivery Methods	**Yes**	**No**	**N/A**	**To Do List**
It is feasible to deliver a notice going door-to-door.	☐	☒	☐	☐
We have a list of all of our customers' addresses.	☐	☐	☐	☒
We have a list of customer telephone numbers or access to a Reverse 9-1-1 system.	☐	☐	☐	☒
We have a list of customer email addresses.	☐	☒	☐	☐
We encourage our customers to remain in contact with us using social media.	☒	☐	☐	☐
We have an active website we can quickly update to include important messages.	☒	☐	☐	☐
Our customers drive by a single location where we could post an advisory and expect everyone to see it.	☒	☐	☐	☐
We need a news release to supplement our public notification process.	☒	☐	☐	☐

Distribution System *E. coli* Response Plan

If we have *E. coli* in our distribution system, we will immediately:

1. Call DOH.
2. Collect repeat and triggered source samples per Part D. Collect additional investigative samples as necessary.
3. Evaluate results of repeat and triggered source samples, conduct further sampling to investigate extent of distribution contamination.
4. Assess source disinfection treatment and adjust to achieve higher CT and distribution chlorine residuals in affected areas.
5. Conduct assessments of system components and facilities to identify potential pathways/causes of contamination.
6. Discuss with DOH whether to issue a Health Advisory based on the findings of steps 3-5.

E. coli-Present Triggered Source Sample Response Checklist – All Sources				
Background Information	**Yes**	**No**	**N/A**	**To Do List**
We review our sanitary survey results and respond to any recommendations affecting the microbial quality of our water supply.	☒	☐	☐	☐
We address any significant deficiencies identified during a sanitary survey.	☒	☐	☐	☐
There are contaminant sources within our Wellhead Protection Area that could affect the microbial quality of our source water, and If yes, we can eliminate them.	☒ ☐	☐ ☐	☐ ☐	☐ ☒
We routinely inspect our well site(s).	☒	☐	☐	☐
We have a good raw water sample tap installed at each source.	☒	☐	☐	☐
After we complete work on a source, we disinfect the source, flush, and collect an investigative sample.	☒	☐	☐	☐
Public Notice	**Yes**	**No**	**N/A**	**To Do List**
We discussed the requirement for immediate public notice of an *E. coli*-present source sample result with our water system's governing body (board of directors or commissioners) and received direction from them on our response plan.	☐	☐	☐	☒
We discussed the requirement for immediate public notice of an *E. coli*-present source sample result with our wholesale customers and encouraged them to develop a response plan.	☐	☐	☐	☒
We have prepared templates and a communications plan that will help us quickly distribute our messages.	☐	☐	☐	☒

E. coli-Present Triggered Source Sample Response Checklist – All Sources				
Alternate Sources	**Yes**	**No**	**N/A**	**To Do List**
We can stop using this source and still provide reliable water service to our customers.	☒	☐	☐	☐
We have an emergency intertie with a neighboring water system that we can use until corrective action is complete (perhaps for several months).	☒	☐	☐	☐
We can provide bottled water to all or part of the distribution system for an indefinite period.	☐	☐	☐	☒
We can quickly replace our existing source of supply with a more protected new source.	☐	☐	☐	☒
Temporary Treatment	**Yes**	**No**	**N/A**	**To Do List**
This source is continuously chlorinated, and our existing facilities can provide 4-log virus treatment (CT = 6) before the first customer. If yes, at what concentration? **0.70** mg/L	☒	☐	☐	☐
We can quickly introduce chlorine into the water system and take advantage of the existing contact time to provide 4-log virus treatment to a large portion of the distribution system.	☒	☐	☐	☐
We can reduce the production capacity of our pumps or alter the configuration of our storage quantities (operational storage) to increase the amount of time the water stays in the system before the first customer to achieve CT = 6.	☒	☐	☐	☐
We can alter the demand for drinking water (maximum day or peak hour) through conservation messages to increase the time the water is in the system prior to the first customer in order to achieve 4-log virus treatment with chlorine.	☒	☐	☐	☐

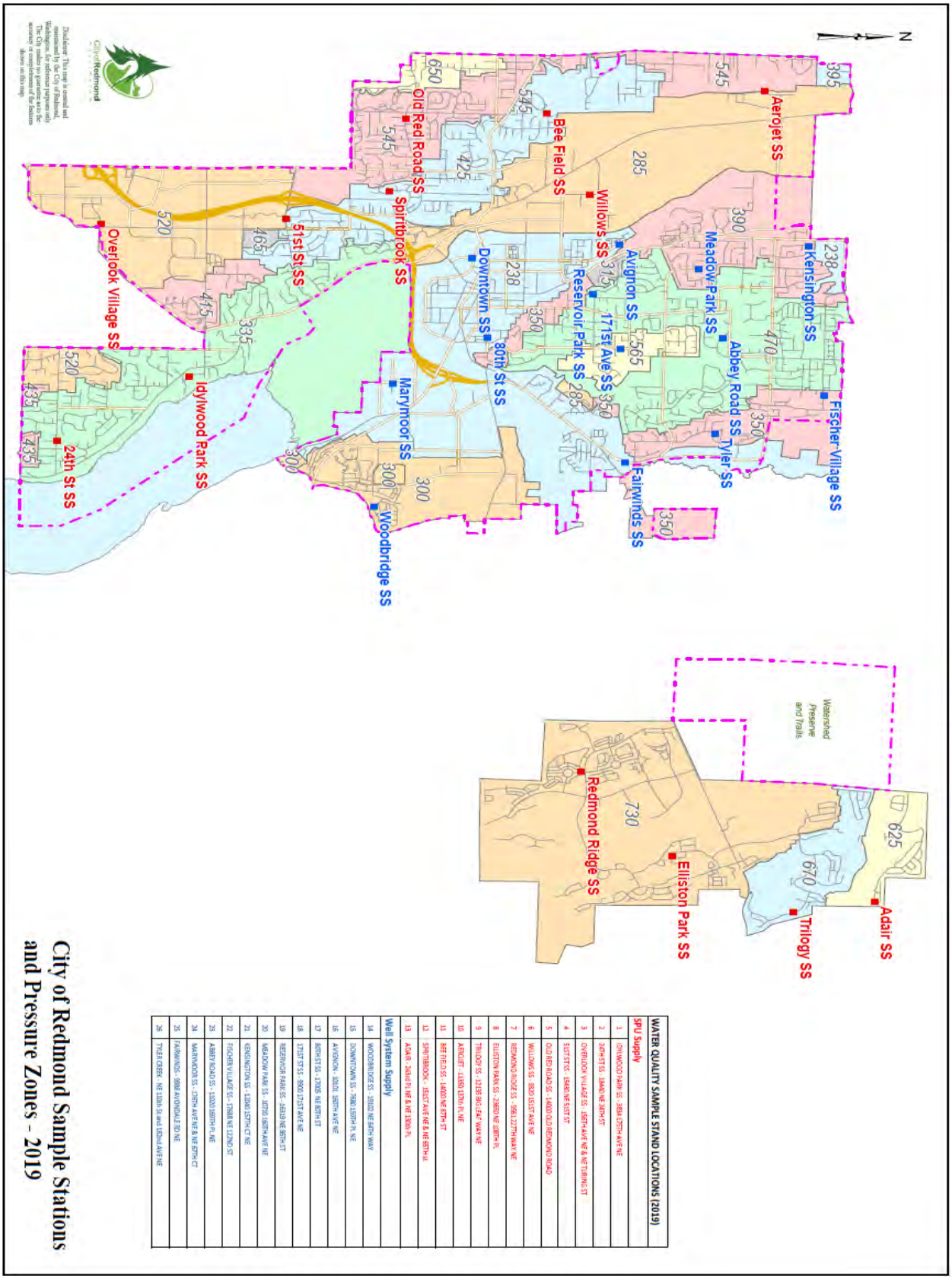
*NOTE: If your system has multiple sources, you may want to complete a separate checklist for each source.

E. coli-Present Triggered Source Sample Response Plan – All Sources

If we have *E. coli* in any Source water, we will immediately:

1. Call DOH.
2. Discontinue use of effected source.
3. Open interties to maintain water demand.
4. Conduct further water quality sampling.
5. Discuss findings with DOH.
6. Perform necessary emergency chlorination/flushing procedures of facilities based on findings.
7. Re-evaluate disinfection treatment efficacy and adjust treatment as directed by DOH.
8. Run source to waste and conduct final water quality sampling.
9. Place source back into service pursuant to satisfactory bacteriological results.
10. Collect daily bacteriological samples (raw/finished) until directed otherwise by DOH.

H. System Map


City of Redmond Sample Stations and Pressure Zones - 2019
Aerojet SS
Bee Field SS
Old Red Road SS
Spiritbrook SS
51st St SS
Overlook Village SS
Idylwood Park SS
24th St SS
Willows SS
Avignon SS
Reservoir Park SS
171st Ave SS
Downtown SS
80th St SS
Marymoor SS
Woodbridge SS
Kensington SS
Meadow Park SS
Abbey Road SS
Tyler SS
Fairwinds SS
Fisher Village SS
Redmond Ridge SS
Elliston Park SS
Trilogy SS
Adair SS
Watershed Preserve and Trails
N
WATER QUALITY SAMPLE STAND LOCATIONS (2019)
SPU Supply
1 DOGWOOD PARK SS - 3884 155TH AVE NE
2 30TH ST SS - 16440 NE 30TH ST
3 OVERLOOK VILLAGE SS - 15674 AVE NE & NE TURING ST
4 51ST ST SS - 15436 NE 51ST ST
5 OLD RED ROAD SS - 14400 OLD REDMOND ROAD
6 WILLOWS SS - 9500 161ST AVE NE
7 REDMOND RIDGE SS - 9581 227TH WAY NE
8 ELLISTON PARK SS - 23650 NE 108TH PL
9 TRILOGY SS - 22385 NE JEAN WAY NE
10 AERO JET - 14981 159TH PL NE
11 BEE FIELD SS - 14900 NE 87TH ST
12 SPIRITBROOK - 16617 AVE NE & NE 85TH PL
13 ADAIR - 2454 PL NE & NE 108TH PL
Well System Supply
14 WOODBRIDGE SS - 15900 NE 68TH WAY
15 DOWNTOWN SS - 7686 165TH PL NE
16 AVONDON - 10170 - 180TH AVE NE
17 80TH ST SS - 17005 NE 80TH ST
18 171ST ST SS - 9900 171ST AVE NE
19 REDMOND PARK SS - 16516 NE 85TH ST
20 MEADOW PARK SS - 10710 180TH AVE NE
21 KENSINGTON SS - 18080 157TH CT NE
22 FISCHER VILLAGE SS - 17068 NE 122ND ST
23 ABBEY ROAD SS - 11020 168TH PL NE
24 MARYMOOR SS - 17434 AVONDALE RD NE
25 FAIRWINDS - 9998 AVONDALE RD NE
26 TYLER CREEK - NE 116th St and 182nd AVE NE

April 2016
DOH 331-206
Revised

Fact Sheet

Revised Total Coliform Rule

Treatment technique triggers, violations, and public notification requirements

The Revised Total Coliform Rule (RTCR) continues the basic monitoring requirements and objectives of the Total Coliform Rule; however, it offers greater public health protection by adding new requirements and updating others.

The Office of Drinking Water (ODW) always required water systems with microbial contamination to find and fix any maintenance or operational defect that could allow contamination to enter a water system. RTCR formalizes this process and requires water systems to submit a water system assessment report to us any time they have unsatisfactory sample results. It also assigns violations to water systems that fail to complete these tasks.

Treatment Technique Triggers

When a treatment trigger occurs, water systems must conduct an assessment to find and fix any sanitary defects. There are two assessment levels; both evaluate the entire system from the point of sample collection to the source of supply.

Don't wait for us to notify you about the treatment technique trigger. You must complete the assessment within 30 days after the trigger occurs, and submit an assessment report to us.

A Level 1 assessment is a basic system evaluation that an owner or other knowledgeable person can do. The RTCR requires a Level 1 assessment when one of these treatment technique triggers occurs:

- A system that collects fewer than 40 routine samples during the month has more than one coliform-present sample.
- A system that collects 40 or more routine samples during the month has coliform-present results in more than 5 percent of the routine and repeat samples.
- A water system fails to collect three repeat samples for every total coliform-present sample.

A Level 2 assessment is a more complex evaluation that only a state-qualified person can do. The RTCR requires a Level 2 assessment when one of these treatment technique triggers occurs:

- A water system has an *E. coli* MCL violation (see page 2).
- A water system incurs a second treatment technique trigger in a rolling 12-month period.

3 parts of a Level 1 or Level 2 assessment

- **Evaluation:** Identify any sanitary defect that allowed coliform to enter the distribution system or failure or imminent failure of an existing barrier.
- **Discussion:** Discuss what you identified during the assessment that might allow contamination to occur and the corrective action needed to fix it.
- **Corrective action:** Record the steps you took or will take to fix the sanitary defect that allowed the contamination to occur.

Washington State Department of Health
Environmental Public Health
Office of Drinking Water

HELPING TO ENSURE SAFE AND RELIABLE DRINKING WATER

Violations

Violations under the RTCR usually indicate a failure to act. Water systems should prepare themselves to follow the rule requirements to protect the safety of their water supply.

Public Notification Requirements
Tier 1: Issued within 24 hours
Tier 2: Issued within 30 days
Tier 3: Issued within 1 year

Treatment Technique Violation

A treatment technique violation indicates the water system failed to act or respond as required. When a treatment technique violation occurs, a system must provide **Tier 2 public notification** to its customers. A coliform treatment technique violation occurs when one of the following occurs:

- A water system fails to conduct or fully complete a required Level 1 or Level 2 Assessment within 30 days of the treatment technique trigger.
- A system fails to correct any sanitary defect by taking required corrective action within the required timeframe.
- A seasonal system fails to complete an ODW-approved start-up procedure and submit a certificate of completion prior to serving water at the start of its season.

E. coli MCL Violation

If a system incurs an *E.coli* MCL violation, it must perform a **Level 2 assessment** and provide **Tier 1 public notification** to its customers. RTCR requires public notice within 24 hours after receiving confirmation of an *E. coli* MCL violation. There are four ways a system can have an *E. coli* MCL violation:

1. A total coliform-present repeat sample follows an *E. coli*-present routine sample.
2. An *E. coli*-present repeat sample follows a total coliform-present routine sample.
3. The lab fails to test a total coliform-present repeat sample for *E. coli.*
4. The system fails to take three repeat samples following an *E. coli*-present routine sample.

Monitoring Violation

A water system that incurs a monitoring violation must provide **Tier 3 public notification** to its customers. A monitoring violation occurs when:

- A system fails to collect all routine samples.
- A system fails to have each total coliform-present routine sample analyzed for *E.coli*.

Reporting Violation

A water system that incurs a reporting violation must provide **Tier 3 public notification** to its customers. A reporting violation occurs when:

- A system fails to submit a monitoring report or completed assessment form to ODW in a timely manner.
- A system fails to notify ODW of an *E. coli*-present sample in a timely manner.
- A seasonal system fails to submit to ODW a certificate of completion of an approved start-up procedure before serving water to consumers.

For more information:

Call our regional office.

Eastern Region: Spokane Valley (509) 329-2100
Northwest Region: Kent (253) 395-6750
Southwest Region: Tumwater (360) 236-3030

PUBLIC HEALTH
ALWAYS WORKING FOR A SAFER AND HEALTHIER WASHINGTON

Our publications are online at https://fortress.wa.gov/doh/eh/dw/publications/publications.cfm

For people with disabilities, this document is available on request in other formats. To submit a request, please call 1-800-525-0127 (TDD/TTY call 711).

Appendix K
Disinfection By-Products Monitoring Plan

Washington State Department of Health
Environmental Public Health
Office of Drinking Water

DOH 331-464
Updated July 2013

Stage 2 DBP Monitoring Plan - Surface Water (Routine Monitoring)

System Name	City of Redmond
PWSID#	71650 B
Date	7/19/2023
Completed by	Dylan Herndon
Population	123565

Initial Stage 2 Sampling Period First sampling period following **April 1, 2012**

Number of Samples Required 8 Dual Sample Sets per Quarter

Stage 2 Compliance Monitoring Site ID		Projected Sampling Date (Date or week) - every 90 days			
		Period 1	Period 2	Period 3	Period 4
RD-3	BIG LEAF SS	1/4/2023	4/7/2023	7/7/2023	10/6/2023
RD-2	24TH ST SS	1/4/2023	4/7/2023	7/7/2023	10/6/2023
RD-4	171ST ST SS	1/4/2023	4/7/2023	7/7/2023	10/6/2023
RD-5	ADAIR SS	1/4/2023	4/7/2023	7/7/2023	10/6/2023
RD-6	ELLISTON SS	1/4/2023	4/7/2023	7/7/2023	10/6/2023
RD-7	51ST ST SS	1/4/2023	4/7/2023	7/7/2023	10/6/2023
RD-W4	AVIGNON SS	1/4/2023	4/7/2023	7/7/2023	10/6/2023
RD-RR	RED RIDGE SS	1/4/2023	4/7/2023	7/7/2023	10/6/2023

Determining Compliance for TTHM and HAA5

Our system is required to monitor quarterly. Each quarter we will calculate a locational running annual average (LRAA) for TTHM and HAA5 at each monitoring location. Compliance will be achieved if the TTHM and the HAA5 LRAA at each monitoring location for the four most recent quarters is less than or equal to 0.080 mg/L for TTHM and less than or equal to 0.060 mg/l for HAA5.

Disinfectant Monitoring

Chlorine residuals must be measured at the same time and place as routine or repeat coliform samples
MRDL for chlorine and chloramines = 4.0 mg/l as Cl_2

Determining Compliance for disinfectant residuals

Compliance is based on the running annual average (RAA) of 12 consecutive months
Daily residual measurements will / **will not** be included in the compliance calculations

Attach a distribution map with sample locations

Comments

RD-3	BIG LEAF SS	12135 Big Leaf Way
RD-2	24TH ST SS	18400 NE 24th St
RD-4	171ST ST SS	9900 171st Ave NE
RD-5	ADAIR SS	243rd Pl NE & NE 130th Pl
RD-6	ELLISTON SS	23650 NE 108th Pl
RD-7	51ST ST SS	15430 NE 51st St
RD-W4	AVIGNON SS	10200 160th Ave NE
RD-RR	REDMOND RIDGE SS	9516 227th Way NE

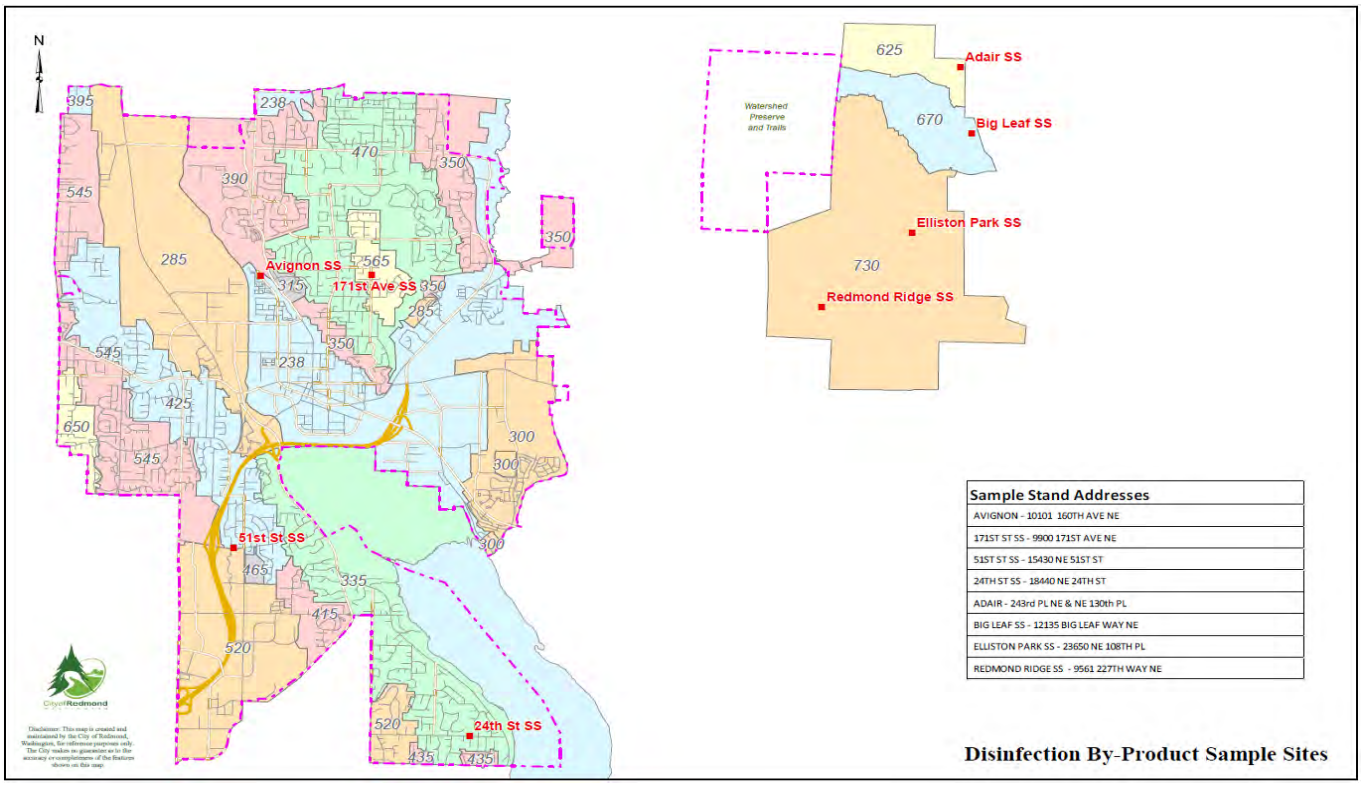
Send copy of completed form to:

☐Eastern Regional Drinking Water Office, 16201 E Indiana Ave, Suite 1500, Spokane Valley, WA 99216
Phone: (509) 329-2100 Fax (509) 329-2104

☐Northwest Regional Drinking Water Office, 20425 72nd Ave S, Suite 310, Kent, WA 98032
Phone: (253) 395-6750 Fax: (253) 395-6760

☐Southwest Regional Drinking Water Office, PO Box 47823, Olympia, WA 98504-7823
Phone: (360) 236-3030 Fax to (360) 664-8058

If you need this publication in an alternate format, call (800) 525-0127. For TTY/TDD call (800) 833-6388.



Appendix L
Annual Water Quality Report

Water Quality Report

2023



Redmond
WASHINGTON

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Redmond's Drinking Water

A message from Mayor Angela Birney

Ensuring and conserving safe, healthy, and reliable drinking water is a priority of the City of Redmond. I am proud to share that Redmond's water quality continues to meet or exceed the highest water standards in Washington state.

Abundant, safe, clean drinking water does not happen by accident. It requires the support of the community and the dedication of volunteers and staff, who work to monitor and maintain the City's water resources. Redmond's water supply comes from natural watersheds and aquifers, as well as the City's water delivery systems. Thanks to these collective efforts, we can ensure that safe and sustainable drinking water reliably flows to everyone in Redmond.

As you read Redmond's 2023 Water Quality Report, join me in the appreciation for all the outstanding efforts to successfully maintain this vital and valued resource in our community.



- Mayor Birney



The sources of drinking water (both tap and bottled water) include rivers, lakes, streams, ponds, reservoirs, springs, and wells. As water travels over the surface of the land or through the ground, it dissolves naturally-occurring minerals and can pick up substances resulting from the presence of animal or human activity.

Substances and contaminants that could be present in source water include:

- **Microbes** such as viruses and bacteria, which may come from septic systems, livestock, and wildlife.
- **Inorganic chemicals** such as salts and metals, which may be naturally–occurring or result from urban stormwater runoff, wastewater discharges and farming.
- **Pesticides and herbicides** from agriculture, urban stormwater runoff, and residential uses.
- **Organic chemicals** both synthetic and volatile, which are by-products of industry and can also come from gas stations, dry cleaners, urban stormwater runoff and septic systems.
- **Radioactive contaminants**, which can be naturally–occurring or result from petroleum production or mining activities.

To ensure the safety of tap water, the EPA regulates the amount of contaminants allowed in public drinking water. The FDA regulates the contaminants in bottled water, which must provide a similar degree of safety.

Drinking water, including bottled water, may reasonably be expected to contain at least small amounts of some contaminants. The presence of contaminants does not necessarily indicate that the water poses a health risk. More information about contaminants and potential health effects can be obtained by calling the Environmental Protection Agency's Safe Drinking Water Hotline at 800-426-4791.

Some people may be more vulnerable to contaminants in drinking water than the general population. Immunocompromised persons – such as persons with cancer undergoing chemotherapy, persons who have undergone organ transplants, people with HIV/AIDS or other immune system disorders, some elderly, and infants – can be particularly at risk from infections. These people should seek advice about drinking water from their health care providers. EPA/CDC guidelines on appropriate means to lessen the risk of infection by cryptosporidium and other microbial contaminants are available from the Safe Drinking Water Hotline at 800-426-4791.

Where Does My Water Come From?

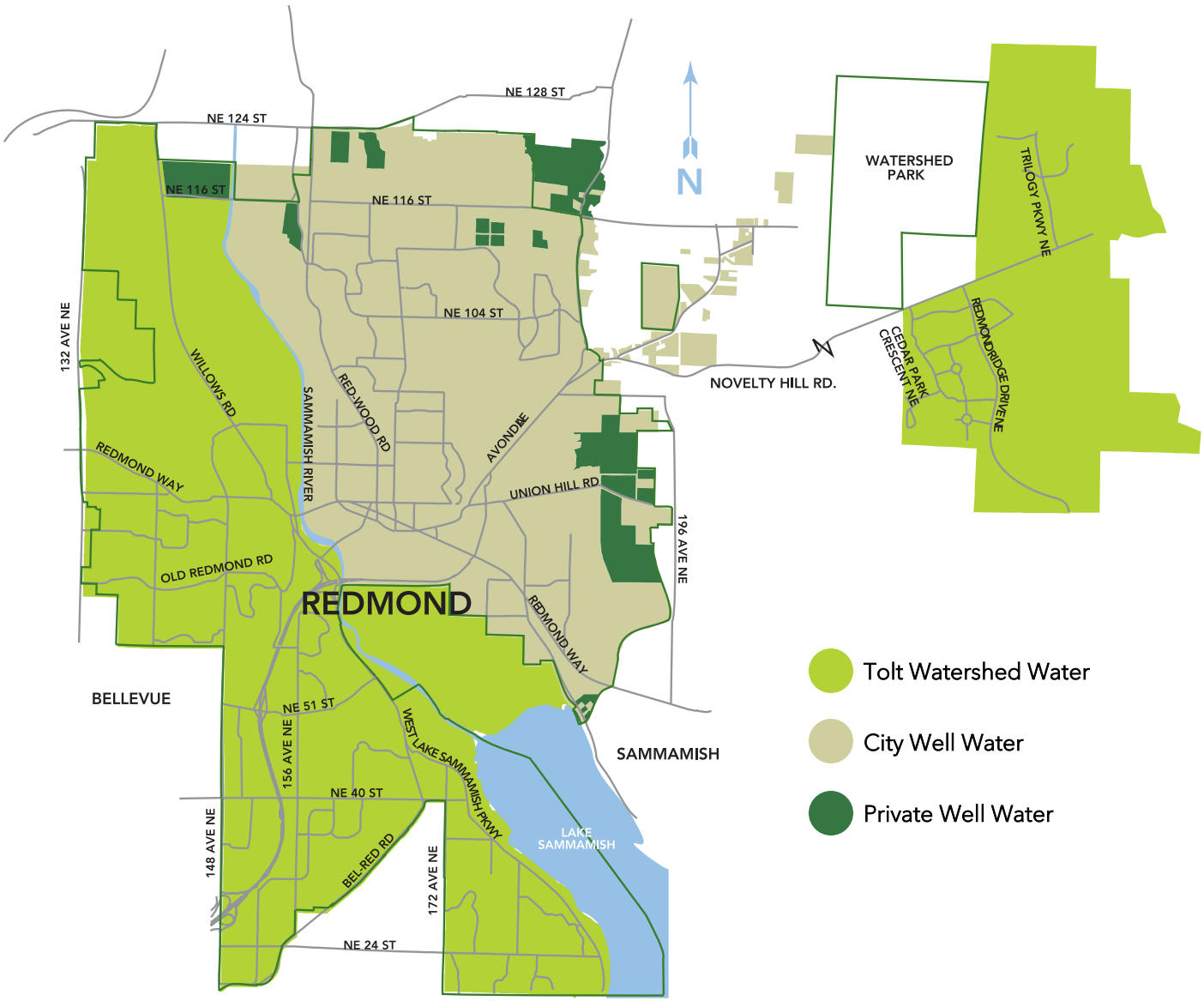
The City of Redmond has a hybrid water system. Depending on where you live, you may drink water from the Cascade Mountains or well water from an aquifer.

The Tolt Watershed

Residents on the west side of Lake Sammamish and the Sammamish River, as well as those who live in Redmond Ridge and Trilogy, are served water from the Tolt Watershed in the Cascade Mountains.

The Groundwater System

Residents east of Lake Sammamish and the Sammamish River drink well water from our aquifer. During the summer, water from the Tolt will be blended with the groundwater to help meet peak summer demand.



The Tolt Watershed

From the Cascades to Your Tap

The Tolt Reservoir and Watershed are located 15 miles east of Redmond in the Cascade Mountains. Rivers, streams, and snowmelt are impounded here to make up the reservoir supply. The water is filtered and treated and then travels through a supply pipeline to Redmond and other eastside water districts on its way to Seattle. The City of Seattle owns the watershed and pipeline. Redmond, as a member of the Cascade Water Alliance, buys this water, and both Seattle and Redmond monitor and test it to maintain quality.

Watershed Protection

The Tolt Watershed covers nearly 14,000 acres and is closed to public access. Seattle's aggressive watershed protection plan safeguards the water supply from degradation and human intrusion. However, according to the State Department of Health, all surface waters in Washington State are given a contamination susceptibility rating of "high," whether contaminants have been detected. Contamination that might occur would most likely be from soil erosion or animal activity.

Treatment

Water treatment of the Tolt supply consists of filtration, ozonation, chlorine disinfection, and fluoridation. Calcium oxide and CO2 are added to help reduce the water's natural corrosive effect on plumbing. Filtration removes organic material and makes the water cleaner and clearer. Ozone kills tough potential pathogens like giardia and cryptosporidium.

2022 Water Quality Data - Tolt System (Seattle Supply)

Detected Compounds	Units	MCLG	MCL	Average	Range	Typical Sources
Total Organic Compounds **(Raw)**	ppm	NA	TT	1.24	1.10 to 1.41	Naturally present in the environment
Finished Water						
Turbidity	NTU	NA	TT	0.04	0.02 to 0.24	Soil Runoff
Arsenic	ppb	0	10	0.28	0.22 to 0.38	Erosion of natural deposits
Barium	ppb	2000	2000	1.21	1.14 to 1.30	Erosion of natural deposits
Bromate	ppb	0	10	ND	ND	By-product of drinking water disinfection
Fluoride	ppm	<4.0	4	0.7	0.6 to 0.8	Additive for dental health
Total Coliform	% Positive	0	5%	ND	ND	Naturally present in the environment
Total Trihalomethane (TTHM)	ppb	NA	80	26.6	11.4 to 35.9	Chlorination by-products
Haloacetic Acids (HAA5)	ppb	NA	60	28.2	12.5 to 44.2	Chlorination by-products
Chlorine	ppm	NA	4 MRDL	0.82	0.20 - 1.73	Additive that kills germs

Water quality data for non-regulated parameters such as pH, alkalinity, hardness, and conductivity are provided on the Seattle Public Utilities website: http:www.seattle.gov/utilities/services/water/water-quality/analyses. Click on the 2022 Quarterly Analyses for the Tolt Supply.

MCLG – Maximum Contaminant Level Goal. The level of a contaminant in drinking water below which there is no known or expected risk to health. MCLGs allow for a margin of safety.

MCL – Maximum Contaminant Level. The highest level of a contaminant allowed in drinking water. MCLs are set as close to the MCLGs as feasible using the best available treatment technology.

MRDL – Maximum Residual Disinfectant Level. The highest level of a disinfectant allowed in drinking water. The addition of a disinfectant acts as a safety net against microbial contaminants.

TT - Treatment Technique. A required process intended to reduce the level of a contaminant in drinking water.

NTU - Nephelometric Turbidity Units are used to measure how clear the water looks.

NA - Not Applicable

ND - Not Detected

ppm - 1 part per million. 1mg/L: 1 milligram per liter

ppb - 1 part per billion. 1 ug/L: 1 microgram per liter

The Groundwater System

Redmond's Renewable Resource

An underground, water-bearing formation called an aquifer lies beneath the Downtown, Avondale Road, and SE Redmond areas. The aquifer is a vital drinking water resource and is highly susceptible to pollutants spilled on the ground .This shallow aquifer has supplied drinking water to Redmond since the 1950s. In 2022, the City's supply wells pumped over one billion gallons of water from the aquifer.

Groundwater Protection

To protect groundwater resources from contamination and depletion, in 2003 Redmond created a Wellhead Protection Program. This program is responsible for:

- Establishing protection areas known as Critical Aquifer Recharge Areas (CARA) where groundwater protection efforts are focused.
- Gathering hazardous materials data and visiting businesses to help identify, properly manage, and eliminate possible hazards to groundwater.
- Reviewing development proposals to ensure that groundwater will not be adversely impacted.
- Monitoring groundwater levels and quality at monitoring wells within the CARA to safeguard supply wells if an issue is detected.

As a result of the Wellhead Protection Program, Redmond maintains compliance with the three components of the Washington State Source Water Assessment Program: Protection Area Delineation, Contaminant Source Inventory, and Susceptibility Assessment.

Distribution

The City of Redmond currently maintains 337 miles of pipe 4" and larger. Redmond has 26 sample sites strategically placed throughout the distribution system for water quality sampling. The City collects 26 samples per week and analyzes them for safety, pH, chlorine residual, and temperature as part of our ongoing efforts to deliver clean water.

2022 Water Quality Data – Groundwater System (Well Water)

Detected Compounds	Units	MCLG	MCL	Average	Range	Typical Sources
Total Organic Compounds **(Raw)**	ppm	NA	TT	ND	ND	Naturally present in the environment
Finished Water						
Fluoride	ppm	4	4	0.69	0.39 to 1.14	Additive for dental health
Chlorine	ppm	N/A	4 MRDL	0.80	0.23 to 1.66	Additive that kills germs
Total Trihalomethane (TTHM)	ppb	N/A	80	23.6	9.7 to 49.6	Chlorination by-products
Haloacetic Acids (HAA5)	ppb	N/A	60	17.6	6.8 to 31.8	Chlorination by-products
Nitrate	ppm	10	10	0.79	ND to 1.8	Erosion of natural deposits, septic systems, and fertilizers
Total Coliform	% Positive	0	5%	ND	ND	Naturally present in the environment

MCLG – Maximum Contaminant Level Goal. The level of a contaminant in drinking water below which there is no known or expected risk to health. MCLGs allow for a margin of safety.
MCL – Maximum Contaminant Level. The highest level of a contaminant allowed in drinking water. MCLs are set as close to the MCLGs as feasible using the best available treatment technology.
MRDL – Maximum Residual Disinfectant Level. The highest level of a disinfectant allowed in drinking water. The addition of a disinfectant acts as a safety net against microbial contaminants.

TT - Treatment Technique. A required process intended to reduce the level of a contaminant in drinking water.
NTU - Nephelometric Turbidity Units are used to measure how clear the water looks.
NA - Not Applicable
ND - Not Detected
ppm - 1 part per million. 1mg/L: 1 milligram per liter
ppb - 1 part per billion. 1 ug/L: 1 microgram per liter

Keeping the Lead Out

Since 1983, Redmond's drinking water has been treated to minimize corrosion in household plumbing. The lead and copper mandatory testing requirement began in 1992. The rule required the City to select homes that would most likely have plumbing components containing lead. The expectation is to sample the same houses every three years for comparison.

In 2021, samples for lead and copper levels were collected again using the same selected 30 homes. Due to our increased population, we were required to add 20 additional homes for sampling, for a total of 50. Once again, Redmond's test results have successfully complied with all state and federal requirements relating to lead and copper.

Controlling pH is the key to reducing the corrosion of plumbing. The pH in our aquifer is about 6.5. The desired pH for finished water is 7.5-7.8. Our wells are equipped with air-stripping towers. They introduce high-pressure air through the water. This process releases trapped CO2 in the water and naturally raises the pH to the desired level without chemical additives.

Lead and Copper Citywide Monitoring Program Results 2021				
Parameter and Units	MCLG	90th Percentile Action Level*	2021 Results**	# of Homes Exceeding Action Level
Lead (mg/L)	0	0.015 mg/L	0.003 mg/L	0 out of 50
Copper (mg/L)	1.3 mg/L	1.3 mg/L	0.190 mg/L	0 out of 50

* The concentration of a contaminant which, if exceeded, triggers treatment or other requirements that a water system must follow.

** 90th percentile: i.e., 90 percent of the samples were less than the value shown

There is no detectable lead or copper in Redmond's drinking water. However, lead is a serious contaminant and can be found in the water of some homes due to older plumbing. If present, elevated lead levels can cause serious health problems, especially for pregnant women and young children. Lead in drinking water is primarily from materials and components associated with private service lines and household plumbing and fixtures.

The City of Redmond is responsible for providing high-quality drinking water but cannot control the variety of materials used in residential and commercial plumbing components. When your water has been sitting for several hours, you can minimize the potential for lead exposure by flushing your cold water tap for 30 seconds to 2 minutes before using the water for drinking or cooking.

If you are concerned about lead in your water, you may wish to have your water tested. Information on lead in drinking water, testing methods, and steps you can take to minimize exposure is available from the Safe Drinking Water Information Helpline at 800-426-4791 or visit www.epa.gov/safewater/lead. You can also get information from the Redmond Maintenance and Operations Center by calling 425-556-2800 or emailing info@redmond.gov.

Finally, keep in mind that drinking water is only a minor contributor to overall exposure to lead. Other common sources include paint, soil, and food.

2022 Annual Water Use

The Redmond Water Utility is pleased to provide its annual performance report. This report includes information about our metering status, our distribution system leakage, and progress made toward our water efficiency goals.

Efficiency Performance Report

Cascade Water Alliance (Cascade) provides water efficiency programs and services on behalf of its members, Bellevue, Issaquah, Kirkland, Redmond, Tukwila, Sammamish Plateau Water District, and Skyway Water and Sewer District. "Cascade will dedicate outreach, education, and programmatic resources necessary to achieve a cumulative drinking water savings of 0.5 million gallons per day for the time period 2019 – 2024." – Adopted by the Cascade Water Alliance Board of Directors, November 16, 2022.

Highlights of the 2022 water efficiency program include:

- Provided water education school programs on diverse topics. The program achieved:
    - 429 classroom presentations delivered to 10,123 students
    - 124 remote classroom presentations delivered to 2,759 students
    - Remote learning materials accessed from website 1,463 times
    - Videos and other materials provided to support remote learning
    - Live remote classes and video chat sessions for deeper inquiry into subjects
- Co-created and supported the Problem-Based Learning for Water Systems (PBL4WS) program with Sustainability Ambassadors for teachers and students who want more in-depth learning about water systems.
- Supported student-led effort at local high schools to install a water bottle filling stations and discourage the use of single-use plastic bottles with funding and free reusable water bottles, which students received after taking a pledge to avoid using plastic water bottles
- Supported two schools with supplies for students to conduct home water audits
- Provided 369 rebates for EnergyStar-labeled clothes washers
- Delivered free conservation items to multifamily properties and Cascade members for distribution to residents / customers
- Participated in the Northwest Flower and Garden Show, Issaquah Salmon Days, Bellevue Family Fourth, Redmond Derby Days, Skyway Health and Wellness Fair, Tukwila Bark in the Park, Sammamish Party on the Plateau, and Kirkland Concert Series and Farmer's Market to promote water efficiency
- Distributed 4,233 conservation items at community events
- Provided thirteen remote gardening classes with 1,650 attendees
- Provided three in-person garden walking tours with 120 attendees
- Provided four watershed ecology field trips with 60 attendees
- Partnered with the Sno-King Watershed Council to train residents to become stream monitors at local streams
- Provided 11 irrigation system assessments for high-peak season use customers, such as school districts, parks departments, and homeowner associations
- Supported the regional Garden Hotline; received 237 calls from member areas
- Partnered with Tilth Alliance to deliver the Soil and Water Stewardship program, which trains residents on sustainable landscaping practices, rainwater harvesting, drip irrigation, and other water-related topics
- Partnered with Lake Washington Institute of Technology to offer the Sustainable Landscape Technologies accredited program to train students and industry professionals on the fundamentals of efficient irrigation system management and sustainable landscaping
- Delivered 6,391 free toilet leak detection dye packets to 175 multifamily properties
- Delivered 475 free toilet leak detection dye packets to seven hotel / motel properties
- Provided 620 free shower timers, rain gauges, toilet leak detection dye, and other conservation items through Cascade's website
- Developed a strategic plan for Cascade's "We Need Water" social media campaign
- Promoted "Fix A Leak Week", "World Water Day", "Drinking Water Week", "Earth Day", "Source Protection Week", "Groundwater Awareness Week", "Imagine A Day Without Water", and other events through social and digital media

These programs and services promoted water efficiency and stewardship of water resources throughout the region resulting in thousands of student, teacher, business, and customer engagements representing all Cascade members and achieved an estimated savings of 11,553 gallons of water per day in 2022. Along with 2019 - 2021 savings, this represents 48% of Cascade's 2019 – 2024 Water Use Efficiency Goal.

Safeguarding Our Water



The City of Redmond utilizes multiple safeguards to ensure the quality and reliability of the water you receive. This preventative approach uses a series of technical, physical, and managerial safeguards to prevent contamination of drinking water as it travels from the source to your tap.

Source water safeguards within delineated Critical Aquifer Recharge Areas include:

- Pollution prevention practices
- Groundwater monitoring of water levels and quality in a network of monitoring wells
- Development plan reviews for groundwater protection

These safeguards ensure adequate water pressure by accounting for system elevations during normal operating conditions and utilizing best management practices to ensure safety during emergency outages, system repairs, and planned shutdowns.

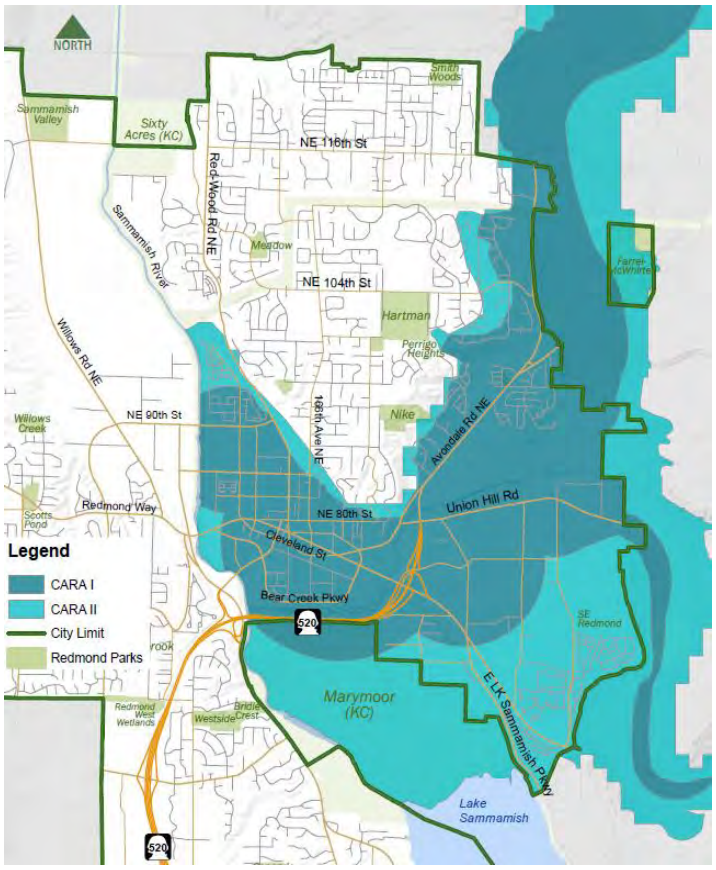
Drinking water quality safeguards include monitoring, treating, conveying, and daily drinking water testing in the distribution system.

Physical safeguards protect against backflow and cross-connections to prevent contamination from external sources entering the drinking water supply system.

Critical Aquifer Recharge Areas (CARA I and CARA II)

Redmond's groundwater aquifer is located beneath City Center and extends east towards Avondale Rd and SE Redmond. Redmond's aquifer is shallow, starting 5 to 15 feet below the ground surface. It's replenished mainly by rainwater that seeps or infiltrates into the ground. Groundwater supplies 40% of Redmond's drinking water through its municipal wells.

Critical Aquifer Recharge Areas, CARA I and CARA II, are special protection areas that help safeguard this important drinking water resource. They represent areas where groundwater is vulnerable to contamination due to the nature of the aquifer and the time it takes for groundwater to travel to the nearest municipal supply well.



The City of Redmond, its residents, and businesses already take several actions in the CARA to safeguard the aquifer. The City monitors groundwater levels and water quality in a network of monitoring wells to identify possible issues early. Under the Wellhead Protection Ordinance, construction sites implement specific protection standards, and with City staff's assistance, businesses are reducing the amount of chemicals they store, use, and handle.

Learn more about the CARA and Redmond's Wellhead/Groundwater Protection Program at www.redmond.gov/Groundwater.

Protecting Our Water is Up to All of Us

The best way to protect our groundwater drinking water resource is to ensure pollutants, such as oils, cleaners, and other chemicals, do not get onto the ground or into stormwater, especially in the Critical Aquifer Recharge Area (CARA). To learn about ways you can take action to safeguard our drinking water resources, visit redmond.gov/1225/Taking-Action for more information.

Immediately clean up spills and call Redmond's Pollution Hotline at 425-556-2868 to report it.



Natural Lawn Care

Use organic or slow-release products and follow the application directions on the package.

Water deeply but infrequently for root growth. Mow your lawn high (2-3 inches) to retain moisture.

For more information, visit cascadewater.org/water-efficiency/natural-yard-care/.



Maintain your Septic System

Routine maintenance of your septic system can save you money and lengthen the life of your system. Pump your septic system every three to five years and check for system failures such as odor and wet spots. Properly maintain your septic system to keep Redmond's drinking water clean.

To learn more, visit redmond.gov/Septic.



Properly Dispose Hazardous Waste

Dispose of used motor oil, oil-based paint, cleaning solvents, fuels, antifreeze, transmission and brake fluids, pesticides, and herbicides at a proper hazardous waste facility.

Residents and qualifying businesses are eligible for FREE hazardous waste disposal at King County Hazardous Waste facilities and traveling WasteMobile.

For more information about drop off locations, visit King County's website: www.hazwastehelp.org.

If you own or operate a business in Redmond, evaluate your hazardous materials handling process.

- Store chemicals and waste products in proper containers, with a cover if outside. Use secondary containment by placing the original container into another container to catch spills and leaks.
- Be prepared for spills. Have a spill kit and spill procedures in place and train employees on how to use them. For more information about how to get a FREE spill kit, contact a Pollution Prevention Specialist at 425-556-2888.
- Keep lids closed on dumpsters and waste bins.
- Minimize the use of toxic cleaning solvents, such as chlorinated solvents and other harmful chemicals.
- For additional information on hazardous materials storage and handling or environmentally safer alternatives, contact our Wellhead Protection staff at 425-556-2714.

wellhead protection

Backflow Prevention and Cross-Connection Control

Backflow is the undesirable reversal of the flow of water or mixtures of water and other undesirable substances from any source (such as used water, industrial fluids, gases, or any substance other than the intended potable water) into the distribution pipes of the potable water system. The most common concerns for residential customers are lawn irrigation and fire suppression systems.

A cross-connection is an actual or potential pathway between our drinking water supply and a source of contamination or pollution. In our homes and businesses, water is often used to dilute, mix, cool, and clean. Potable water may encounter dangerous chemicals and substances. Cross-connected plumbing may put your drinking water in contact with contaminated water. A homeowner or business owner is responsible if their water system contaminates the public water system.

Annual Backflow Assembly Testing

If you have an irrigation system, fire system, boiler, spa, or water feature, state law requires that you install a backflow prevention assembly to prevent contaminated water from flowing back into your drinking water. Backflow assemblies fail for a variety of reasons; therefore, they must be tested annually. The city mails out reminder letters for those we have records of. If you don't receive an annual reminder letter from the city to have your backflow assembly tested, please contact the Cross-Connection Program at backflowtests@redmond.gov. [You may hire any Backflow Assembly Tester certified in the State of Washington at https://grcc.greenriver.edu/wacertservices/bat/hire-a-bat/] Please have your backflow tester submit all backflow-related documents to Swift Comply here: https://redmondwa.c3swift.com. Your effort in performing required testing is essential in protecting your drinking water.

Garden Hoses can be hazardous to the water quality in your home. To prevent backflow and keep your water safe:

- Do not submerge a garden hose into anything you would not want to drink.
- Do not leave hose-end applicators such as fertilizers or weed killers attached to your hose. Use them and disconnect!

Emergency Alert System

The City of Redmond has joined the enhanced regional emergency alert system, ALERT King County. This powerful system enables the public to receive important information about significant events or emergencies. The free and confidential service allows you to register home and work addresses for geographic-specific alerts sent by phone, text, and email. For example, the system could notify you on your registered cell phone if your address is affected by a drinking water emergency. To sign up, please visit www.redmond.gov/Alert.

Get Involved

It's your drinking water, and your input is important. Attend and comment at City Council meetings on the first and third Tuesday of the month at 7:30 p.m. in the Council Chambers at Redmond City Hall, 15670 NE 85th Street. Agendas for the meetings can be found on the city's website (www.redmond.gov) or posted in the lobbies of City Hall and the Public Safety Building.



FUN FACT

The City's first official public source of drinking water was Perrigo Springs, acquired and developed in 1914.

Water Conservation Resources

Information & Freebies!

The Cascade Water Alliance Water Efficiency webpage offers resources, tips, free items, and more.

For more information about how to conserve water and order your **free water-saving items**, please visit the Cascade Water Alliance Water Efficiency page.

Redmond Resources

Public Works Water Quality: www.redmond.gov/DrinkingWater

Maintenance and Operations Center: 425.556.2800 info@redmond.gov

Wellhead Protection Program: www.redmond.gov/Groundwater groundwater@redmond.gov

Public Works Office: 425.556.2701

Cross Connection Control Program: www.redmond.gov/Backflow backflowtests@redmond.gov

Pollution Hotline: 425.556.2868

Additional Resources

Washington Department of Health: www.doh.wa.gov/ehp/dw, 800.521.0323

Environmental Protection Agency: www.epa.gov/safewater

Safe Drinking Water Hotline: 800.426.4791

American Water Works Association: www.drinktap.org, www.awwa.org

Cascade Water Alliance: www.cascadewater.org

Questions?

If you have questions about this report or about your drinking water, please contact Redmond's Drinking Water Quality section at info@redmond.gov or 425.556.2800.

Este documento contiene información muy importante sobre el agua potable.

这份报告包含了有关您的饮用水的非常重要的信息。

इस रिपोर्ट में आपके पीने के पानी के बारे में बहुत महत्वपूर्ण जानकारी है।

Этот отчет содержит очень важную информацию о вашей питьевой воде.

This report contains very important information about your drinking water.



Notice of nondiscrimination is available at redmond.gov/TitleVI.
无歧视声明可在本市的网址redmond.gov/TitleVI **上**查阅
El aviso contra la discriminación está disponible en redmond.gov/TitleVI

Appendix M
Cross Connection Control Program

Redmond
WASHINGTON

CROSS-CONNECTION CONTROL PROGRAM

May 2025

REVIEW HISTORY

DATE	REVIEWED BY	CHANGES/NOTES
1/26/2024	I. Andreev (CCS)	Document Created
5/19/2025	J. Hansen	Section 6 updated

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SECTION 1.

REDMOND MUNICIPAL CODE

A. The City of Redmond (City) has adopted Ordinance 1116, (in effect from the 7th of May 1983) which established Chapter 13.10 of the Redmond Municipal Code (RMC) – "Cross-Connection and Backflow Prevention".

B. RMC 13.10 Gives the authority to the Public Works Director and his designee, the City's Cross-Connection Specialist (CCS), to implement a cross-connection control program (CCCP).

C. Backflow prevention assemblies, when required by Washington Administrative Code (WAC) 246-290-490, or by the CCS's discretion, shall be installed and maintained by the customer to protect the public water supply.

D. The CCS shall be allowed access to all portions of properties, where water is supplied, at reasonable hours of the day for the sole purpose of inspecting and determining the existence of cross-connections.

E. Customers shall comply with the requirements set forth in WAC 246-290-490. Water service may be refused or discontinued to any premises for failure to comply. Written notice shall be provided prior to termination of water service unless the CCS determines that an immediate danger of contamination to the public water supply is present.

SECTION 2.

HAZARD EVALUATION

A. All new building plans are subjected to review for compliance with WAC 246-290-490 by the City's engineering team in the Planning Department. Plans that do not meet the minimum requirements are not approved.

B. Building remodel work involving plumbing requires permitting and is subject to the latest edition of the Uniform Plumbing Code in compliance with WAC 51-56. The City's inspectors and permitting staff communicate with the CCS on any plumbing permits that may be subject to WAC 246-290-490.

C. Existing customers with backflow assemblies are periodically reevaluated, with high hazard connections having priority. High hazard connections are surveyed every 3 years, or more often, based on compliance/incident history per the CCS's discretion.

D. Oral summary shall be given to the customer unless a deficiency is found, in which case a written notice shall be given with corrective action required and due date for completion. At the CCS's discretion the due date may be shorter than what is permissible in WAC 246-290-490.

SECTION 3.

PROCEDURES

A. All potential high health hazards shall be protected by an Air Gap or Reduced Pressure Backflow Assembly (RPBA or RPDA) where backpressure and backsiphonage can occur.
B. All potential low health hazards shall be protected by a Double Check Valve Assembly (DCVA or DCDA) where backpressure and backsiphonage can occur.
C. Potential low and high hazards may be protected by a Pressure Vacuum Breaker Assembly (PVB) or Spill Resistant Vacuum breaker (SVB) only where back-siphonage can occur.
D. Hydrant use permits shall be issued only after a passing assembly test report, not older than 30 days, is provided or after the air gap on the tanker vehicle is inspected by the CCS.
E. At the CCS's discretion a higher level of protection may be required than what is permissible under WAC 246-290-490.
F. No exceptions to the premises isolation requirements shall be granted.
G. Only assemblies listed in the most current version of the Manual of Cross-Connection Control published by the University of Southern California Foundation of Cross-Connection Control and Hydraulic Research shall be accepted.

SECTION 4.

CROSS-CONNECTION SPECIALIST

A. The City has designated an employee to implement the City's Cross-Connection Control Program. The employee is required to maintain a Washington State Department of Health certification as a Cross-Connection Specialist, and Water Distribution Manager-1.
B. The City strongly encourages and assists other Water Department employees to earn a CCS certification in order to assist in the implementation the City's CCCP, in case of a backflow event, or to identify any potential cross-connections they may encounter in their field work.

SECTION 5.

TESTING

A. Assemblies shall be tested when installed, repaired, or moved, and annually thereafter.

B. Test reports shall be accepted only by Washington Department of Health (WA DOH) certified Backflow Assembly Testers (BAT). The criteria for tester certification and test kit calibration shall be in accordance with the most current version of the following:

(I) Manual of Cross-Connection Control published by the University of Southern California Foundation of Cross-Connection Control and Hydraulic Research

(II) Accepted Procedure and Practice published by the Cross-Connection Control Committee of the Pacific Northwest Section of the American Water Works Association

(III) Recommended Practice for Backflow Prevention and Cross-Connection Control published by the American Water Works Association

C. Reports, at a minimum, shall contain the following information: BAT number, test kit serial number and last calibration date, assembly serial number, valve PSID, whether the valve leaked or closed tight, whether repairs were made, line pressure at the time of the test.

D. Tests performed more than 60 days before the assembly's due date shall not be accepted.

E. The CCS shall mail, via USPS, a notice to all customers with backflow assemblies a reminder no later than 30 days before the assembly is due to be tested.

F. The CCS shall mail via, USPS, a final notice to all customers with overdue backflow assemblies no later than 30 days after the assembly test was due.

G. At a minimum, the notice shall include the following information - due date, serial number of the assembly, type, make and model, size, location.

H. Customers who are not in compliance shall receive a shut-off notice posted on the premises at least 72 hours prior to service termination.

I. In the event of a backflow incident or at the CCS's discretion the service termination may be done without prior notice.

J. Service restoration for testing purposes will be available during the CCS's regular business hours by appointment only.

SECTION 6.

INCIDENT RESPONSE

A. The CCS or the City's Water Quality Analyst will respond to any reported backflow incidents and investigate the cause. If confirmed immediate mitigation measures will be taken to reduce the consequences of the incident based on severity.
B. As per the City's established standby program, Water Quality staff is available 24/7 to respond to emergencies.
C. In the event of a backflow incident, City staff will complete and submit to DOH the Backflow Incident Report Form (DOH Form 331-457), the latest version of which is appended to this plan.

SECTION 7.

PUBLIC OUTREACH

A. Information regarding the City's backflow prevention program is available on the City's website under the Drinking Water Operations section.
B. The Annual Consumer Confidence Report includes information on the CCCP.
C. Bill inserts are utilized to reach customers directly.
D. A phone line and email are available for customers to reach out to the CCS directly.

SECTION 8.

RECORD KEEPING

A. The City utilizes SwiftComply to maintain electronic records of backflow assemblies, including but not limited to, physical location, make and model, size, serial number, installation date, hazard level, compliance status, test reports, surveys.
B. Air Gaps are inspected annually by the CCS and the inspection results recorded.
C. BATs are required to submit test reports directly in SwiftComply in order to avoid clerical errors when entering data. Paper submissions are not accepted.
D. Only approved BATs are able to submit test reports in SwiftComply. The CCS reviews and approves each BAT before they can submit reports. Approval is revoked annually automatically on the 31st of January, pending a renewed BAT card submission to the City.
E. Records are retained for the life of the assembly.

Application Form—CCC Program

Backflow Incident Report Form

331-457-F • June 2024

Note: Use this form to comply with WAC 246-290-490(8)(g).

Part 1: Public Water System (PWS) Information					
PWS ID		PWS Name		County	Choose an item.

Part 2: Backflow Incident Information					
A. Incident Identification					
Incident Date	Date	Incident Time	Enter Time	*Incident ID (ODW Use Only)*	Internal ID#

B. Information on Premises where Backflow Originated			
Name of Premises	Click or tap here to enter text.		
Premises Physical Address	Click or tap here to enter text.		
City	Click or tap here to enter text.	Zip Code	Click or tap here to enter text.
Premises Type	Non-Residential ☐	Residential ☐	
Premises category/description (Table 13 formerly Table 9 category,* if applicable)	Click or tap here to enter text.		
Most Recent Hazard Evaluation Prior To Incident *(mm/dd/yyyy)*	Click or tap here to enter text.	None ☐	
PWS's Assessed Hazard Level	Click or tap here to enter text.		
Premises Isolation Required by PWS? Yes ☐ No ☐	PWS Relies on In-Premises Protection? Yes ☐ No ☐		
Type of Backflow Preventer Required by PWS	Click or tap here to enter text.		
Other Hazard Evaluation Information	Click or tap here to enter text.		
**See WAC 246-290-490(4)(b)(i).*			

C. Backflow Discovery Method				
How was the backflow discovered? Check all that apply.	Direct observation Meter running backwards Water use decrease Disinfectant residual monitoring Water quality monitoring	☐ ☐ ☐ ☐ ☐	Water quality complaint Illness/injury complaint Result of Investigation Other (Describe)	☐ ☐ ☐ Click or tap here to enter text.
By whom was the incident reported to the PWS?	PWS Personnel Premises Owner/Occupant Other PWS Customer Backflow Assembly Tester	☐ ☐ ☐ ☐	Other (Please Specify)	Click or tap here to enter text.

D. Contaminant Information						
Contaminant Type (Check all that apply.)	Microbiological	☐	Chemical	☐	Physical	☐
Describe contaminant (for example, the organism name, chemical, etc.). Please attach lab analysis or MSDS, if available.	Click or tap here to enter text.					

E. Extent and Effects of Contamination		
Estimated extent of contamination	Contained within Premises Entered PWS Distribution System	☐ ☐
Estimated number of connections affected	Residential Non-residential	Click or tap here to enter text. Click or tap here to enter text.
Estimated population affected or at risk	Residential Non-residential	Click or tap here to enter text. Click or tap here to enter text.

Number of water quality complaints	Click or tap here to enter text.
Describe water quality complaints	Click or tap here to enter text.
Number of illnesses reported	Click or tap here to enter text.
Describe Illnesses/irritation (specifics, if known)	Click or tap here to enter text.
Number of physical injuries (i.e., burns) or irritations (e.g., rashes) cases reported	Click or tap here to enter text.

Part 3: Public Water System (PWS) Information

A. Source of Contamination

Source of contaminant or fixture type (Check all that apply.)

Air conditioner/heat exchanger	☐	Industrial/commercial process water/fluid	☐
Auxiliary water supply	☐	Medical/dental fixture	☐
Beverage machine	☐	Reclaimed water system	☐
Boiler, hot water system	☐	Swimming pools, spa	☐
Chemical injector/aspirator	☐	Wastewater (sewage) system	☐
Fire protection system	☐	Other (specify)	Click or tap here to enter text.
Irrigation system (PWS supplied)	☐		

B. Distribution System Pressure Conditions in the Vicinity of the Backflow Incident

Backflow Type	Backsiphonage ☐	Backpressure ☐	
Typical distribution system pressure in vicinity of incident (if range, enter lower end of range)	Click or tap here to enter text. psi		

Main/pressure status at time of incident (Check all that apply.)

Normal	☐	Source/plant outage	☐
Main break	☐	Scheduled water shutoff by PWS	☐
Firefighting	☐	Unscheduled/emergency shutoff	☐
Other high usage	☐	Unknown	☐
Power outage	☐	Other (specify)	Click or tap here to enter text.

Describe causes and circumstances leading to backflow incident.

Click or tap here to enter text.

C. Backflow Preventer Information/Installation/Approval Status at Site of Backflow

Complete the tables in C and D for the premises isolation preventer for either of the following situations:

- If a premises isolation backflow preventer is installed and the contaminant entered the PWS distribution system.
- If the premises isolation assembly is the only backflow preventer at the site.

In all other cases, complete tables in C and D for the in-premises backflow preventer installed at the fixture. If more than one backflow preventer was involved in the backflow incident, copy tables C and D and complete them for the additional preventer(s

If no backflow preventer was installed at the time the incident occurred, check this box ☐ and go directly to Part 4. Don't fill out the tables below (C and D).

Backflow Preventer Information	Type Installed	Click or tap here to enter text.
	Installed For	Click or tap here to enter text.
	Make	Click or tap here to enter text.
	Model	Click or tap here to enter text.
	Size	Click or tap here to enter text.
	Serial Number	Click or tap here to enter text.
	Date Installed	Click or tap to enter a date.

Installation Status. Check all that Apply.	Properly installed/plumbed	☐
	Improperly installed/plumbed	☐
	Improperly protected bypass present	☐
	If so, explain	Click or tap here to enter text.
Commensurate with assessed degree of hazard?	Yes ☐ No ☐	If not, explain. Click or tap here to enter text.
DOH/USC-approved at time of backflow incident?	Yes ☐ No ☐	If not, approved when installed? Yes ☐ No ☐

D. Backflow Preventer Inspection/Testing Information at Site of Backflow

Most recent inspection/test information prior to backflow incident. Attach test report(s), if available.	Not test report on record.	☐
	Date tested/inspected.	Click or tap to enter a date.
	Passed test/inspection *without* repairs.	☐
	Failed initial test/inspection, passed *after* repair.	☐
	Failed test/inspection, no repairs made.	☐
Inspection/test information after backflow incident [per WAC 246-290-490(7)(b)]. Attach test report.	Not tested/inspected.	☐
	Date tested/inspected.	Click or tap to enter a date.
	Passed test/inspection *without* repairs.	☐
	Failed initial test/inspection, passed *after* repair.	☐
	Failed test/inspection, no repairs made.	☐

Backflow Preventer failure information, if applicable. Check all that apply.	Fouled check	☐
	Debris	☐
	Weather-related damage	☐
	Damaged seat	☐
	Other	Click or tap here to enter text.
If preventer failed inspection/test, did failure allow backflow?	Yes ☐ No ☐	If yes, explain. Click or tap here to enter text.

Part 4: Corrective Action/Notification

Action *taken* by PWS to restore water quality. Check all that apply.	None	☐
	Flushed/cleaned mains	☐
	Flushed/cleaned plumbing	☐
	Disinfected mains	☐
	Disinfected plumbing	☐
	Other treatment (describe)	Click or tap here to enter text.
	Replaced mains	☐
	Replaced plumbing	☐
	Other	Click or tap here to enter text.

Action *ordered* by PWS to correct cross-connection. Check all that apply.	None	☐
	Eliminate cross-connection	☐
	Remove by-pass	☐
	Install new preventer For premises isolation For fixture protection	☐ ☐ ☐
	Change existing preventer Repair/replumb ..... Reinstall correctly ..... Replace with same type Upgrade type	☐ ☐ ☐ ☐ ☐
	Other	Click or tap here to enter text.

Action ordered accomplished?	Yes	☐	Date	Click or tap to enter a date.
	No	☐	Explain	Click or tap here to enter text.

Agency notifications per WAC 246-290-490(8)(f). Check all that apply.	DOH	☐
	Local Health Agency	☐
	Local Administrative Authority	☐
	Issued by end of next business day	Click or tap here to enter text.

Notifications of consumers in area of incident (check all that apply)	Population at risk	☐
	Public Notification (PN per DOH regs)	☐
	Boil Water Advisory	☐
	Other (describe)	Click or tap here to enter text.
Other enforcement/corrective actions (describe).	Click or tap here to enter text.	

Part 5: Cost of Backflow Incident *(Optional)*

Item	PWS Personnel Hours Expended	Cost to PWS ($)	Cost to Premises Owner ($)
Investigation	Click or tap here to enter text.	Click or tap here to enter text.	Click or tap here to enter text.
Restoration of Water Quality	Click or tap here to enter text.	Click or tap here to enter text.	Click or tap here to enter text.
Correction of Cross-Connection Situation	Click or tap here to enter text.	Click or tap here to enter text.	Click or tap here to enter text.
Litigation and/or Settlement	Click or tap here to enter text.	Click or tap here to enter text.	Click or tap here to enter text.
Other Not Included in Above	Click or tap here to enter text.	Click or tap here to enter text.	Click or tap here to enter text.

Part 6: Further Information/Documentation

Additional information about this incident such as pictures, sketches, newspaper/journal articles, water quality analyses, epidemiological reports, etc. is helpful. Provide information in electronic or hard copy form.

Click or tap here to enter text.

Click or tap here to enter text.

Click or tap here to enter text.

Part 7: Form Completion Information	
Note: Form should be completed by a person currently certified as a Cross-Connection Control Specialist.	
I certify that the information provided in this Backflow Incident Report is complete and accurate to the best of my knowledge.	
CCC Program Manager Name	Click or tap here to enter text.
Title	Click or tap here to enter text.
CCS Certification Number	Click or tap here to enter text.
Signature	
Date	Click or tap to enter a date.
Phone	Click or tap here to enter text.
Email	Click or tap here to enter text.
I have reviewed this report and certify that the information is complete and accurate to the best of my knowledge.	
PWS Manager/Representative Name	Click or tap here to enter text.
Title	Click or tap here to enter text.
Operator Certification Number	Click or tap here to enter text.
Signature	
Date	Click or tap to enter a date.

Please send completed backflow incident form to:

Mail
Washington State Department of Health
Office of Drinking Water—CCC Program Manager
P O Box 47822
Olympia, WA 98504-7822

Email cccprogram@doh.wa.gov

Please send any form questions, comments, or suggestions to the address above or email cccprogram@doh.wa.gov.

To request this document in another format, call 1-800-525-0127. Deaf or hard of hearing customers, please call 711 (Washington Relay) or email doh.information@doh.wa.gov. If in need of translation services, call 1-800-525-0127.

Appendix N
Hydraulic Model Results

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Table 1. Existing System Fire Flow Results

Hydrant Model Node (Label)	Fire Flow Status	Fire Flow (Needed) (gpm)	Fire Flow (Available) (gpm)	Percent Deficient (%)
1106	Velocity Failed	1,500	380	75%
40140	Velocity Failed	1500	380	75%
J-7546	Velocity Failed	1,500	390	74%
40458	Velocity Failed	1500	390	74%
40456	Velocity Failed	1500	390	74%
2466	Residual Pressure Failed	1500	450	70%
J-4541	Velocity Failed	3,500	1,080	69%
J-7259	Velocity Failed	3,500	1,100	69%
J-6978	Velocity Failed	3,500	1,180	66%
J-5	Zone Pressure Failed	1500	510	66%
1217	Velocity Failed	1,500	570	62%
J-6790	Velocity Failed	1,500	580	61%
J-6791	Velocity Failed	1,500	580	61%
J-6600	Velocity Failed	3,500	1,360	61%
J-4431	Velocity Failed	3,500	1,540	56%
J-4433	Velocity Failed	3,500	1,540	56%
J-4434	Velocity Failed	3,500	1,540	56%
J-8454	Velocity Failed	3,500	1,540	56%
J-4522	Residual Pressure Failed	1500	660	56%
J-4394	Velocity Failed	3,500	1,560	55%
J-7138	Velocity Failed	3,500	1,560	55%
J-7340	Velocity Failed	3,500	1,560	55%
54247	Velocity Failed	3,500	1,570	55%
48530	Velocity Failed	3,500	1,570	55%
J-4407	Velocity Failed	3,500	1,570	55%
J-4408	Velocity Failed	3,500	1,570	55%
J-4411	Velocity Failed	3,500	1,570	55%
J-4425	Velocity Failed	3,500	1,570	55%
J-6589	Velocity Failed	3,500	1,570	55%
J-6591	Velocity Failed	3,500	1,570	55%
J-6592	Velocity Failed	3,500	1,570	55%
J-6971	Velocity Failed	3,500	1,570	55%
J-7389	Velocity Failed	3,500	1,570	55%
J-7734	Velocity Failed	3,500	1,570	55%
J-7735	Velocity Failed	3,500	1,570	55%
J-7736	Velocity Failed	3,500	1,570	55%
J-7781	Velocity Failed	3,500	1,570	55%
J-7818	Velocity Failed	3,500	1,570	55%
J-4243	Velocity Failed	3500	1570	55%
J-4244	Velocity Failed	3500	1570	55%
J-6	Velocity Failed	3500	1570	55%
J-152	Velocity Failed	3500	1570	55%

1045	Velocity Failed	3,500	1,620	54%
J-300-0002	Velocity Failed	3,500	1,620	54%
54318	Velocity Failed	3,500	1,620	54%
J-300-0028	Velocity Failed	3,500	1,620	54%
J-300-0034	Velocity Failed	3,500	1,620	54%
54305	Velocity Failed	3,500	1,620	54%
1052	Velocity Failed	3,500	1,620	54%
J-300-0004	Velocity Failed	3,500	1,620	54%
54311	Velocity Failed	3,500	1,620	54%
1044	Velocity Failed	3,500	1,620	54%
1046	Velocity Failed	3,500	1,620	54%
J-300-0001	Velocity Failed	3,500	1,620	54%
J-300-0005	Velocity Failed	3,500	1,620	54%
J-300-0027	Velocity Failed	3,500	1,620	54%
J-300-0003	Velocity Failed	3,500	1,620	54%
1047	Velocity Failed	3,500	1,620	54%
J-300-0009	Velocity Failed	3,500	1,620	54%
54303	Velocity Failed	3,500	1,620	54%
39947	Velocity Failed	3,500	1,620	54%
J-300-0036	Velocity Failed	3,500	1,620	54%
54313	Velocity Failed	3,500	1,620	54%
1051	Velocity Failed	3,500	1,620	54%
J-4428	Velocity Failed	3,500	1,620	54%
J-4429	Velocity Failed	3,500	1,620	54%
J-300-0030	Velocity Failed	3,500	1,620	54%
J-300-0029	Velocity Failed	3,500	1,620	54%
J-300-0033	Velocity Failed	3,500	1,620	54%
J-6671	Velocity Failed	3,500	1,620	54%
J-7935	Velocity Failed	3,500	1,620	54%
J-7973	Velocity Failed	3,500	1,620	54%
J-7976	Velocity Failed	3,500	1,620	54%
J-7977	Velocity Failed	3,500	1,620	54%
J-7991	Velocity Failed	3,500	1,620	54%
J-8028	Velocity Failed	3,500	1,620	54%
J-8161	Velocity Failed	3,500	1,620	54%
J-8162	Velocity Failed	3,500	1,620	54%
J-8168	Velocity Failed	3,500	1,620	54%
J-8177	Velocity Failed	3,500	1,620	54%
J-8194	Velocity Failed	3,500	1,620	54%
J-8195	Velocity Failed	3,500	1,620	54%
J-8210	Velocity Failed	3,500	1,620	54%
J-8217	Velocity Failed	3,500	1,620	54%
J-8234	Velocity Failed	3,500	1,620	54%
J-8252	Velocity Failed	3,500	1,620	54%
J-8276	Velocity Failed	3,500	1,620	54%
J-8277	Velocity Failed	3,500	1,620	54%
J-8288	Velocity Failed	3,500	1,620	54%

J-8289	Velocity Failed	3,500	1,620	54%
J-8308	Velocity Failed	3,500	1,620	54%
J-8335	Velocity Failed	3,500	1,620	54%
J-8345	Velocity Failed	3,500	1,620	54%
J-8350	Velocity Failed	3,500	1,620	54%
J-8351	Velocity Failed	3,500	1,620	54%
J-8373	Velocity Failed	3,500	1,620	54%
J-8374	Velocity Failed	3,500	1,620	54%
J-8385	Velocity Failed	3,500	1,620	54%
J-8391	Velocity Failed	3,500	1,620	54%
J-8392	Velocity Failed	3,500	1,620	54%
J-8397	Velocity Failed	3,500	1,620	54%
J-8408	Velocity Failed	3,500	1,620	54%
J-8409	Velocity Failed	3,500	1,620	54%
J-8424	Velocity Failed	3,500	1,620	54%
J-8427	Velocity Failed	3,500	1,620	54%
J-8430	Velocity Failed	3,500	1,620	54%
J-8431	Velocity Failed	3,500	1,620	54%
J-8432	Velocity Failed	3,500	1,620	54%
J-8433	Velocity Failed	3,500	1,620	54%
J-8434	Velocity Failed	3,500	1,620	54%
J-8447	Velocity Failed	3,500	1,620	54%
39941	Velocity Failed	3,500	1,770	49%
40589	Zone Pressure Failed	1500	770	49%
J-6934	Velocity Failed	3,500	1,830	48%
1314	Velocity Failed	1,500	810	46%
1315	Velocity Failed	1,500	810	46%
1316	Velocity Failed	1,500	810	46%
Avignon-Clarion	Velocity Failed	1,500	810	46%
1210	Velocity Failed	1,500	810	46%
J-4345	Velocity Failed	1,500	810	46%
J-4346	Velocity Failed	1,500	810	46%
J-4481	Velocity Failed	1,500	810	46%
J-7716	Velocity Failed	1,500	810	46%
919	Velocity Failed	1,500	820	45%
J-4377	Velocity Failed	1,500	820	45%
J-6729	Velocity Failed	1,500	820	45%
J-4412	Velocity Failed	3,500	1,920	45%
2502	ıne Pressure and Velocity Fail	1500	830	45%
2501	ıne Pressure and Velocity Fail	1500	830	45%
49110	Velocity Failed	1,500	850	43%
J-6427	Velocity Failed	1,500	850	43%
J-6369	Velocity Failed	1,500	850	43%
J-7201	Velocity Failed	1,500	850	43%
J-6783	Velocity Failed	3,500	1,990	43%
J-4352	Velocity Failed	1,500	860	43%
J-6753	Velocity Failed	1,500	860	43%

J-6754	Velocity Failed	1,500	860	43%
2508	Velocity Failed	1500	860	43%
J-4413	Velocity Failed	3,500	2,010	43%
J-6990	Velocity Failed	3,500	2,010	43%
J-8267	Velocity Failed	3,500	2,020	42%
49755	Velocity Failed	3,500	2,030	42%
J-4521	Velocity Failed	1,500	870	42%
J-7089	Velocity Failed	1,500	870	42%
J-6465	Velocity Failed	1,500	870	42%
J-6328	Velocity Failed	1,500	870	42%
J-6334	Velocity Failed	1,500	870	42%
J-7251	Velocity Failed	1,500	870	42%
J-7276	Velocity Failed	1,500	870	42%
40591	Velocity Failed	1500	870	42%
2505	Velocity Failed	1500	870	42%
J-4206	Velocity Failed	1500	870	42%
2506	Velocity Failed	1500	870	42%
J-8557	Velocity Failed	3,500	2,050	41%
50160	Velocity Failed	1,500	880	41%
J-4349	Velocity Failed	1,500	880	41%
J-4354	Velocity Failed	1,500	880	41%
J-4518	Velocity Failed	1,500	880	41%
J-6940	Velocity Failed	1,500	880	41%
J-4250	Velocity Failed	1500	880	41%
2507	Velocity Failed	1500	880	41%
2504	Velocity Failed	1500	880	41%
J-6965	Velocity Failed	3,500	2,060	41%
J-6593	Velocity Failed	3,500	2,080	41%
J-6999	Velocity Failed	3,500	2,090	40%
J-7852	Velocity Failed	3,500	2,090	40%
J-6991	Velocity Failed	3,500	2,110	40%
48932	Velocity Failed	3,500	2,120	39%
J-6992	Velocity Failed	3,500	2,180	38%
J-8156	Velocity Failed	3,500	2,190	37%
J-172	Velocity Failed	3500	2260	35%
J-7056	Velocity Failed	3,500	2,300	34%
48387	Velocity Failed	3,500	2,330	33%
49073	Velocity Failed	3,500	2,340	33%
J-7952	Velocity Failed	3,500	2,340	33%
J-8558	Velocity Failed	3,500	2,380	32%
2479	Residual Pressure Failed	1500	1020	32%
J-6964	Velocity Failed	3,500	2,410	31%
J-6781	Velocity Failed	3,500	2,420	31%
50007	Velocity Failed	3,500	2,430	31%
J-6782	Velocity Failed	3,500	2,430	31%
J-7347	Velocity Failed	3,500	2,430	31%
J-6970	Velocity Failed	3,500	2,440	30%

J-7057	Velocity Failed	3,500	2,450	30%
J-6969	Velocity Failed	3,500	2,460	30%
J-7075	Velocity Failed	3,500	2,470	29%
J-6968	Velocity Failed	3,500	2,480	29%
1212	Velocity Failed	1,500	1,070	29%
J-8562	Velocity Failed	3,500	2,520	28%
40454	Velocity Failed	1500	1090	27%
J-4414	Velocity Failed	3,500	2,550	27%
Hydrant 236	Velocity Failed	3,500	2,550	27%
J-6966	Velocity Failed	3,500	2,560	27%
J-7120	Velocity Failed	3,500	2,560	27%
J-7117	Velocity Failed	3,500	2,590	26%
47769	Velocity Failed	3,500	2,600	26%
J-8549	Velocity Failed	3,500	2,600	26%
2392	Velocity Failed	3500	2600	26%
J-6996	Velocity Failed	3,500	2,610	25%
J-6933	Velocity Failed	3,500	2,620	25%
J-8214	Velocity Failed	3,500	2,620	25%
2431	Velocity Failed	3500	2630	25%
1242	Velocity Failed	1,500	1,130	25%
40093	Velocity Failed	1500	1130	25%
J-4230	Velocity Failed	3500	2650	24%
1122	Velocity Failed	1,500	1,140	24%
J-7082	Velocity Failed	3,500	2,660	24%
J-7346	Velocity Failed	3,500	2,670	24%
40054	Velocity Failed	3,500	2,680	23%
J-4503	Velocity Failed	3,500	2,680	23%
J-6784	Velocity Failed	3,500	2,680	23%
J-6813	Velocity Failed	3,500	2,680	23%
J-6389	Velocity Failed	1,500	1,150	23%
J-7265	Velocity Failed	1,500	1,150	23%
J-7266	Velocity Failed	1,500	1,150	23%
J-8201	Velocity Failed	3,500	2,690	23%
J-6770	Velocity Failed	3,500	2,710	23%
50410	Velocity Failed	3,500	2,730	22%
J-4388	Velocity Failed	3,500	2,730	22%
J-7070	Velocity Failed	3,500	2,730	22%
J-8418	Velocity Failed	3,500	2,740	22%
J-7010	Velocity Failed	1,500	1,180	21%
J-6980	Velocity Failed	1,500	1,180	21%
J-6981	Velocity Failed	1,500	1,180	21%
J-6982	Velocity Failed	1,500	1,180	21%
Hydrant_1969	Velocity Failed	1,500	1,180	21%
J-8554	Velocity Failed	1,500	1,180	21%
48282	Velocity Failed	1,500	1,190	21%
J-6774	Velocity Failed	3,500	2,780	21%
J-7025	Velocity Failed	3,500	2,780	21%

48331	Velocity Failed	3,500	2,790	20%
J-7007	Velocity Failed	1,500	1,200	20%
J-6806	Velocity Failed	3,500	2,830	19%
1181	Velocity Failed	1,500	1,220	19%
J-6928	Velocity Failed	3,500	2,850	19%
J-7898	Velocity Failed	3,500	2,860	18%
2430	Velocity Failed	3500	2860	18%
Hydrant 139	Velocity Failed	3,500	2,870	18%
J-7908	Velocity Failed	3,500	2,880	18%
J-6436	Velocity Failed	3,500	2,890	17%
49390	Velocity Failed	1,500	1,240	17%
J-6809	Velocity Failed	3,500	2,900	17%
J-7909	Velocity Failed	3,500	2,900	17%
54403	Velocity Failed	3,500	2,910	17%
J-6988	Velocity Failed	3,500	2,920	17%
J-7207	Velocity Failed	3,500	2,930	16%
48236	Velocity Failed	3,500	2,940	16%
J-8555	Velocity Failed	1,500	1,260	16%
J-6989	Velocity Failed	3,500	2,950	16%
54361	Velocity Failed	3,500	2,960	15%
J-7081	Velocity Failed	3,500	2,960	15%
J-7123	Velocity Failed	3,500	2,960	15%
47543	Velocity Failed	1,500	1,270	15%
J-6375	Velocity Failed	1,500	1,270	15%
J-6977	Velocity Failed	1,500	1,270	15%
49905	Velocity Failed	3,500	2,970	15%
J-6776	Velocity Failed	3,500	2,970	15%
2336	Velocity Failed	3500	2970	15%
941	Velocity Failed	1,500	1,280	15%
J-7192	Velocity Failed	1,500	1,280	15%
J-6963	Velocity Failed	3,500	2,990	15%
J-7350	Velocity Failed	3,500	2,990	15%
J-4238	Velocity Failed	3500	3000	14%
J-173	Velocity Failed	3500	3000	14%
J-6395	Velocity Failed	1,500	1,290	14%
J-6396	Velocity Failed	1,500	1,290	14%
J-6397	Velocity Failed	1,500	1,290	14%
J-6398	Velocity Failed	1,500	1,290	14%
J-6400	Velocity Failed	1,500	1,290	14%
J-6871	Velocity Failed	1,500	1,290	14%
J-6872	Velocity Failed	1,500	1,290	14%
J-6873	Velocity Failed	1,500	1,290	14%
J-7855	Velocity Failed	1,500	1,290	14%
J-7894	Velocity Failed	1,500	1,290	14%
J-7928	Velocity Failed	1,500	1,290	14%
J-7929	Velocity Failed	1,500	1,290	14%
J-7963	Velocity Failed	1,500	1,290	14%

J-7972	Velocity Failed	1,500	1,290	14%
J-8073	Velocity Failed	1,500	1,290	14%
J-8100	Velocity Failed	1,500	1,290	14%
J-8102	Velocity Failed	1,500	1,290	14%
J-8113	Velocity Failed	1,500	1,290	14%
J-8135	Velocity Failed	1,500	1,290	14%
J-8159	Velocity Failed	1,500	1,290	14%
J-8160	Velocity Failed	1,500	1,290	14%
J-8230	Velocity Failed	1,500	1,290	14%
J-8257	Velocity Failed	1,500	1,290	14%
J-8285	Velocity Failed	1,500	1,290	14%
J-8327	Velocity Failed	1,500	1,290	14%
J-8331	Velocity Failed	1,500	1,290	14%
J-8365	Velocity Failed	1,500	1,290	14%
J-8370	Velocity Failed	1,500	1,290	14%
J-8377	Velocity Failed	1,500	1,290	14%
J-8415	Velocity Failed	1,500	1,290	14%
J-8419	Velocity Failed	1,500	1,290	14%
J-8441	Velocity Failed	1,500	1,290	14%
J-8445	Velocity Failed	1,500	1,290	14%
J-8451	Velocity Failed	1,500	1,290	14%
J-8456	Velocity Failed	1,500	1,290	14%
J-174	Velocity Failed	1500	1290	14%
J-4275	Velocity Failed	3,500	3,030	13%
J-4277	Velocity Failed	3,500	3,030	13%
J-4282	Velocity Failed	3,500	3,030	13%
J-7352	Velocity Failed	3,500	3,030	13%
J-6994	Velocity Failed	3,500	3,050	13%
1120	Velocity Failed	1,500	1,310	13%
J-6751	Velocity Failed	1,500	1,310	13%
40131	Velocity Failed	1500	1310	13%
J-6995	Velocity Failed	3,500	3,060	13%
50505	Velocity Failed	3,500	3,080	12%
J-4483	Velocity Failed	3,500	3,090	12%
J-4241	Velocity Failed	3500	3090	12%
J-4415	Velocity Failed	3,500	3,100	11%
48161	Velocity Failed	1,500	1,330	11%
J-6370	Velocity Failed	1,500	1,330	11%
J-7191	Velocity Failed	1,500	1,330	11%
40117	Velocity Failed	1500	1330	11%
47759	Velocity Failed	1,500	1,340	11%
48332	Velocity Failed	1,500	1,340	11%
J-7190	Velocity Failed	1,500	1,340	11%
J-7252	Velocity Failed	1,500	1,340	11%
1305	Velocity Failed	1,500	1,350	10%
1121	Velocity Failed	1,500	1,350	10%
J-6958	Velocity Failed	1,500	1,350	10%

2347	Velocity Failed	3500	3150	10%
2391	Velocity Failed	3500	3160	10%
48866	Velocity Failed	1,500	1,360	9%
48262	Velocity Failed	1,500	1,360	9%
J-6492	Velocity Failed	1,500	1,360	9%
J-6957	Velocity Failed	1,500	1,360	9%
J-4249	Velocity Failed	1500	1360	9%
50323	Velocity Failed	1,500	1,370	9%
50156	Velocity Failed	1,500	1,370	9%
J-6485	Velocity Failed	1,500	1,370	9%
J-4423	Velocity Failed	3,500	3,200	9%
J-4267	Velocity Failed	1,500	1,380	8%
J-6466	Velocity Failed	1,500	1,380	8%
2423	Velocity Failed	3500	3220	8%
2420	Velocity Failed	3500	3220	8%
40419	Velocity Failed	3500	3220	8%
2422	Velocity Failed	3500	3220	8%
2421	Velocity Failed	3500	3220	8%
J-28	Velocity Failed	3500	3220	8%
J-29	Velocity Failed	3500	3220	8%
J-30	Velocity Failed	3500	3220	8%
J-31	Velocity Failed	3500	3220	8%
J-32	Velocity Failed	3500	3220	8%
J-151	Velocity Failed	3500	3220	8%
J-221	Velocity Failed	3500	3220	8%
40417	Velocity Failed	3500	3230	8%
J-7137	Velocity Failed	3,500	3,240	7%
J-6430	Velocity Failed	1,500	1,390	7%
2516	dual Pressure and Velocity Fa	1500	1390	7%
50031	Velocity Failed	3,500	3,250	7%
J-7817	Velocity Failed	3,500	3,260	7%
48445	Velocity Failed	1,500	1,400	7%
J-7058	Velocity Failed	1,500	1,400	7%
J-7059	Velocity Failed	1,500	1,400	7%
J-7060	Velocity Failed	1,500	1,400	7%
J-7816	Velocity Failed	3,500	3,270	7%
J-4424	Velocity Failed	3,500	3,280	6%
J-6463	Velocity Failed	1,500	1,410	6%
J-7465	Velocity Failed	1,500	1,410	6%
J-7466	Velocity Failed	1,500	1,410	6%
2424	Velocity Failed	3500	3300	6%
1321	Velocity Failed	1,500	1,420	5%
J-6954	Velocity Failed	1,500	1,420	5%
J-7464	Velocity Failed	1,500	1,420	5%
J-6884	Velocity Failed	1,500	1,430	5%
937	Velocity Failed	3,500	3,340	5%
J-158	Velocity Failed	3500	3340	5%

48451	Velocity Failed	3,500	3,360	4%
49614	Velocity Failed	1,500	1,440	4%
J-7254	Velocity Failed	1,500	1,440	4%
40197	Velocity Failed	1500	1440	4%
J-208	Velocity Failed	1500	1440	4%
40339	Velocity Failed	3500	3380	3%
40595	Velocity Failed	3500	3380	3%
1228	Velocity Failed	1,500	1,450	3%
J-6345	Velocity Failed	1,500	1,450	3%
J-212	Velocity Failed	3500	3390	3%
49662	Velocity Failed	3,500	3,420	2%
1322	Velocity Failed	1,500	1,470	2%
1226	Velocity Failed	1,500	1,470	2%
936	Velocity Failed	3,500	3,430	2%
J-4269	Velocity Failed	1,500	1,470	2%
J-6351	Velocity Failed	1,500	1,470	2%
J-6746	Velocity Failed	1,500	1,470	2%
J-7526	Velocity Failed	1,500	1,470	2%
40587	Velocity Failed	1500	1470	2%
J-4235	Velocity Failed	3500	3440	2%
J-4278	Velocity Failed	3,500	3,450	1%
J-7261	Velocity Failed	3,500	3,450	1%
J-7262	Velocity Failed	3,500	3,450	1%
J-7865	Velocity Failed	1,500	1,480	1%
J-7872	Velocity Failed	1,500	1,480	1%
J-7985	Velocity Failed	1,500	1,480	1%
J-8059	Velocity Failed	1,500	1,480	1%
J-8093	Velocity Failed	1,500	1,480	1%
J-8180	Velocity Failed	1,500	1,480	1%
J-8188	Velocity Failed	1,500	1,480	1%
J-8221	Velocity Failed	1,500	1,480	1%
J-8268	Velocity Failed	1,500	1,480	1%
J-8300	Velocity Failed	1,500	1,480	1%
J-8416	Velocity Failed	1,500	1,480	1%
J-8423	Velocity Failed	1,500	1,480	1%
J-8459	Velocity Failed	1,500	1,480	1%
J-8473	Velocity Failed	1,500	1,480	1%
J-8476	Velocity Failed	1,500	1,480	1%
48988	Velocity Failed	1,500	1,490	1%
J-6356	Velocity Failed	1,500	1,490	1%
J-6357	Velocity Failed	1,500	1,490	1%
J-6358	Velocity Failed	1,500	1,490	1%
J-6359	Velocity Failed	1,500	1,490	1%
Hydrant_1970	Velocity Failed	1,500	1,490	1%
J-7856	Velocity Failed	1,500	1,490	1%
J-7893	Velocity Failed	1,500	1,490	1%
J-7954	Velocity Failed	1,500	1,490	1%

J-7955	Velocity Failed	1,500	1,490	1%
J-8120	Velocity Failed	1,500	1,490	1%
J-8121	Velocity Failed	1,500	1,490	1%
J-8138	Velocity Failed	1,500	1,490	1%
J-8278	Velocity Failed	1,500	1,490	1%
40613	Velocity Failed	3500	3490	0.3%
40611	Velocity Failed	3500	3490	0.3%

Table 2. Fire Flow Results (10-Year Demands Scenario)

Hydrant Model Node (Label)	Fire Flow Status	Fire Flow (Needed) (gpm)	Fire Flow (Available) (gpm)	Percent Deficient (%)
1106	Velocity Failed	1,500	380	75%
J-7546	Velocity Failed	1500	380	75%
40140	Velocity Failed	1,500	380	75%
40458	Velocity Failed	1500	390	74%
40456	Velocity Failed	1500	390	74%
2466	Residual Pressure Failed	1500	430	71%
J-4541	Velocity Failed	3,500	1,040	70%
J-6978	Velocity Failed	3,500	1,090	69%
J-5	Zone Pressure Failed	1,500	490	67%
1217	Velocity Failed	1500	530	65%
J-6790	Velocity Failed	1,500	540	64%
J-6791	Velocity Failed	1,500	540	64%
J-7259	Velocity Failed	3,500	1,260	64%
J-6600	Velocity Failed	3,500	1,360	61%
1045	Velocity Failed	3,500	1,370	61%
J-300-0002	Velocity Failed	3,500	1,370	61%
54318	Velocity Failed	3,500	1,370	61%
J-300-0028	Velocity Failed	3,500	1,370	61%
J-300-0034	Velocity Failed	3500	1370	61%
54305	Velocity Failed	3,500	1,370	61%
1052	Velocity Failed	3,500	1,370	61%
J-300-0004	Velocity Failed	3,500	1,370	61%
54311	Velocity Failed	3,500	1,370	61%
1044	Velocity Failed	3,500	1,370	61%
1046	Velocity Failed	3,500	1,370	61%
J-300-0001	Velocity Failed	3,500	1,370	61%
54247	Velocity Failed	3,500	1,370	61%
J-300-0005	Velocity Failed	3,500	1,370	61%
J-300-0027	Velocity Failed	3,500	1,370	61%
J-300-0003	Velocity Failed	3,500	1,370	61%
1047	Velocity Failed	3,500	1,370	61%
J-300-0009	Velocity Failed	3,500	1,370	61%
54303	Velocity Failed	3,500	1,370	61%
39947	Velocity Failed	3,500	1,370	61%
J-300-0036	Velocity Failed	3,500	1,370	61%
54313	Velocity Failed	3,500	1,370	61%
1051	Velocity Failed	3,500	1,370	61%
J-4428	Velocity Failed	3,500	1,370	61%
J-4429	Velocity Failed	3500	1370	61%
J-6589	Velocity Failed	3500	1370	61%
J-300-0030	Velocity Failed	3500	1370	61%
J-300-0029	Velocity Failed	3500	1370	61%
J-300-0033	Velocity Failed	3,500	1,370	61%

J-6671	Velocity Failed	3,500	1,370	61%
J-7935	Velocity Failed	3,500	1,370	61%
J-7973	Velocity Failed	3,500	1,370	61%
J-7976	Velocity Failed	3,500	1,370	61%
J-7977	Velocity Failed	3,500	1,370	61%
J-7991	Velocity Failed	3,500	1,370	61%
J-8028	Velocity Failed	3,500	1,370	61%
J-8161	Velocity Failed	3,500	1,370	61%
J-8162	Velocity Failed	3,500	1,370	61%
J-8168	Velocity Failed	3,500	1,370	61%
J-8177	Velocity Failed	3,500	1,370	61%
J-8194	Velocity Failed	3,500	1,370	61%
J-8195	Velocity Failed	3,500	1,370	61%
J-8210	Velocity Failed	3,500	1,370	61%
J-8217	Velocity Failed	3,500	1,370	61%
J-8234	Velocity Failed	3,500	1,370	61%
J-8252	Velocity Failed	3,500	1,370	61%
J-8276	Velocity Failed	3,500	1,370	61%
J-8277	Velocity Failed	3,500	1,370	61%
J-8288	Velocity Failed	3,500	1,370	61%
J-8289	Velocity Failed	3,500	1,370	61%
J-8308	Velocity Failed	3,500	1,370	61%
J-8335	Velocity Failed	3,500	1,370	61%
J-8345	Velocity Failed	3,500	1,370	61%
J-8350	Velocity Failed	3,500	1,370	61%
J-8351	Velocity Failed	3,500	1,370	61%
J-8373	Velocity Failed	3,500	1,370	61%
J-8374	Velocity Failed	3,500	1,370	61%
J-8385	Velocity Failed	3,500	1,370	61%
J-8391	Velocity Failed	3,500	1,370	61%
J-8392	Velocity Failed	3,500	1,370	61%
J-8397	Velocity Failed	3,500	1,370	61%
J-8408	Velocity Failed	3,500	1,370	61%
J-8409	Velocity Failed	3,500	1,370	61%
J-8424	Velocity Failed	3,500	1,370	61%
J-8427	Velocity Failed	3,500	1,370	61%
J-8430	Velocity Failed	3,500	1,370	61%
J-8431	Velocity Failed	3,500	1,370	61%
J-8432	Velocity Failed	3,500	1,370	61%
J-8433	Velocity Failed	3,500	1,370	61%
J-8434	Velocity Failed	3,500	1,370	61%
J-8447	Velocity Failed	3,500	1,370	61%
J-4522	Residual Pressure Failed	1,500	640	57%
J-8454	Velocity Failed	3,500	1,530	56%
J-4431	Velocity Failed	3,500	1,540	56%
J-4433	Velocity Failed	3,500	1,540	56%
J-4434	Velocity Failed	3,500	1,540	56%

J-7340	Velocity Failed	3,500	1,550	56%
J-4394	Velocity Failed	3,500	1,560	55%
J-7138	Velocity Failed	3,500	1,560	55%
48530	Velocity Failed	3,500	1,570	55%
J-4407	Velocity Failed	3,500	1,570	55%
J-4408	Velocity Failed	3,500	1,570	55%
J-4411	Velocity Failed	3,500	1,570	55%
J-4425	Velocity Failed	3,500	1,570	55%
J-6591	Velocity Failed	3,500	1,570	55%
J-6592	Velocity Failed	3,500	1,570	55%
J-6971	Velocity Failed	3,500	1,570	55%
J-7389	Velocity Failed	3,500	1,570	55%
J-7734	Velocity Failed	3,500	1,570	55%
J-7735	Velocity Failed	3,500	1,570	55%
J-7736	Velocity Failed	3,500	1,570	55%
J-7781	Velocity Failed	3,500	1,570	55%
J-7818	Velocity Failed	3,500	1,570	55%
J-4243	Velocity Failed	3,500	1,570	55%
J-4244	Velocity Failed	3,500	1,570	55%
J-6	Velocity Failed	3,500	1,570	55%
J-152	Velocity Failed	3,500	1,570	55%
40589	Zone Pressure Failed	1,500	740	51%
39941	Velocity Failed	3500	1760	50%
J-6934	Velocity Failed	3,500	1,820	48%
1314	Velocity Failed	1,500	790	47%
1315	Velocity Failed	1,500	790	47%
1316	Velocity Failed	1,500	790	47%
Avignon-Clarion	Velocity Failed	1,500	790	47%
1210	Velocity Failed	1,500	790	47%
J-4345	Velocity Failed	1,500	790	47%
J-4346	Velocity Failed	1,500	790	47%
J-4481	Velocity Failed	1,500	790	47%
J-7716	Velocity Failed	1,500	790	47%
2502	ıne Pressure and Velocity Fail	1,500	800	47%
2501	ıne Pressure and Velocity Fail	1,500	800	47%
919	Velocity Failed	1,500	810	46%
J-4377	Velocity Failed	1,500	810	46%
J-6729	Velocity Failed	1500	810	46%
J-4412	Velocity Failed	3500	1920	45%
49110	Velocity Failed	1,500	840	44%
J-6427	Velocity Failed	1,500	840	44%
J-6369	Velocity Failed	1,500	840	44%
J-7201	Velocity Failed	1,500	840	44%
J-4352	Velocity Failed	1,500	850	43%
J-6753	Velocity Failed	1,500	850	43%
J-6754	Velocity Failed	1,500	850	43%
2508	Velocity Failed	1,500	850	43%

J-6783	Velocity Failed	3500	1990	43%
J-7251	Velocity Failed	1,500	860	43%
J-7276	Velocity Failed	1,500	860	43%
40591	Velocity Failed	1,500	860	43%
J-4413	Velocity Failed	3,500	2,010	43%
J-6990	Velocity Failed	3,500	2,010	43%
J-8267	Velocity Failed	3,500	2,010	43%
49755	Velocity Failed	3,500	2,030	42%
J-4521	Velocity Failed	1,500	870	42%
J-7089	Velocity Failed	1,500	870	42%
J-6465	Velocity Failed	1,500	870	42%
J-6328	Velocity Failed	1,500	870	42%
J-6334	Velocity Failed	1500	870	42%
2505	Velocity Failed	1500	870	42%
J-4206	Velocity Failed	1500	870	42%
2506	Velocity Failed	1500	870	42%
2504	Velocity Failed	1,500	870	42%
J-8557	Velocity Failed	3,500	2,040	42%
J-6965	Velocity Failed	3,500	2,050	41%
50160	Velocity Failed	1,500	880	41%
J-4349	Velocity Failed	1,500	880	41%
J-4354	Velocity Failed	1,500	880	41%
J-4518	Velocity Failed	1500	880	41%
J-6940	Velocity Failed	1500	880	41%
J-4250	Velocity Failed	1500	880	41%
2507	Velocity Failed	1,500	880	41%
J-6593	Velocity Failed	3,500	2,080	41%
J-6999	Velocity Failed	3,500	2,090	40%
J-6991	Velocity Failed	3,500	2,100	40%
J-7852	Velocity Failed	3,500	2,100	40%
48932	Velocity Failed	3,500	2,120	39%
J-6992	Velocity Failed	3,500	2,180	38%
J-8156	Velocity Failed	3,500	2,190	37%
J-172	Velocity Failed	3500	2250	36%
2479	Residual Pressure Failed	1,500	980	35%
J-7056	Velocity Failed	3,500	2,290	35%
48387	Velocity Failed	3,500	2,320	34%
J-7952	Velocity Failed	3,500	2,330	33%
49073	Velocity Failed	3,500	2,340	33%
1212	Velocity Failed	1500	1010	33%
J-8558	Velocity Failed	3,500	2,370	32%
J-6964	Velocity Failed	3,500	2,400	31%
48282	Velocity Failed	1,500	1,030	31%
50007	Velocity Failed	3,500	2,410	31%
J-4503	Velocity Failed	3,500	2,410	31%
J-6782	Velocity Failed	3,500	2,420	31%
J-6970	Velocity Failed	3,500	2,420	31%

J-6781	Velocity Failed	3,500	2,430	31%
J-7347	Velocity Failed	3,500	2,430	31%
J-7057	Velocity Failed	3,500	2,440	30%
J-6969	Velocity Failed	3,500	2,440	30%
40454	Velocity Failed	1,500	1,050	30%
J-6968	Velocity Failed	3500	2460	30%
J-7075	Velocity Failed	3,500	2,470	29%
J-8562	Velocity Failed	3,500	2,530	28%
J-6966	Velocity Failed	3,500	2,540	27%
J-6980	Velocity Failed	1,500	1,090	27%
J-6981	Velocity Failed	1,500	1,090	27%
J-6982	Velocity Failed	1,500	1,090	27%
J-4414	Velocity Failed	3,500	2,550	27%
Hydrant 236	Velocity Failed	3500	2550	27%
J-7120	Velocity Failed	3,500	2,560	27%
J-7117	Velocity Failed	3,500	2,590	26%
Hydrant_1969	Velocity Failed	1,500	1,110	26%
J-8549	Velocity Failed	3500	2590	26%
2392	Velocity Failed	3,500	2,590	26%
47769	Velocity Failed	3500	2600	26%
J-6996	Velocity Failed	3500	2600	26%
J-8214	Velocity Failed	3,500	2,600	26%
J-6389	Velocity Failed	1,500	1,120	25%
J-7265	Velocity Failed	1,500	1,120	25%
J-7266	Velocity Failed	1,500	1,120	25%
40093	Velocity Failed	1,500	1,120	25%
J-6933	Velocity Failed	3,500	2,620	25%
2431	Velocity Failed	3,500	2,620	25%
1242	Velocity Failed	1,500	1,130	25%
1122	Velocity Failed	1,500	1,130	25%
J-4230	Velocity Failed	3,500	2,650	24%
J-6784	Velocity Failed	3,500	2,660	24%
J-7082	Velocity Failed	3,500	2,660	24%
J-7346	Velocity Failed	3,500	2,670	24%
40054	Velocity Failed	3,500	2,680	23%
J-6813	Velocity Failed	3,500	2,680	23%
J-8201	Velocity Failed	3,500	2,680	23%
J-6770	Velocity Failed	3,500	2,710	23%
J-4388	Velocity Failed	3,500	2,720	22%
J-7070	Velocity Failed	3,500	2,720	22%
50410	Velocity Failed	3,500	2,730	22%
J-8418	Velocity Failed	3,500	2,740	22%
49390	Velocity Failed	1,500	1,180	21%
J-7010	Velocity Failed	1,500	1,180	21%
48331	Velocity Failed	3,500	2,760	21%
J-8554	Velocity Failed	1,500	1,190	21%
J-6774	Velocity Failed	3,500	2,780	21%

J-7025	Velocity Failed	3,500	2,780	21%
J-7007	Velocity Failed	1,500	1,200	20%
J-8555	Velocity Failed	1,500	1,210	19%
40197	Velocity Failed	1,500	1,210	19%
J-208	Velocity Failed	1,500	1,210	19%
J-6806	Velocity Failed	3500	2830	19%
1181	Velocity Failed	1,500	1,220	19%
J-6928	Velocity Failed	3,500	2,850	19%
2430	Velocity Failed	3,500	2,850	19%
J-4275	Velocity Failed	3,500	2,860	18%
J-4277	Velocity Failed	3,500	2,860	18%
J-4282	Velocity Failed	3,500	2,860	18%
J-7898	Velocity Failed	3,500	2,860	18%
J-6977	Velocity Failed	1,500	1,230	18%
Hydrant 139	Velocity Failed	3,500	2,870	18%
J-7908	Velocity Failed	3,500	2,870	18%
J-7909	Velocity Failed	3,500	2,890	17%
47543	Velocity Failed	1,500	1,240	17%
J-6395	Velocity Failed	1,500	1,240	17%
J-6396	Velocity Failed	1,500	1,240	17%
J-6397	Velocity Failed	1,500	1,240	17%
J-6398	Velocity Failed	1,500	1,240	17%
J-6400	Velocity Failed	1,500	1,240	17%
J-6871	Velocity Failed	1,500	1,240	17%
J-6872	Velocity Failed	1,500	1,240	17%
J-6873	Velocity Failed	1,500	1,240	17%
J-7855	Velocity Failed	1500	1240	17%
J-7894	Velocity Failed	1,500	1,240	17%
J-7928	Velocity Failed	1,500	1,240	17%
J-7929	Velocity Failed	1,500	1,240	17%
J-7963	Velocity Failed	1,500	1,240	17%
J-7972	Velocity Failed	1500	1240	17%
J-8073	Velocity Failed	1500	1240	17%
J-8100	Velocity Failed	1,500	1,240	17%
J-8102	Velocity Failed	1,500	1,240	17%
J-8113	Velocity Failed	1,500	1,240	17%
J-8135	Velocity Failed	1,500	1,240	17%
J-8159	Velocity Failed	1,500	1,240	17%
J-8160	Velocity Failed	1,500	1,240	17%
J-8230	Velocity Failed	1,500	1,240	17%
J-8257	Velocity Failed	1,500	1,240	17%
J-8285	Velocity Failed	1,500	1,240	17%
J-8327	Velocity Failed	1,500	1,240	17%
J-8331	Velocity Failed	1,500	1,240	17%
J-8365	Velocity Failed	1,500	1,240	17%
J-8370	Velocity Failed	1,500	1,240	17%
J-8377	Velocity Failed	1,500	1,240	17%

J-8415	Velocity Failed	1,500	1,240	17%
J-8419	Velocity Failed	1,500	1,240	17%
J-8441	Velocity Failed	1,500	1,240	17%
J-8445	Velocity Failed	1,500	1,240	17%
J-8451	Velocity Failed	1,500	1,240	17%
J-8456	Velocity Failed	1,500	1,240	17%
J-6436	Velocity Failed	3,500	2,900	17%
J-6809	Velocity Failed	3,500	2,900	17%
J-7192	Velocity Failed	1,500	1,250	17%
J-174	Velocity Failed	1,500	1,250	17%
48236	Velocity Failed	3,500	2,920	17%
54403	Velocity Failed	3,500	2,920	17%
49905	Velocity Failed	3,500	2,920	17%
J-6988	Velocity Failed	3,500	2,920	17%
J-7207	Velocity Failed	3,500	2,930	16%
J-6989	Velocity Failed	3,500	2,940	16%
J-7081	Velocity Failed	3,500	2,950	16%
54361	Velocity Failed	3,500	2,960	15%
J-7123	Velocity Failed	3,500	2,960	15%
J-6776	Velocity Failed	3,500	2,970	15%
2336	Velocity Failed	3,500	2,980	15%
J-4238	Velocity Failed	3500	2980	15%
48161	Velocity Failed	1,500	1,280	15%
941	Velocity Failed	1,500	1,280	15%
J-6370	Velocity Failed	1,500	1,280	15%
J-6375	Velocity Failed	1,500	1,280	15%
J-7191	Velocity Failed	1,500	1,280	15%
J-6963	Velocity Failed	3,500	2,990	15%
J-7350	Velocity Failed	3,500	2,990	15%
J-173	Velocity Failed	3500	3000	14%
47759	Velocity Failed	1,500	1,290	14%
J-7190	Velocity Failed	1,500	1,290	14%
J-190	Velocity Failed	1,500	1,290	14%
2423	Velocity Failed	3500	3020	14%
2420	Velocity Failed	3,500	3,020	14%
40419	Velocity Failed	3,500	3,020	14%
40417	Velocity Failed	3,500	3,020	14%
2422	Velocity Failed	3,500	3,020	14%
2421	Velocity Failed	3500	3020	14%
J-28	Velocity Failed	3,500	3,020	14%
J-29	Velocity Failed	3,500	3,020	14%
J-30	Velocity Failed	3,500	3,020	14%
J-31	Velocity Failed	3,500	3,020	14%
J-32	Velocity Failed	3,500	3,020	14%
J-151	Velocity Failed	3,500	3,020	14%
J-221	Velocity Failed	3,500	3,020	14%
J-7352	Velocity Failed	3500	3030	13%

1120	Velocity Failed	1500	1300	13%
48332	Velocity Failed	1,500	1,300	13%
J-6751	Velocity Failed	1,500	1,300	13%
40131	Velocity Failed	1,500	1,300	13%
J-6994	Velocity Failed	3,500	3,040	13%
J-6958	Velocity Failed	1500	1310	13%
J-6995	Velocity Failed	3,500	3,060	13%
50505	Velocity Failed	3,500	3,080	12%
48866	Velocity Failed	1,500	1,320	12%
48262	Velocity Failed	1,500	1,320	12%
J-6957	Velocity Failed	1,500	1,320	12%
J-7252	Velocity Failed	1,500	1,320	12%
J-4483	Velocity Failed	3500	3090	12%
J-4241	Velocity Failed	3500	3090	12%
J-4415	Velocity Failed	3500	3100	11%
2424	Velocity Failed	3500	3100	11%
50323	Velocity Failed	1500	1330	11%
J-6463	Velocity Failed	1500	1330	11%
J-6485	Velocity Failed	1500	1330	11%
40117	Velocity Failed	1500	1330	11%
1305	Velocity Failed	1500	1340	11%
50156	Velocity Failed	1500	1340	11%
1121	Velocity Failed	1500	1340	11%
48445	Velocity Failed	1500	1340	11%
J-4423	Velocity Failed	3500	3130	11%
J-158	Velocity Failed	3,500	3,130	11%
J-6492	Velocity Failed	1,500	1,350	10%
2391	Velocity Failed	3500	3160	10%
2347	Velocity Failed	3,500	3,160	10%
J-7137	Velocity Failed	3,500	3,170	9%
J-7058	Velocity Failed	1,500	1,360	9%
J-7059	Velocity Failed	1,500	1,360	9%
J-7060	Velocity Failed	1,500	1,360	9%
J-7465	Velocity Failed	1,500	1,360	9%
40339	Velocity Failed	3,500	3,180	9%
40595	Velocity Failed	3,500	3,180	9%
J-7817	Velocity Failed	3,500	3,190	9%
Red Hill South	Velocity Failed	1,500	1,370	9%
J-300-0041	Velocity Failed	1,500	1,370	9%
1073	Velocity Failed	1500	1370	9%
J-300-0062	Velocity Failed	1,500	1,370	9%
J-300-0056	Velocity Failed	1,500	1,370	9%
J-300-0048	Velocity Failed	1,500	1,370	9%
J-300-0049	Velocity Failed	1,500	1,370	9%
J-300-0010	Velocity Failed	1,500	1,370	9%
J-300-0046	Velocity Failed	1500	1370	9%
J-300-0039	Velocity Failed	1,500	1,370	9%

J-300-0020	Velocity Failed	1,500	1,370	9%
J-300-0021	Velocity Failed	1,500	1,370	9%
Red Hill North	Velocity Failed	1500	1370	9%
J-300-0057	Velocity Failed	1500	1370	9%
J-300-0060	Velocity Failed	1500	1370	9%
J-4267	Velocity Failed	1500	1370	9%
J-300-0042	Velocity Failed	1,500	1,370	9%
J-6415	Velocity Failed	1,500	1,370	9%
J-6416	Velocity Failed	1500	1370	9%
J-300-0063	Velocity Failed	1,500	1,370	9%
J-300-0022	Velocity Failed	1,500	1,370	9%
J-300-0015	Velocity Failed	1,500	1,370	9%
J-300-0052	Velocity Failed	1,500	1,370	9%
J-300-0051	Velocity Failed	1,500	1,370	9%
J-300-0024	Velocity Failed	1,500	1,370	9%
J-300-0023	Velocity Failed	1,500	1,370	9%
J-300-0019	Velocity Failed	1,500	1,370	9%
J-300-0012	Velocity Failed	1500	1370	9%
J-300-0014	Velocity Failed	1500	1370	9%
J-300-0016	Velocity Failed	1,500	1,370	9%
J-300-0040	Velocity Failed	1,500	1,370	9%
J-300-0038	Velocity Failed	1,500	1,370	9%
J-300-0045	Velocity Failed	1,500	1,370	9%
J-300-0044	Velocity Failed	1,500	1,370	9%
J-300-0059	Velocity Failed	1,500	1,370	9%
J-6636	Velocity Failed	1,500	1,370	9%
J-6637	Velocity Failed	1,500	1,370	9%
J-6638	Velocity Failed	1,500	1,370	9%
J-6639	Velocity Failed	1,500	1,370	9%
J-6640	Velocity Failed	1,500	1,370	9%
J-6643	Velocity Failed	1,500	1,370	9%
s Creek at Woodb	Velocity Failed	1,500	1,370	9%
J-6645	Velocity Failed	1,500	1,370	9%
J-6647	Velocity Failed	1,500	1,370	9%
J-6648	Velocity Failed	1,500	1,370	9%
J-6649	Velocity Failed	1,500	1,370	9%
J-6789	Velocity Failed	1,500	1,370	9%
J-7300	Velocity Failed	1,500	1,370	9%
J-7356	Velocity Failed	1,500	1,370	9%
J-7357	Velocity Failed	1,500	1,370	9%
J-7358	Velocity Failed	1,500	1,370	9%
J-7359	Velocity Failed	1,500	1,370	9%
J-7360	Velocity Failed	1,500	1,370	9%
J-7361	Velocity Failed	1,500	1,370	9%
J-7362	Velocity Failed	1,500	1,370	9%
J-7364	Velocity Failed	1,500	1,370	9%
J-7365	Velocity Failed	1,500	1,370	9%

J-7366	Velocity Failed	1,500	1,370	9%
J-7367	Velocity Failed	1,500	1,370	9%
J-7368	Velocity Failed	1,500	1,370	9%
J-7369	Velocity Failed	1,500	1,370	9%
J-7370	Velocity Failed	1500	1370	8.7%
J-7371	Velocity Failed	1500	1370	8.7%
J-7373	Velocity Failed	1,500	1,370	9%
J-7374	Velocity Failed	1,500	1,370	9%
J-7376	Velocity Failed	1,500	1,370	9%
J-7377	Velocity Failed	1,500	1,370	9%
J-7378	Velocity Failed	1,500	1,370	9%
J-7379	Velocity Failed	1,500	1,370	9%
J-7380	Velocity Failed	1,500	1,370	9%
J-7381	Velocity Failed	1,500	1,370	9%
J-7382	Velocity Failed	1,500	1,370	9%
J-7383	Velocity Failed	1,500	1,370	9%
J-7464	Velocity Failed	1,500	1,370	9%
J-7466	Velocity Failed	1,500	1,370	9%
Hydrant_4258	Velocity Failed	1,500	1,370	9%
Hydrant_4256	Velocity Failed	1,500	1,370	9%
J-8006	Velocity Failed	1,500	1,370	9%
J-8086	Velocity Failed	1,500	1,370	9%
J-8103	Velocity Failed	1,500	1,370	9%
J-8128	Velocity Failed	1,500	1,370	9%
J-8129	Velocity Failed	1,500	1,370	9%
J-8139	Velocity Failed	1,500	1,370	9%
J-8140	Velocity Failed	1,500	1,370	9%
J-8231	Velocity Failed	1,500	1,370	9%
J-8306	Velocity Failed	1,500	1,370	9%
J-8324	Velocity Failed	1,500	1,370	9%
J-8437	Velocity Failed	1,500	1,370	9%
2516	Residual Pressure and Velocit	1,500	1,370	9%
J-4424	Velocity Failed	3,500	3,200	9%
J-7816	Velocity Failed	3,500	3,200	9%
J-6466	Velocity Failed	1,500	1,380	8%
J-6954	Velocity Failed	1,500	1,380	8%
J-4249	Velocity Failed	1,500	1,380	8%
J-6430	Velocity Failed	1,500	1,390	7%
50031	Velocity Failed	3,500	3,250	7%
1049	Velocity Failed	3,500	3,280	6%
48451	Velocity Failed	3,500	3,280	6%
54250	Velocity Failed	3,500	3,290	6%
1321	Velocity Failed	1,500	1,420	5%
50319	Velocity Failed	3,500	3,320	5%
J-4278	Velocity Failed	3,500	3,320	5%
J-4279	Velocity Failed	3,500	3,320	5%
J-4281	Velocity Failed	3,500	3,320	5%

J-4284	Velocity Failed	3,500	3,320	5%
J-7005	Velocity Failed	3,500	3,320	5%
Microsoft 1	Velocity Failed	3,500	3,320	5%
J-7006	Velocity Failed	3,500	3,320	5%
J-7261	Velocity Failed	3,500	3,320	5%
J-7262	Velocity Failed	3,500	3,320	5%
J-6884	Velocity Failed	1,500	1,430	5%
J-7254	Velocity Failed	1,500	1,430	5%
937	Velocity Failed	3,500	3,340	5%
1228	Velocity Failed	1,500	1,440	4%
48988	Velocity Failed	1,500	1,440	4%
J-6357	Velocity Failed	1,500	1,440	4%
J-6359	Velocity Failed	1,500	1,440	4%
2464	Zone Pressure and Velocity F	1,500	1,450	3%
1322	Velocity Failed	1,500	1,450	3%
49614	Velocity Failed	1,500	1,450	3%
J-6345	Velocity Failed	1,500	1,450	3%
J-6351	Velocity Failed	1,500	1,450	3%
J-7526	Velocity Failed	1,500	1,450	3%
J-210	Velocity Failed	3,500	3,400	3%
1226	Velocity Failed	1,500	1,460	3%
J-7865	Velocity Failed	1,500	1,460	3%
J-7872	Velocity Failed	1,500	1,460	3%
J-7985	Velocity Failed	1,500	1,460	3%
J-8059	Velocity Failed	1,500	1,460	3%
J-8093	Velocity Failed	1,500	1,460	3%
J-8180	Velocity Failed	1,500	1,460	3%
J-8188	Velocity Failed	1,500	1,460	3%
J-8221	Velocity Failed	1,500	1,460	3%
J-8268	Velocity Failed	1,500	1,460	3%
J-8300	Velocity Failed	1,500	1,460	3%
J-8416	Velocity Failed	1,500	1,460	3%
J-8423	Velocity Failed	1,500	1,460	3%
J-8459	Velocity Failed	1,500	1,460	3%
J-8473	Velocity Failed	1,500	1,460	3%
J-8476	Velocity Failed	1,500	1,460	3%
49662	Velocity Failed	3,500	3,420	2%
J-212	Velocity Failed	3,500	3,420	2%
50104	Velocity Failed	1,500	1,470	2%
936	Velocity Failed	3,500	3,430	2%
J-4269	Velocity Failed	1,500	1,470	2%
J-6746	Velocity Failed	1,500	1,470	2%
J-7856	Velocity Failed	1,500	1,470	2%
J-7893	Velocity Failed	1,500	1,470	2%
J-7954	Velocity Failed	1,500	1,470	2%
J-7955	Velocity Failed	1,500	1,470	2%
J-8120	Velocity Failed	1,500	1,470	2%

J-8121	Velocity Failed	1,500	1,470	2%
J-8138	Velocity Failed	1,500	1,470	2%
J-8278	Velocity Failed	1,500	1,470	2%
40587	Velocity Failed	1,500	1,470	2%
J-4235	Velocity Failed	3,500	3,430	2%
J-4228	Velocity Failed	3,500	3,440	2%
J-78	Velocity Failed	3,500	3,440	2%
J-7419	Velocity Failed	1,500	1,480	1%
J-4229	Velocity Failed	3,500	3,470	1%
40613	Velocity Failed	3,500	3,470	1%
J-4227	Velocity Failed	3,500	3,470	1%
40611	Velocity Failed	3,500	3,470	1%
1119	Velocity Failed	1,500	1,490	1%
1117	Velocity Failed	1,500	1,490	1%
J-6333	Velocity Failed	1,500	1,490	1%
Hydrant_1970	Velocity Failed	1,500	1,490	1%
2533	Velocity Failed	1,500	1,490	1%
1050	Velocity Failed	3,500	3,480	1%
J-4225	Velocity Failed	3,500	3,480	1%

Table 3. Fire Flow Results (20-Year Demands Scenario)

Hydrant Model Node (Label)	Fire Flow Status	Fire Flow (Needed) (gpm)	Fire Flow (Available) (gpm)	Percent Deficient (%)
40140	Velocity Failed	1,500	370	75%
40458	Velocity Failed	1,500	380	75%
40456	Velocity Failed	1,500	380	75%
J-7546	Velocity Failed	1500	380	75%
1106	Velocity Failed	1,500	390	74%
2466	Residual Pressure Failed	1,500	410	73%
J-4541	Velocity Failed	3,500	990	72%
J-6978	Velocity Failed	3,500	1,010	71%
J-5	Zone Pressure Failed	1,500	460	69%
1045	Velocity Failed	3,500	1,130	68%
J-300-0002	Velocity Failed	3,500	1,130	68%
54318	Velocity Failed	3,500	1,130	68%
J-300-0028	Velocity Failed	3,500	1,130	68%
J-300-0034	Velocity Failed	3,500	1,130	68%
54305	Velocity Failed	3500	1130	68%
1052	Velocity Failed	3,500	1,130	68%
J-300-0004	Velocity Failed	3,500	1,130	68%
54311	Velocity Failed	3,500	1,130	68%
1044	Velocity Failed	3,500	1,130	68%
1046	Velocity Failed	3,500	1,130	68%
J-300-0001	Velocity Failed	3,500	1,130	68%
54247	Velocity Failed	3,500	1,130	68%
J-300-0005	Velocity Failed	3,500	1,130	68%
J-300-0027	Velocity Failed	3,500	1,130	68%
J-300-0003	Velocity Failed	3,500	1,130	68%
1047	Velocity Failed	3,500	1,130	68%
J-300-0009	Velocity Failed	3,500	1,130	68%
54303	Velocity Failed	3,500	1,130	68%
39947	Velocity Failed	3,500	1,130	68%
J-300-0036	Velocity Failed	3,500	1,130	68%
54313	Velocity Failed	3,500	1,130	68%
1051	Velocity Failed	3,500	1,130	68%
J-4428	Velocity Failed	3,500	1,130	68%
J-4429	Velocity Failed	3,500	1,130	68%
J-6589	Velocity Failed	3500	1130	68%
J-300-0030	Velocity Failed	3500	1130	68%
J-300-0029	Velocity Failed	3500	1130	68%
J-300-0033	Velocity Failed	3500	1130	68%
J-6671	Velocity Failed	3,500	1,130	68%
J-7935	Velocity Failed	3,500	1,130	68%
J-7973	Velocity Failed	3,500	1,130	68%
J-7976	Velocity Failed	3,500	1,130	68%

J-7977	Velocity Failed	3,500	1,130	68%
J-7991	Velocity Failed	3,500	1,130	68%
J-8028	Velocity Failed	3,500	1,130	68%
J-8161	Velocity Failed	3,500	1,130	68%
J-8162	Velocity Failed	3,500	1,130	68%
J-8168	Velocity Failed	3,500	1,130	68%
J-8177	Velocity Failed	3,500	1,130	68%
J-8194	Velocity Failed	3,500	1,130	68%
J-8195	Velocity Failed	3,500	1,130	68%
J-8210	Velocity Failed	3,500	1,130	68%
J-8217	Velocity Failed	3,500	1,130	68%
J-8234	Velocity Failed	3,500	1,130	68%
J-8252	Velocity Failed	3,500	1,130	68%
J-8276	Velocity Failed	3,500	1,130	68%
J-8277	Velocity Failed	3,500	1,130	68%
J-8288	Velocity Failed	3,500	1,130	68%
J-8289	Velocity Failed	3,500	1,130	68%
J-8308	Velocity Failed	3,500	1,130	68%
J-8335	Velocity Failed	3,500	1,130	68%
J-8345	Velocity Failed	3,500	1,130	68%
J-8350	Velocity Failed	3,500	1,130	68%
J-8351	Velocity Failed	3,500	1,130	68%
J-8373	Velocity Failed	3,500	1,130	68%
J-8374	Velocity Failed	3,500	1,130	68%
J-8385	Velocity Failed	3,500	1,130	68%
J-8391	Velocity Failed	3,500	1,130	68%
J-8392	Velocity Failed	3,500	1,130	68%
J-8397	Velocity Failed	3,500	1,130	68%
J-8408	Velocity Failed	3,500	1,130	68%
J-8409	Velocity Failed	3,500	1,130	68%
J-8424	Velocity Failed	3,500	1,130	68%
J-8427	Velocity Failed	3,500	1,130	68%
J-8430	Velocity Failed	3,500	1,130	68%
J-8431	Velocity Failed	3,500	1,130	68%
J-8432	Velocity Failed	3,500	1,130	68%
J-8433	Velocity Failed	3,500	1,130	68%
J-8434	Velocity Failed	3,500	1,130	68%
J-8447	Velocity Failed	3,500	1,130	68%
1217	Velocity Failed	1,500	510	66%
J-6790	Velocity Failed	1,500	520	65%
J-6791	Velocity Failed	1,500	520	65%
J-6600	Velocity Failed	3,500	1,360	61%
J-4522	Residual Pressure Failed	1,500	600	60%
J-7259	Velocity Failed	3,500	1,440	59%
J-8454	Velocity Failed	3,500	1,530	56%
J-4431	Velocity Failed	3,500	1,540	56%
J-4433	Velocity Failed	3,500	1,540	56%

J-4434	Velocity Failed	3,500	1,540	56%
J-7340	Velocity Failed	3,500	1,550	56%
J-4394	Velocity Failed	3,500	1,560	55%
J-7138	Velocity Failed	3,500	1,560	55%
J-4243	Velocity Failed	3,500	1,570	55%
J-4244	Velocity Failed	3,500	1,570	55%
J-6	Velocity Failed	3,500	1,570	55%
J-152	Velocity Failed	3,500	1,570	55%
48530	Velocity Failed	3,500	1,570	55%
J-4407	Velocity Failed	3,500	1,570	55%
J-4408	Velocity Failed	3,500	1,570	55%
J-4411	Velocity Failed	3,500	1,570	55%
J-4425	Velocity Failed	3,500	1,570	55%
J-6591	Velocity Failed	3,500	1,570	55%
J-6592	Velocity Failed	3,500	1,570	55%
J-6971	Velocity Failed	3,500	1,570	55%
J-7389	Velocity Failed	3,500	1,570	55%
J-7734	Velocity Failed	3,500	1,570	55%
J-7735	Velocity Failed	3,500	1,570	55%
J-7736	Velocity Failed	3,500	1,570	55%
J-7781	Velocity Failed	3500	1570	55%
J-7818	Velocity Failed	3,500	1,570	55%
40589	Zone Pressure Failed	1500	690	54%
2502	Zone Pressure and Velocity Failed	1500	750	50%
2501	Zone Pressure and Velocity Failed	1500	750	50%
39941	Velocity Failed	3,500	1,760	50%
1314	Velocity Failed	1,500	780	48%
1315	Velocity Failed	1,500	780	48%
1316	Velocity Failed	1,500	780	48%
Avignon-Clarion	Velocity Failed	1,500	780	48%
1210	Velocity Failed	1,500	780	48%
J-4345	Velocity Failed	1,500	780	48%
J-4346	Velocity Failed	1,500	780	48%
J-4481	Velocity Failed	1,500	780	48%
J-6934	Velocity Failed	3,500	1,820	48%
J-7716	Velocity Failed	1,500	780	48%
919	Velocity Failed	1,500	800	47%
J-4377	Velocity Failed	1,500	800	47%
J-6729	Velocity Failed	1500	800	47%
J-4412	Velocity Failed	3500	1920	45%
49110	Velocity Failed	1,500	830	45%
J-6427	Velocity Failed	1,500	830	45%
J-6369	Velocity Failed	1,500	830	45%
J-7201	Velocity Failed	1,500	830	45%
2508	Velocity Failed	1,500	840	44%
40591	Velocity Failed	1,500	850	43%
J-4352	Velocity Failed	1,500	850	43%

J-6753	Velocity Failed	1,500	850	43%
J-6754	Velocity Failed	1500	850	43%
J-6783	Velocity Failed	3,500	1,990	43%
J-6990	Velocity Failed	3,500	2,000	43%
2505	Velocity Failed	1,500	860	43%
2506	Velocity Failed	1,500	860	43%
J-6328	Velocity Failed	1,500	860	43%
J-7251	Velocity Failed	1,500	860	43%
J-7276	Velocity Failed	1,500	860	43%
J-4413	Velocity Failed	3,500	2,010	43%
J-8267	Velocity Failed	3,500	2,010	43%
J-4250	Velocity Failed	1,500	870	42%
J-4206	Velocity Failed	1,500	870	42%
2504	Velocity Failed	1500	870	42%
49755	Velocity Failed	3500	2030	42%
J-4521	Velocity Failed	1500	870	42%
J-7089	Velocity Failed	1500	870	42%
J-6465	Velocity Failed	1,500	870	42%
J-6334	Velocity Failed	1,500	870	42%
J-6965	Velocity Failed	3,500	2,040	42%
J-8557	Velocity Failed	3,500	2,040	42%
2507	Velocity Failed	1,500	880	41%
50160	Velocity Failed	1,500	880	41%
J-4349	Velocity Failed	1500	880	41%
J-4354	Velocity Failed	1500	880	41%
J-4518	Velocity Failed	1500	880	41%
J-6940	Velocity Failed	1,500	880	41%
J-6593	Velocity Failed	3,500	2,080	41%
J-6999	Velocity Failed	3,500	2,090	40%
J-7852	Velocity Failed	3,500	2,100	40%
48932	Velocity Failed	3,500	2,120	39%
2479	Residual Pressure Failed	1,500	920	39%
J-4503	Velocity Failed	3,500	2,160	38%
J-7057	Velocity Failed	3,500	2,180	38%
J-8156	Velocity Failed	3,500	2,190	37%
40197	Velocity Failed	1500	940	37%
J-208	Velocity Failed	1,500	940	37%
J-172	Velocity Failed	3,500	2,250	36%
1212	Velocity Failed	1,500	970	35%
48282	Velocity Failed	1,500	970	35%
J-7056	Velocity Failed	3,500	2,280	35%
40454	Velocity Failed	1500	990	34%
48387	Velocity Failed	3,500	2,320	34%
49073	Velocity Failed	3,500	2,330	33%
J-7952	Velocity Failed	3,500	2,330	33%
J-190	Velocity Failed	1,500	1,000	33%
J-6980	Velocity Failed	1,500	1,010	33%

J-6981	Velocity Failed	1,500	1,010	33%
J-6982	Velocity Failed	1,500	1,010	33%
J-8558	Velocity Failed	3,500	2,370	32%
50007	Velocity Failed	3,500	2,380	32%
J-6964	Velocity Failed	3,500	2,380	32%
J-6970	Velocity Failed	3,500	2,410	31%
J-6782	Velocity Failed	3,500	2,420	31%
J-6969	Velocity Failed	3500	2430	31%
J-7347	Velocity Failed	3,500	2,430	31%
J-6781	Velocity Failed	3,500	2,450	30%
J-6968	Velocity Failed	3,500	2,450	30%
J-7075	Velocity Failed	3,500	2,450	30%
Hydrant_1969	Velocity Failed	1,500	1,060	29%
J-8562	Velocity Failed	3,500	2,520	28%
J-6966	Velocity Failed	3,500	2,530	28%
J-4414	Velocity Failed	3500	2550	27%
Hydrant 236	Velocity Failed	3,500	2,550	27%
J-7120	Velocity Failed	3,500	2,560	27%
2533	Velocity Failed	1,500	1,100	27%
J-6389	Velocity Failed	1500	1100	27%
J-7265	Velocity Failed	1,500	1,100	27%
J-7266	Velocity Failed	1500	1100	27%
2392	Velocity Failed	3500	2580	26%
J-8549	Velocity Failed	3,500	2,580	26%
40093	Velocity Failed	1,500	1,110	26%
47769	Velocity Failed	3,500	2,590	26%
J-7117	Velocity Failed	3,500	2,590	26%
J-8214	Velocity Failed	3,500	2,590	26%
J-6996	Velocity Failed	3,500	2,600	26%
2431	Velocity Failed	3,500	2,610	25%
48236	Velocity Failed	3,500	2,620	25%
J-6933	Velocity Failed	3,500	2,620	25%
J-4277	Velocity Failed	3,500	2,630	25%
1242	Velocity Failed	1,500	1,130	25%
Red Hill South	Velocity Failed	1,500	1,130	25%
1122	Velocity Failed	1,500	1,130	25%
J-300-0041	Velocity Failed	1,500	1,130	25%
1073	Velocity Failed	1,500	1,130	25%
J-300-0062	Velocity Failed	1,500	1,130	25%
J-300-0056	Velocity Failed	1,500	1,130	25%
J-300-0048	Velocity Failed	1,500	1,130	25%
J-300-0049	Velocity Failed	1,500	1,130	25%
J-300-0010	Velocity Failed	1,500	1,130	25%
J-300-0046	Velocity Failed	1,500	1,130	25%
J-300-0039	Velocity Failed	1,500	1,130	25%
J-300-0020	Velocity Failed	1,500	1,130	25%
J-300-0021	Velocity Failed	1,500	1,130	25%

Red Hill North	Velocity Failed	1,500	1,130	25%
J-300-0057	Velocity Failed	1,500	1,130	25%
J-300-0060	Velocity Failed	1,500	1,130	25%
J-300-0042	Velocity Failed	1,500	1,130	25%
J-6415	Velocity Failed	1,500	1,130	25%
J-6416	Velocity Failed	1,500	1,130	25%
J-300-0063	Velocity Failed	1,500	1,130	25%
J-300-0022	Velocity Failed	1500	1130	25%
J-300-0015	Velocity Failed	1,500	1,130	25%
J-300-0052	Velocity Failed	1,500	1,130	25%
J-300-0051	Velocity Failed	1,500	1,130	25%
J-300-0024	Velocity Failed	1,500	1,130	25%
J-300-0023	Velocity Failed	1,500	1,130	25%
J-300-0019	Velocity Failed	1,500	1,130	25%
J-300-0012	Velocity Failed	1,500	1,130	25%
J-300-0014	Velocity Failed	1,500	1,130	25%
J-300-0016	Velocity Failed	1,500	1,130	25%
J-300-0040	Velocity Failed	1,500	1,130	25%
J-300-0038	Velocity Failed	1,500	1,130	25%
J-300-0045	Velocity Failed	1,500	1,130	25%
J-300-0044	Velocity Failed	1,500	1,130	25%
J-300-0059	Velocity Failed	1,500	1,130	25%
J-6636	Velocity Failed	1,500	1,130	25%
J-6637	Velocity Failed	1,500	1,130	25%
J-6638	Velocity Failed	1,500	1,130	25%
J-6639	Velocity Failed	1,500	1,130	25%
J-6640	Velocity Failed	1,500	1,130	25%
J-6643	Velocity Failed	1,500	1,130	25%
s Creek at Woodb	Velocity Failed	1500	1130	25%
J-6645	Velocity Failed	1,500	1,130	25%
J-6647	Velocity Failed	1,500	1,130	25%
J-6648	Velocity Failed	1,500	1,130	25%
J-6649	Velocity Failed	1,500	1,130	25%
J-6789	Velocity Failed	1500	1130	25%
J-7300	Velocity Failed	1500	1130	25%
J-7356	Velocity Failed	1,500	1,130	25%
J-7357	Velocity Failed	1,500	1,130	25%
J-7358	Velocity Failed	1,500	1,130	25%
J-7359	Velocity Failed	1,500	1,130	25%
J-7360	Velocity Failed	1,500	1,130	25%
J-7361	Velocity Failed	1,500	1,130	25%
J-7362	Velocity Failed	1,500	1,130	25%
J-7364	Velocity Failed	1,500	1,130	25%
J-7365	Velocity Failed	1,500	1,130	25%
J-7366	Velocity Failed	1,500	1,130	25%
J-7367	Velocity Failed	1,500	1,130	25%
J-7368	Velocity Failed	1,500	1,130	25%

J-7369	Velocity Failed	1,500	1,130	25%
J-7370	Velocity Failed	1,500	1,130	25%
J-7371	Velocity Failed	1,500	1,130	25%
J-7373	Velocity Failed	1,500	1,130	25%
J-7374	Velocity Failed	1,500	1,130	25%
J-7376	Velocity Failed	1,500	1,130	25%
J-7377	Velocity Failed	1,500	1,130	25%
J-7378	Velocity Failed	1,500	1,130	25%
J-7379	Velocity Failed	1,500	1,130	25%
J-7380	Velocity Failed	1,500	1,130	25%
J-7381	Velocity Failed	1,500	1,130	25%
J-7382	Velocity Failed	1,500	1,130	25%
J-7383	Velocity Failed	1,500	1,130	25%
Hydrant_4258	Velocity Failed	1,500	1,130	25%
Hydrant_4256	Velocity Failed	1,500	1,130	25%
J-8006	Velocity Failed	1,500	1,130	25%
J-8086	Velocity Failed	1,500	1,130	25%
J-8103	Velocity Failed	1,500	1,130	25%
J-8128	Velocity Failed	1,500	1,130	25%
J-8129	Velocity Failed	1,500	1,130	25%
J-8139	Velocity Failed	1,500	1,130	25%
J-8140	Velocity Failed	1,500	1,130	25%
J-8231	Velocity Failed	1,500	1,130	25%
J-8306	Velocity Failed	1500	1130	25%
J-8324	Velocity Failed	1,500	1,130	25%
J-8437	Velocity Failed	1,500	1,130	25%
50319	Velocity Failed	3,500	2,640	25%
J-4275	Velocity Failed	3,500	2,640	25%
J-4278	Velocity Failed	3,500	2,640	25%
J-4279	Velocity Failed	3,500	2,640	25%
J-4281	Velocity Failed	3,500	2,640	25%
J-4282	Velocity Failed	3500	2640	25%
J-4284	Velocity Failed	3,500	2,640	25%
J-7005	Velocity Failed	3,500	2,640	25%
Microsoft 1	Velocity Failed	3,500	2,640	25%
J-7006	Velocity Failed	3500	2640	25%
J-6784	Velocity Failed	3,500	2,640	25%
J-7261	Velocity Failed	3,500	2,640	25%
J-7262	Velocity Failed	3,500	2,640	25%
J-4230	Velocity Failed	3,500	2,660	24%
J-7082	Velocity Failed	3500	2660	24%
2423	Velocity Failed	3,500	2,670	24%
2420	Velocity Failed	3,500	2,670	24%
40419	Velocity Failed	3,500	2,670	24%
40417	Velocity Failed	3,500	2,670	24%
2422	Velocity Failed	3,500	2,670	24%
2421	Velocity Failed	3,500	2,670	24%

J-28	Velocity Failed	3,500	2,670	24%
J-29	Velocity Failed	3500	2670	24%
J-30	Velocity Failed	3500	2670	24%
J-31	Velocity Failed	3,500	2,670	24%
J-32	Velocity Failed	3,500	2,670	24%
J-151	Velocity Failed	3,500	2,670	24%
J-221	Velocity Failed	3,500	2,670	24%
J-7346	Velocity Failed	3500	2670	24%
40054	Velocity Failed	3,500	2,680	23%
J-6813	Velocity Failed	3,500	2,680	23%
J-8201	Velocity Failed	3,500	2,680	23%
49390	Velocity Failed	1,500	1,150	23%
J-7123	Velocity Failed	3,500	2,690	23%
J-6770	Velocity Failed	3,500	2,710	23%
J-4388	Velocity Failed	3500	2720	22%
J-7070	Velocity Failed	3500	2720	22%
48331	Velocity Failed	3500	2730	22%
50410	Velocity Failed	3500	2730	22%
J-175	Residual Pressure Failed	1,500	1,170	22%
J-8418	Velocity Failed	3500	2740	22%
J-7010	Velocity Failed	1500	1180	21%
J-8555	Velocity Failed	1500	1180	21%
J-158	Velocity Failed	3500	2760	21%
2424	Velocity Failed	3500	2770	21%
J-174	Velocity Failed	1500	1190	21%
J-7007	Velocity Failed	1500	1190	21%
J-6395	Velocity Failed	1500	1190	21%
J-6396	Velocity Failed	1500	1190	21%
J-6397	Velocity Failed	1,500	1,190	21%
J-6398	Velocity Failed	1,500	1,190	21%
J-6400	Velocity Failed	1500	1190	21%
J-6871	Velocity Failed	1,500	1,190	21%
J-6872	Velocity Failed	1,500	1,190	21%
J-6873	Velocity Failed	1,500	1,190	21%
J-6977	Velocity Failed	1,500	1,190	21%
J-7855	Velocity Failed	1,500	1,190	21%
J-7894	Velocity Failed	1,500	1,190	21%
J-7928	Velocity Failed	1,500	1,190	21%
J-7929	Velocity Failed	1,500	1,190	21%
J-7963	Velocity Failed	1,500	1,190	21%
J-7972	Velocity Failed	1,500	1,190	21%
J-8073	Velocity Failed	1,500	1,190	21%
J-8100	Velocity Failed	1500	1190	21%
J-8102	Velocity Failed	1,500	1,190	21%
J-8113	Velocity Failed	1,500	1,190	21%
J-8135	Velocity Failed	1,500	1,190	21%
J-8159	Velocity Failed	1,500	1,190	21%

J-8160	Velocity Failed	1,500	1,190	21%
J-8230	Velocity Failed	1500	1190	21%
J-8257	Velocity Failed	1,500	1,190	21%
J-8285	Velocity Failed	1,500	1,190	21%
J-8327	Velocity Failed	1,500	1,190	21%
J-8331	Velocity Failed	1500	1190	21%
J-8365	Velocity Failed	1500	1190	21%
J-8370	Velocity Failed	1500	1190	21%
J-8377	Velocity Failed	1500	1190	21%
J-8415	Velocity Failed	1,500	1,190	21%
J-8419	Velocity Failed	1,500	1,190	21%
J-8441	Velocity Failed	1500	1190	21%
J-8445	Velocity Failed	1,500	1,190	21%
J-8451	Velocity Failed	1,500	1,190	21%
J-8456	Velocity Failed	1,500	1,190	21%
J-6774	Velocity Failed	3,500	2,780	21%
J-7025	Velocity Failed	3,500	2,790	20%
47543	Velocity Failed	1,500	1,200	20%
J-8554	Velocity Failed	1,500	1,200	20%
J-4274	Velocity Failed	3,500	2,820	19%
J-7352	Velocity Failed	3500	2820	19%
J-7192	Velocity Failed	1500	1210	19%
40339	Velocity Failed	3,500	2,830	19%
J-6806	Velocity Failed	3,500	2,830	19%
2430	Velocity Failed	3,500	2,840	19%
40595	Velocity Failed	3,500	2,840	19%
1181	Velocity Failed	1,500	1,220	19%
J-6928	Velocity Failed	3,500	2,850	19%
J-7898	Velocity Failed	3,500	2,850	19%
49905	Velocity Failed	3,500	2,860	18%
J-6995	Velocity Failed	3,500	2,860	18%
J-4421	Velocity Failed	1,500	1,230	18%
Hydrant 139	Velocity Failed	3,500	2,870	18%
J-7908	Velocity Failed	3,500	2,870	18%
J-7909	Velocity Failed	3,500	2,880	18%
1049	Velocity Failed	3,500	2,890	17%
J-6436	Velocity Failed	3,500	2,900	17%
J-6809	Velocity Failed	3,500	2,900	17%
J-6988	Velocity Failed	3,500	2,910	17%
J-7191	Velocity Failed	1,500	1,250	17%
54403	Velocity Failed	3,500	2,920	17%
J-7207	Velocity Failed	3,500	2,920	17%
47759	Velocity Failed	1,500	1,260	16%
48161	Velocity Failed	1,500	1,260	16%
48332	Velocity Failed	1,500	1,260	16%
J-6370	Velocity Failed	1,500	1,260	16%
J-6989	Velocity Failed	3,500	2,940	16%

J-7190	Velocity Failed	1,500	1,260	16%
54250	Velocity Failed	3,500	2,950	16%
J-7081	Velocity Failed	3,500	2,950	16%
54361	Velocity Failed	3,500	2,960	15%
J-6463	Velocity Failed	1,500	1,270	15%
J-6958	Velocity Failed	1,500	1,270	15%
J-4238	Velocity Failed	3,500	2,970	15%
J-6776	Velocity Failed	3500	2980	14.9%
941	Velocity Failed	1500	1280	14.7%
48866	Velocity Failed	1,500	1,280	15%
48262	Velocity Failed	1,500	1,280	15%
J-6375	Velocity Failed	1,500	1,280	15%
J-6957	Velocity Failed	1,500	1,280	15%
2336	Velocity Failed	3,500	2,990	15%
J-6963	Velocity Failed	3,500	2,990	15%
J-173	Velocity Failed	3,500	3,000	14%
J-210	Velocity Failed	3,500	3,000	14%
J-7350	Velocity Failed	3,500	3,000	14%
50323	Velocity Failed	1,500	1,290	14%
48445	Velocity Failed	1,500	1,290	14%
J-6485	Velocity Failed	1,500	1,290	14%
J-6751	Velocity Failed	1,500	1,290	14%
40131	Velocity Failed	1,500	1,300	13%
1120	Velocity Failed	1,500	1,300	13%
J-4419	Velocity Failed	1,500	1,300	13%
J-7252	Velocity Failed	1,500	1,300	13%
J-6994	Velocity Failed	3,500	3,040	13%
40117	Velocity Failed	1,500	1,310	13%
50156	Velocity Failed	1,500	1,310	13%
1050	Velocity Failed	3,500	3,060	13%
50505	Velocity Failed	3,500	3,080	12%
J-4423	Velocity Failed	3,500	3,080	12%
J-4483	Velocity Failed	3,500	3,080	12%
J-7058	Velocity Failed	1,500	1,320	12%
J-7059	Velocity Failed	1,500	1,320	12%
J-7060	Velocity Failed	1,500	1,320	12%
J-7465	Velocity Failed	1,500	1,320	12%
J-4241	Velocity Failed	3,500	3,100	11%
J-4415	Velocity Failed	3,500	3,100	11%
J-6954	Velocity Failed	1,500	1,330	11%
J-7466	Velocity Failed	1,500	1,330	11%
J-7137	Velocity Failed	3,500	3,110	11%
J-7817	Velocity Failed	3,500	3,120	11%
1305	Velocity Failed	1,500	1,340	11%
1121	Velocity Failed	1,500	1,340	11%
J-6492	Velocity Failed	1,500	1,340	11%
J-7464	Velocity Failed	1,500	1,340	11%

2347	Velocity Failed	3,500	3,130	11%
J-4424	Velocity Failed	3,500	3,130	11%
J-7816	Velocity Failed	3,500	3,130	11%
2464	Zone Pressure Failed	1,500	1,350	10%
40144	Velocity Failed	1,500	1,350	10%
2516	Residual Pressure and Velocity Failed	1,500	1,350	10%
40599	Velocity Failed	3,500	3,160	10%
2391	Velocity Failed	3,500	3,170	9%
J-7021	Velocity Failed	3,500	3,170	9%
50104	Velocity Failed	1,500	1,370	9%
J-6466	Velocity Failed	1,500	1,370	9%
40363	Velocity Failed	1,500	1,380	8%
2538	Velocity Failed	1,500	1,380	8%
2545	Velocity Failed	1,500	1,380	8%
2546	Velocity Failed	1,500	1,380	8%
J-9	Velocity Failed	1,500	1,380	8%
J-110	Velocity Failed	1,500	1,380	8%
J-111	Velocity Failed	1,500	1,380	8%
J-112	Velocity Failed	1,500	1,380	8%
48451	Velocity Failed	3,500	3,220	8%
J-6430	Velocity Failed	1,500	1,380	8%
J-4249	Velocity Failed	1,500	1,390	7%
50031	Velocity Failed	3,500	3,250	7%
J-4267	Velocity Failed	1,500	1,400	7%
50507	Velocity Failed	1,500	1,410	6%
48988	Velocity Failed	1,500	1,410	6%
J-6357	Velocity Failed	1,500	1,410	6%
J-6359	Velocity Failed	1,500	1,410	6%
1321	Velocity Failed	1,500	1,420	5%
J-7254	Velocity Failed	1,500	1,420	5%
J-4420	Velocity Failed	1,500	1,430	5%
J-6351	Velocity Failed	1,500	1,430	5%
J-6884	Velocity Failed	1,500	1,430	5%
J-7419	Velocity Failed	1,500	1,430	5%
937	Velocity Failed	3,500	3,340	5%
1228	Velocity Failed	1,500	1,440	4%
1322	Velocity Failed	1,500	1,440	4%
48304	Velocity Failed	1,500	1,440	4%
J-6345	Velocity Failed	1,500	1,440	4%
J-7526	Velocity Failed	1,500	1,440	4%
2477	Zone Pressure and Velocity Failed	1500	1450	3%
1226	Velocity Failed	1,500	1,450	3%
49614	Velocity Failed	1,500	1,450	3%
J-7865	Velocity Failed	1,500	1,450	3%
J-7872	Velocity Failed	1,500	1,450	3%
J-7985	Velocity Failed	1,500	1,450	3%
J-8059	Velocity Failed	1,500	1,450	3%

J-8093	Velocity Failed	1,500	1,450	3%
J-8180	Velocity Failed	1,500	1,450	3%
J-8188	Velocity Failed	1,500	1,450	3%
J-8221	Velocity Failed	1,500	1,450	3%
J-8268	Velocity Failed	1,500	1,450	3%
J-8300	Velocity Failed	1,500	1,450	3%
J-8416	Velocity Failed	1,500	1,450	3%
J-8423	Velocity Failed	1,500	1,450	3%
J-8459	Velocity Failed	1,500	1,450	3%
J-8473	Velocity Failed	1,500	1,450	3%
J-8476	Velocity Failed	1,500	1,450	3%
54337	Velocity Failed	3,500	3,390	3%
J-223	Velocity Failed	1,500	1,460	3%
J-6746	Velocity Failed	1,500	1,460	3%
J-7856	Velocity Failed	1,500	1,460	3%
J-7893	Velocity Failed	1,500	1,460	3%
J-7954	Velocity Failed	1,500	1,460	3%
J-7955	Velocity Failed	1,500	1,460	3%
J-8120	Velocity Failed	1,500	1,460	3%
J-8121	Velocity Failed	1,500	1,460	3%
J-8138	Velocity Failed	1,500	1,460	3%
J-8278	Velocity Failed	1,500	1,460	3%
J-4235	Velocity Failed	3,500	3,420	2%
49662	Velocity Failed	3,500	3,420	2%
40587	Velocity Failed	1,500	1,470	2%
2393	Velocity Failed	3,500	3,430	2%
1119	Velocity Failed	1,500	1,470	2%
1117	Velocity Failed	1,500	1,470	2%
936	Velocity Failed	3,500	3,430	2%
J-4269	Velocity Failed	1,500	1,470	2%
J-6333	Velocity Failed	1,500	1,470	2%
J-6993	Velocity Failed	3,500	3,430	2%
40613	Velocity Failed	3,500	3,440	2%
40611	Velocity Failed	3,500	3,440	2%
J-212	Velocity Failed	3,500	3,450	1%
54339	Velocity Failed	3,500	3,460	1%
J-7343	Velocity Failed	1,500	1,490	1%
Hydrant_1970	Velocity Failed	1,500	1,490	1%
2338	Velocity Failed	3,500	3,490	0.3%
J-4384	Velocity Failed	3,500	3,490	0.3%
J-4385	Velocity Failed	3,500	3,490	0.3%
J-4387	Velocity Failed	3,500	3,490	0.3%

Table 4. Suggested Improvements in order of Priority

Pipe ID	Hydraulic Model	No. of Deficient Nodes	Node ID of Largest Deficiency	% Deficiency Associated with Identified Node	Priority Level	Ex. Pipe Diam. (in)	Proposed Pipe Diam. (in.)	Length of Pipe (ft)
4684	BOV	4	1639	72%	1	6	10	428
4683	BOV	4	1712	69%	1	6	12	888
3982	BOV	1	1524	59%	1	6	8	261
4498	BOV	3	1524	59%	1	6	8	550
3633	BOV	3	1524	59%	1	8	10	227
3997	BOV	3	1524	59%	1	8	10	396
3798	BOV	1	1524	59%	1	6	10	437
4680	BOV	4	1696	53%	1	6	12	530
3937	BOV	1	1562	52%	1	6	8	698
3564	BOV	2	1455	50%	1	6	10	756
3634	BOV	1	1667	38%	1	6	10	160
3939	BOV	1	1667	38%	1	6	10	661
3657	BOV	1	1667	38%	1	8	10	461
4698	BOV	4	1415	10%	1	6	8	1082
4699	BOV	4	1415	10%	1	6	8	169
5010	RH-WSA	77	4089	83%	2	8	14	328
8626	RH-WSA	75	4089	83%	2	8	14	485
10726	RH-WSA	571	4089	83%	2	8	12	35
10728	RH-WSA	497	4089	83%	2	8	12	36
8464	RH-WSA	159	3000	80%	2	12	16	56
9038	RH-WSA	80	3000	80%	2	12	16	12
4940	RH-WSA	1	2093	80%	2	8	12	248
4792	RH-WSA	1	3478	80%	2	12	14	35
4949	RH-WSA	2	654	80%	2	12	14	270
9035	RH-WSA	1	3917	80%	2	8	12	405
10656	RH-WSA	9	1365	79%	2	8	12	25
10659	RH-WSA	9	1365	79%	2	8	12	28
4889	BOV	1	1536	75%	2	4	10	298
4890	BOV	1	1536	75%	2	4	10	244
3858	BOV	3	1536	75%	2	6	10	171
4726	BOV	4	1536	75%	2	6	10	100
3639	BOV	5	1536	75%	2	8	10	395
4731	BOV	3	1536	75%	2	8	10	370
3496	BOV	2	1296	74%	2	4	10	116
3543	BOV	1	1296	74%	2	6	10	185
10867	RH-WSA	1	10866	74%	2	4	8	275
5111	RH-WSA	1	1429	74%	2	4	8	115
9025	RH-WSA	1	1429	74%	2	4	8	43
9656	RH-WSA	1	4264	73%	2	6	10	51
9655	RH-WSA	1	4263	73%	2	8	10	313
9052	RH-WSA	1	3928	73%	2	6	10	29
9053	RH-WSA	1	3928	73%	2	4	10	60
12417	RH-WSA	2	12374	73%	2	8	10	5
12663	RH-WSA	1	13410	73%	2	8	14	36
13409	RH-WSA	1	13410	73%	2	8	12	221
9049	RH-WSA	1	875	72%	2	8	10	149
8845	RH-WSA	2	3583	72%	2	8	14	991
9048	RH-WSA	1	2919	71%	2	8	10	100
9682	RH-WSA	1	4307	71%	2	8	10	11
9730	RH-WSA	4	4307	71%	2	8	14	83
9645	RH-WSA	1	4258	70%	2	8	10	131
8347	RH-WSA	3	3484	67%	3	8	14	22
8348	RH-WSA	2	3484	67%	3	8	14	53
8350	RH-WSA	1	3484	67%	3	8	12	515
8349	RH-WSA	1	3483	67%	3	8	12	199

5011	RH-WSA	38	3262	66%	3	8	14	497
13360	RH-WSA	7	4086	65%	3	12	14	195
10051	RH-WSA	1	4486	65%	3	8	14	696
8283	RH-WSA	3	3435	64%	3	12	14	134
8287	RH-WSA	1	3438	63%	3	8	10	376
12967	RH-WSA	1	12969	62%	3	8	12	80
9338	RH-WSA	1	4100	62%	3	8	10	71
8297	RH-WSA	1	3444	62%	3	8	12	397
12973	RH-WSA	1	12289	62%	3	8	12	79
13427	RH-WSA	2	12852	61%	3	8	12	235
12851	RH-WSA	1	12359	61%	3	8	12	57
12288	RH-WSA	1	13303	61%	3	8	10	2
13482	RH-WSA	1	13303	61%	3	8	10	311
9347	RH-WSA	1	4104	61%	3	8	10	239
9350	RH-WSA	1	4106	61%	3	8	10	273
12624	RH-WSA	6	3496	61%	3	12	14	42
13065	RH-WSA	4	3496	61%	3	12	14	103
13320	RH-WSA	7	3496	61%	3	12	14	177
9354	RH-WSA	2	1501	61%	3	12	14	730
12452	RH-WSA	8	13066	61%	3	12	14	11
13094	RH-WSA	9	13066	61%	3	12	14	109
13192	RH-WSA	8	13066	61%	3	12	14	144
13307	RH-WSA	7	13066	61%	3	12	14	190
13420	RH-WSA	8	13066	61%	3	12	14	237
11436	RH-WSA	1	3400	61%	3	6	8	216
9404	RH-WSA	1	4136	61%	3	8	10	269
10741	RH-WSA	2	10742	61%	3	8	12	35
9417	RH-WSA	1	3465	61%	3	8	10	101
13823	RH-WSA	2	3465	61%	3	8	12	242
13824	RH-WSA	1	3465	61%	3	8	10	88
8321	RH-WSA	3	3462	61%	3	8	12	58
10547	RH-WSA	1	3658	61%	3	6	8	220
13534	RH-WSA	2	3658	61%	3	12	14	416
8255	RH-WSA	1	3405	61%	3	6	8	720
8322	RH-WSA	1	3463	60%	3	10	12	110
8317	RH-WSA	1	3458	60%	3	8	10	378
10124	RH-WSA	2	3458	60%	3	8	12	156
9409	RH-WSA	1	4139	60%	3	8	10	240
11499	RH-WSA	1	11495	60%	3	8	12	426
7946	RH-WSA	1	2556	60%	3	8	10	224
9374	RH-WSA	6	1629	60%	3	6	10	18
9155	RH-WSA	1	3461	60%	3	8	12	81
9419	RH-WSA	1	4143	60%	3	8	10	260
8323	RH-WSA	1	3464	60%	3	8	10	196
5053	RH-WSA	1	1520	60%	3	8	10	240
11493	RH-WSA	2	11490	60%	3	8	12	277
11494	RH-WSA	1	11490	60%	3	8	12	369
13715	RH-WSA	1	3709	60%	3	8	10	167
5076	RH-WSA	1	2640	60%	3	8	10	152
4908	RH-WSA	2	569	60%	3	8	12	36
9041	RH-WSA	1	3921	59%	3	8	12	86
9359	RH-WSA	1	4112	59%	3	8	12	286
9376	RH-WSA	2	4120	59%	3	6	10	15
9356	RH-WSA	1	4111	59%	3	8	12	153
12776	RH-WSA	1	12778	59%	3	8	12	28
10263	RH-WSA	1	4600	58%	3	8	12	272
12443	RH-WSA	1	12444	58%	3	8	10	10
9360	RH-WSA	1	4113	58%	3	8	12	104
9039	RH-WSA	1	3919	56%	3	8	12	275

9040	RH-WSA	1	3920	56%	3	8	12	289
10185	RH-WSA	1	4552	55%	3	8	12	98
9843	RH-WSA	1	4367	55%	3	8	12	351
11674	RH-WSA	1	11673	55%	3	8	12	247
7332	RH-WSA	1	2542	55%	3	8	12	373
8339	RH-WSA	1	3475	55%	3	8	12	278
9711	RH-WSA	10	4300	55%	3	8	12	152
9718	RH-WSA	1	4300	55%	3	8	12	293
12023	RH-WSA	1	12022	55%	3	8	12	104
4119	BOV	5	4372	55%	3	12	14	89
4120	BOV	2	4372	55%	3	12	14	219
3732	BOV	1	1656	55%	3	8	12	306
4072	BOV	1	1713	55%	3	8	12	366
4373	BOV	1	4372	55%	3	8	12	301
3850	BOV	1	1359	55%	3	8	12	224
9363	RH-WSA	1	4114	55%	3	8	12	478
9226	RH-WSA	20	3470	52%	3	12	14	51
13549	RH-WSA	3	3470	52%	3	12	14	661
3523	BOV	1	1455	50%	3	6	8	438
10804	RH-WSA	9	3531	48%	3	6	10	42
10806	RH-WSA	9	3531	48%	3	6	10	59
10317	RH-WSA	1	2175	48%	3	6	8	39
4826	RH-WSA	4	3396	48%	3	4	8	328
4989	RH-WSA	3	3396	48%	3	6	8	264
8246	RH-WSA	2	3396	48%	3	6	8	154
11446	RH-WSA	1	11445	48%	3	6	8	506
10318	RH-WSA	1	1445	48%	3	6	8	177
5084	RH-WSA	1	1361	47%	3	6	8	155
8281	RH-WSA	3	1361	47%	3	6	10	596
9240	RH-WSA	3	1361	47%	3	6	10	96
9260	RH-WSA	1	1361	47%	3	6	8	214
9273	RH-WSA	3	1361	47%	3	6	8	21
5846	RH-WSA	4	4428	44%	3	6	8	326
9946	RH-WSA	1	4428	44%	3	6	8	339
8737	RH-WSA	1	3701	44%	3	6	8	476
8840	RH-WSA	4	3772	44%	3	8	10	306
5036	RH-WSA	1	3403	43%	3	6	8	313
8254	RH-WSA	1	3403	43%	3	6	8	371
9306	RH-WSA	3	3403	43%	3	6	8	504
9307	RH-WSA	2	3403	43%	3	6	8	112
5021	RH-WSA	2	4084	43%	3	6	8	269
9305	RH-WSA	1	4083	43%	3	6	8	436
7550	RH-WSA	4	4319	43%	3	8	12	50
9751	RH-WSA	1	4319	43%	3	8	12	320
3874	BOV	1	1383	42%	3	6	8	613
3712	BOV	2	1383	42%	3	8	10	41
4724	BOV	2	1383	42%	3	8	10	1165
10038	RH-WSA	2	4503	42%	3	6	8	280
10085	RH-WSA	1	4503	42%	3	6	8	689
3721	BOV	1	1385	42%	3	6	8	469
8796	RH-WSA	1	3742	42%	3	6	8	406
7872	RH-WSA	2	2503	42%	3	8	12	85
4844	BOV	1	1470	42%	3	6	8	82
8806	RH-WSA	1	3748	42%	3	6	8	533
3800	BOV	1	1474	42%	3	6	10	482
8485	RH-WSA	1	3566	42%	3	6	8	556
3873	BOV	1	1643	42%	3	6	8	360
13808	RH-WSA	1	13807	42%	3	8	12	14
8790	RH-WSA	1	3737	42%	3	6	8	445

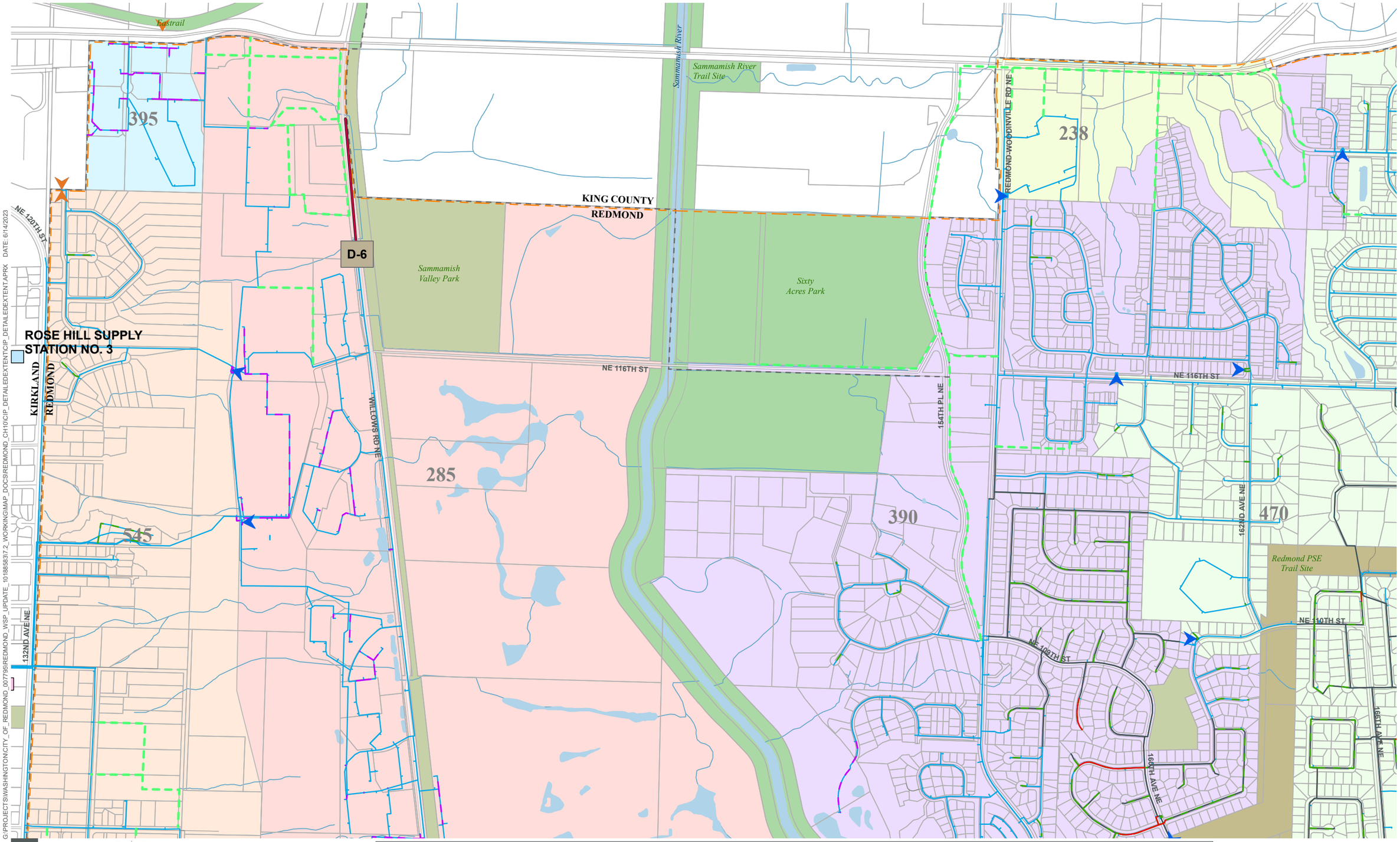
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3522	BOV	1	1390	42%	3	6	8	512
3843	BOV	1	1427	41%	3	6	10	444
4811	RH-WSA	2	3563	41%	3	6	8	338
8482	RH-WSA	1	3563	41%	3	6	8	486
9669	RH-WSA	1	4270	41%	3	6	8	294
7075	RH-WSA	1	894	41%	3	6	8	639
9766	RH-WSA	1	4326	40%	3	8	12	20
9752	RH-WSA	1	4320	40%	3	8	10	248
5039	RH-WSA	1	395	39%	3	6	8	252
13733	RH-WSA	1	2400	39%	3	8	12	42
11543	RH-WSA	2	4042	39%	3	8	10	6
9231	RH-WSA	1	4042	39%	3	8	10	19
9754	RH-WSA	1	4321	38%	3	8	12	99
4835	BOV	2	4789	37%	3	8	10	168
9555	RH-WSA	1	4214	37%	3	6	8	198
4487	BOV	1	4486	36%	3	8	12	134
8601	RH-WSA	2	3637	35%	3	8	12	70
9062	RH-WSA	1	3932	34%	3	8	10	109
13818	RH-WSA	7	3932	34%	3	8	10	303
3579	BOV	1	1370	34%	3	6	8	189
4343	BOV	1	1370	34%	3	6	8	14
4345	BOV	1	1370	34%	3	6	8	15
6363	RH-WSA	1	2215	33%	3	8	12	235
4723	BOV	3	4722	33%	3	8	10	480
9735	RH-WSA	3	4310	32%	3	8	10	252
13811	RH-WSA	1	13810	32%	3	8	12	96
9734	RH-WSA	2	4309	32%	3	8	10	207
9737	RH-WSA	1	4311	32%	3	8	10	250
8154	RH-WSA	1	2996	32%	3	8	10	84
8184	RH-WSA	1	2996	32%	3	8	10	522
10115	RH-WSA	1	2996	32%	3	8	10	147
10118	RH-WSA	1	2996	32%	3	8	10	18
12335	RH-WSA	1	12490	32%	3	12	14	4
12489	RH-WSA	1	12490	32%	3	12	14	16
13702	RH-WSA	23	12490	32%	3	12	14	40
10195	RH-WSA	1	4558	31%	3	8	10	97
10202	RH-WSA	1	4564	30%	4	8	10	177
13817	RH-WSA	6	469	29%	4	8	10	519
10676	RH-WSA	1	10672	29%	4	8	10	59
13820	RH-WSA	1	10672	29%	4	8	10	323
13821	RH-WSA	2	10672	29%	4	8	10	333
9651	RH-WSA	1	861	29%	4	6	8	113
13809	RH-WSA	1	11812	27%	4	8	10	210
9811	RH-WSA	1	4349	27%	4	8	12	144
8618	RH-WSA	3	4493	27%	4	8	10	100
8878	RH-WSA	3	4493	27%	4	8	10	229
10062	RH-WSA	2	4493	27%	4	8	10	537
10063	RH-WSA	1	4493	27%	4	8	10	309
10064	RH-WSA	1	4493	27%	4	8	10	275
3600	BOV	1	1324	26%	4	8	12	431
9806	RH-WSA	1	4346	26%	4	8	10	184
9807	RH-WSA	2	4346	26%	4	8	10	316
5890	RH-WSA	1	2849	26%	4	8	12	227
9762	RH-WSA	1	4325	26%	4	8	10	646
3803	BOV	1	1690	26%	4	6	8	136
3533	BOV	1	1327	25%	4	6	10	321
5015	RH-WSA	2	512	25%	4	6	8	239
9793	RH-WSA	1	4341	24%	4	8	12	117

10193	RH-WSA	1	4557	24%	4	8	10	125
3944	BOV	1	1480	24%	4	8	10	165
4114	BOV	3	4829	24%	4	12	14	452
4115	BOV	4	4829	24%	4	12	14	315
4117	BOV	6	4829	24%	4	12	14	172
4830	BOV	1	4829	24%	4	12	14	183
25934	BOV	18	4829	24%	4	12	14	188
25935	BOV	18	4829	24%	4	12	14	403
25900	BOV	1	1338	24%	4	12	14	228
3640	BOV	2	1651	24%	4	12	14	142
3560	BOV	1	1596	24%	4	12	14	395
3709	BOV	1	1388	24%	4	12	14	375
4831	BOV	1	1596	24%	4	12	14	246
4371	BOV	1	4370	23%	4	12	14	391
8156	RH-WSA	2	3328	22%	4	12	14	811
8525	RH-WSA	3	3328	22%	4	12	14	387
10061	RH-WSA	1	3328	22%	4	12	14	141
9780	RH-WSA	2	4334	22%	4	8	10	47
13789	RH-WSA	1	13788	22%	4	6	8	22
8338	RH-WSA	1	2359	22%	4	8	10	72
5600	RH-WSA	1	1249	22%	4	8	10	268
8534	RH-WSA	1	3595	21%	4	6	8	70
8535	RH-WSA	1	3595	21%	4	6	8	50
9534	RH-WSA	19	12684	21%	4	8	10	467
12916	RH-WSA	19	12684	21%	4	8	10	70
13588	RH-WSA	19	12684	21%	4	8	10	8
13103	RH-WSA	16	13100	21%	4	8	10	110
12702	RH-WSA	1	12704	21%	4	8	10	37
4388	BOV	1	4389	21%	4	12	14	31
9233	RH-WSA	1	4042	21%	4	8	10	33
11540	RH-WSA	1	4042	21%	4	8	10	7
9729	RH-WSA	1	4306	20%	4	8	10	359
4495	BOV	1	4493	20%	4	6	8	286
11832	RH-WSA	1	11830	20%	4	6	8	115
8532	RH-WSA	1	3592	20%	4	6	8	18
9772	RH-WSA	3	4329	20%	4	8	10	269
9679	RH-WSA	20	1821	20%	4	6	8	61
3508	BOV	1	1344	19%	4	8	10	247
5066	RH-WSA	1	2980	19%	4	6	8	541
6660	RH-WSA	7	3040	18%	4	8	10	260
11810	RH-WSA	1	11809	18%	4	8	10	621
13732	RH-WSA	1	323	17%	4	8	10	119
9747	RH-WSA	1	4317	17%	4	8	10	331
9958	RH-WSA	1	4434	16%	4	8	10	409
9748	RH-WSA	1	4318	16%	4	8	10	288
10966	RH-WSA	1	1426	16%	4	8	10	49
10975	RH-WSA	1	1426	16%	4	8	10	32
3872	BOV	1	1310	16%	4	8	10	334
9792	RH-WSA	1	4340	16%	4	8	10	467
4799	BOV	1	4796	15%	4	12	14	37
9822	RH-WSA	1	4352	15%	4	8	10	253
3770	BOV	1	1477	15%	4	8	10	155
6724	RH-WSA	4	524	15%	4	6	8	149
7458	RH-WSA	1	524	15%	4	6	8	263
9708	RH-WSA	1	4292	15%	4	8	10	194
10199	RH-WSA	2	4561	14%	4	8	10	64
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4491	BOV	1	4489	14%	4	8	10	355
8866	RH-WSA	1	3789	14%	4	6	8	180

13793	RH-WSA	1	13791	14%	4	6	8	442
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9758	RH-WSA	1	4323	13%	4	8	10	450
4866	BOV	1	1633	13%	4	8	10	62
6428	RH-WSA	11	3331	13%	4	12	14	201
9760	RH-WSA	1	4324	13%	4	8	10	932
10054	RH-WSA	3	4488	13%	4	12	14	308
10056	RH-WSA	2	4489	13%	4	12	14	569
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10055	RH-WSA	1	3330	13%	4	12	14	556
3584	BOV	1	1305	12%	4	6	8	261
5163	RH-WSA	1	2444	12%	4	8	10	465
9500	RH-WSA	2	2994	12%	4	8	10	323
9501	RH-WSA	1	2994	12%	4	8	10	658
11811	RH-WSA	1	634	12%	4	8	10	154
8409	RH-WSA	1	3533	12%	4	8	10	244
4833	BOV	1	1314	12%	4	8	10	325
4942	RH-WSA	1	1150	11%	4	6	8	685
8533	RH-WSA	1	1135	11%	4	6	8	371
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4895	BOV	1	1334	10%	4	6	8	154
4896	BOV	1	1334	10%	4	6	8	405
6520	RH-WSA	1	2489	10%	4	8	10	79
6697	RH-WSA	1	2489	10%	4	8	10	717
7334	RH-WSA	1	2489	10%	4	8	10	698
8933	RH-WSA	1	3840	10%	4	6	8	24
13792	RH-WSA	1	3784	9%	4	6	8	226
8791	RH-WSA	1	3738	9%	4	6	8	303
8739	RH-WSA	2	3703	9%	4	6	8	262
3976	BOV	1	1518	9%	4	8	10	121
3514	BOV	8	1357	8%	4	8	10	663
3881	BOV	1	1357	8%	4	8	10	395
4078	BOV	6	1357	8%	4	8	10	219
4079	BOV	4	1357	8%	4	8	10	288
5808	RH-WSA	1	3320	8%	4	6	8	141
8138	RH-WSA	1	3320	8%	4	6	8	116
7103	RH-WSA	1	1237	7%	4	8	10	84
3571	BOV	1	1558	7%	4	8	10	625
3552	BOV	1	1434	7%	4	6	8	100
13142	RH-WSA	1	12728	7%	4	8	10	121
13512	RH-WSA	1	12728	7%	4	8	10	344
6332	RH-WSA	3	1874	6%	4	8	10	216
5992	RH-WSA	1	797	5%	4	8	10	482
9963	RH-WSA	1	797	5%	4	8	10	31
10042	RH-WSA	1	4481	5%	4	6	8	281
6326	RH-WSA	1	2918	5%	4	6	8	140
8831	RH-WSA	1	3765	5%	4	8	10	317
9685	RH-WSA	1	2305	4%	4	8	10	56
9686	RH-WSA	1	2305	4%	4	8	10	57
8602	RH-WSA	1	376	4%	4	8	10	136
8841	RH-WSA	2	3770	4%	4	8	10	340
8825	RH-WSA	1	3759	4%	4	6	8	569
3663	BOV	1	1449	4%	4	10	12	88
13263	RH-WSA	15	12497	3%	4	8	10	160
4813	BOV	1	1401	3%	4	12	14	70
8140	RH-WSA	1	3321	3%	4	6	8	289
3595	BOV	1	1326	3%	4	8	10	151

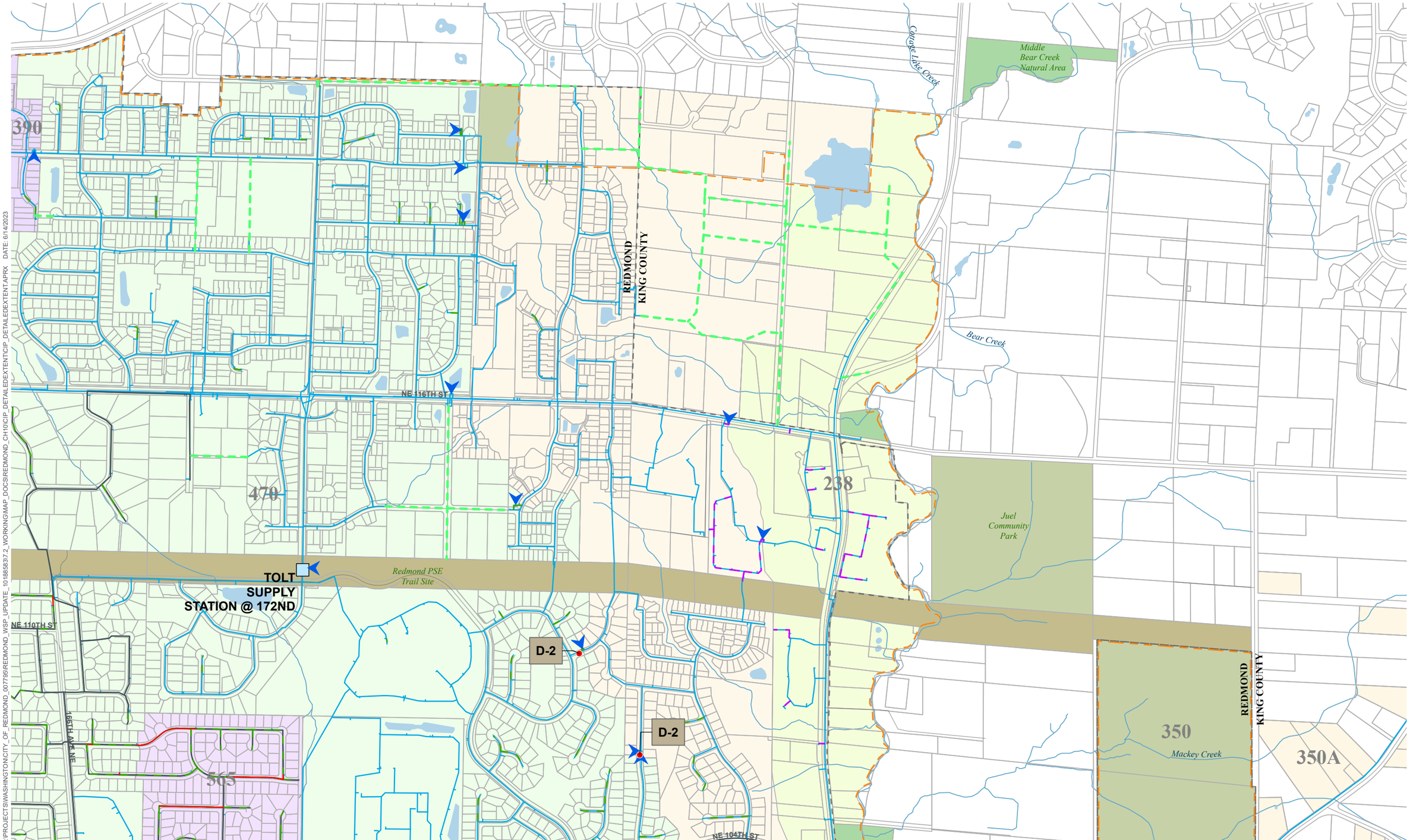
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13029	RH-WSA	7	12447	3%	4	8	10	90
13402	RH-WSA	5	12447	3%	4	8	10	220
9292	RH-WSA	1	4076	2%	4	6	8	507
4885	RH-WSA	1	4631	2%	4	6	8	328
10315	RH-WSA	1	4631	2%	4	6	8	70
8145	RH-WSA	1	3322	2%	4	6	8	668
3720	BOV	1	1632	2%	4	8	10	274
3775	BOV	1	1387	2%	4	6	8	101
4821	RH-WSA	3	3747	2%	4	8	10	365
8803	RH-WSA	1	3747	2%	4	6	8	409
25999	BOV	2	1373	2%	4	12	14	67
8132	RH-WSA	1	3313	1%	4	8	10	21
11828	RH-WSA	1	11827	1%	4	6	8	189
3869	BOV	1	1320	0.3%	4	12	14	323
13812	RH-WSA	1	2469	0.3%	4	8	10	169
4802	BOV	1	4801	0.2%	4	8	10	207

Appendix O
Detailed CIP Maps

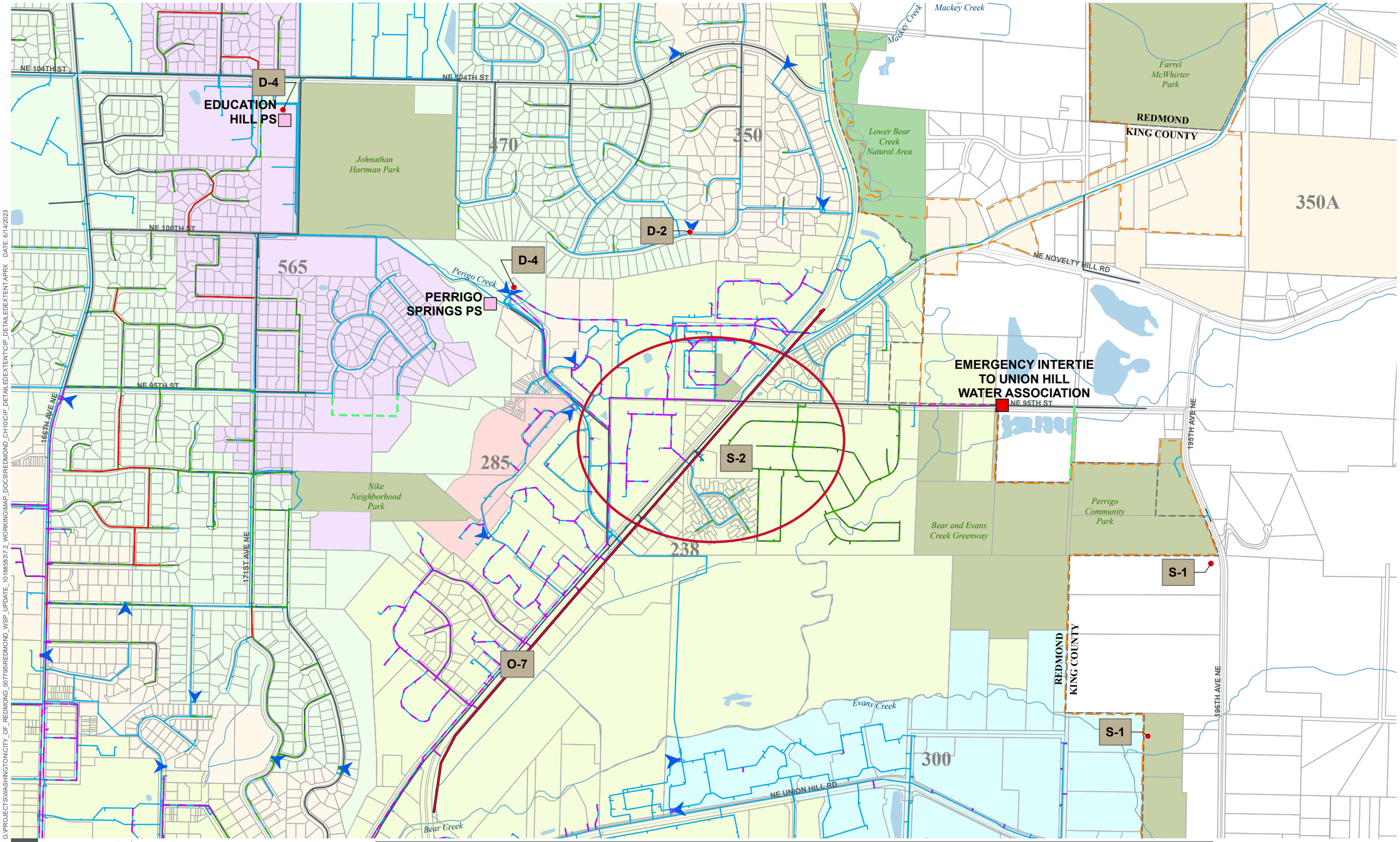


0 750 Feet

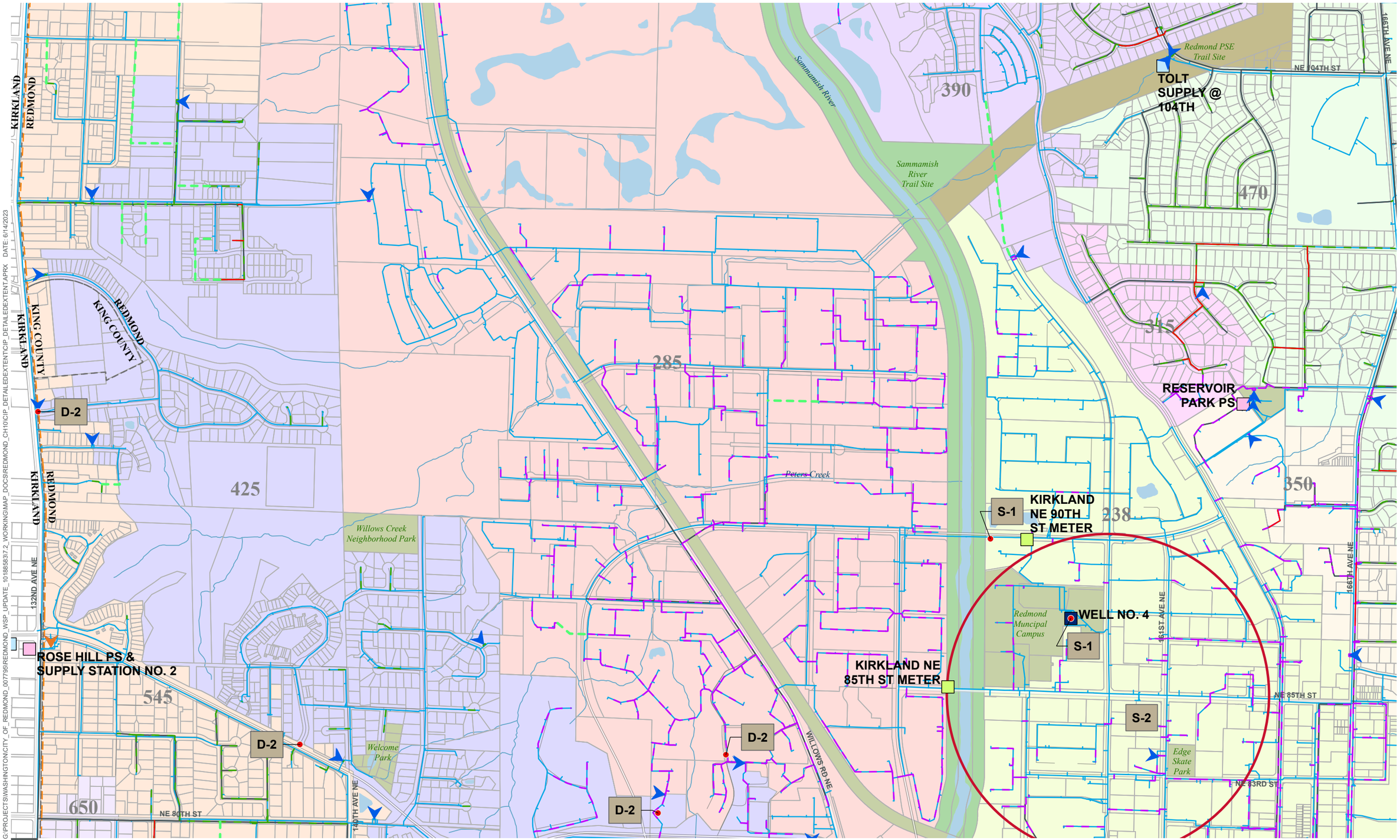
- Meter Station
- Meter Station Maintained by Kirkland
- Supply Intertie
- Emergency Intertie
- Pump Station
- Well
- PRV Station Mainted by Kirkland
- PRV Station
- Existing Pipes
- AC Mains
- High Priority Mains for Replacement
- Undersized Mains (Multi-Family)
- Undersized Mains (Single-Family)
- Developer Extension Lines
- Planned Capital Projects
- Retail Service Area
- City Limits
- Parcel



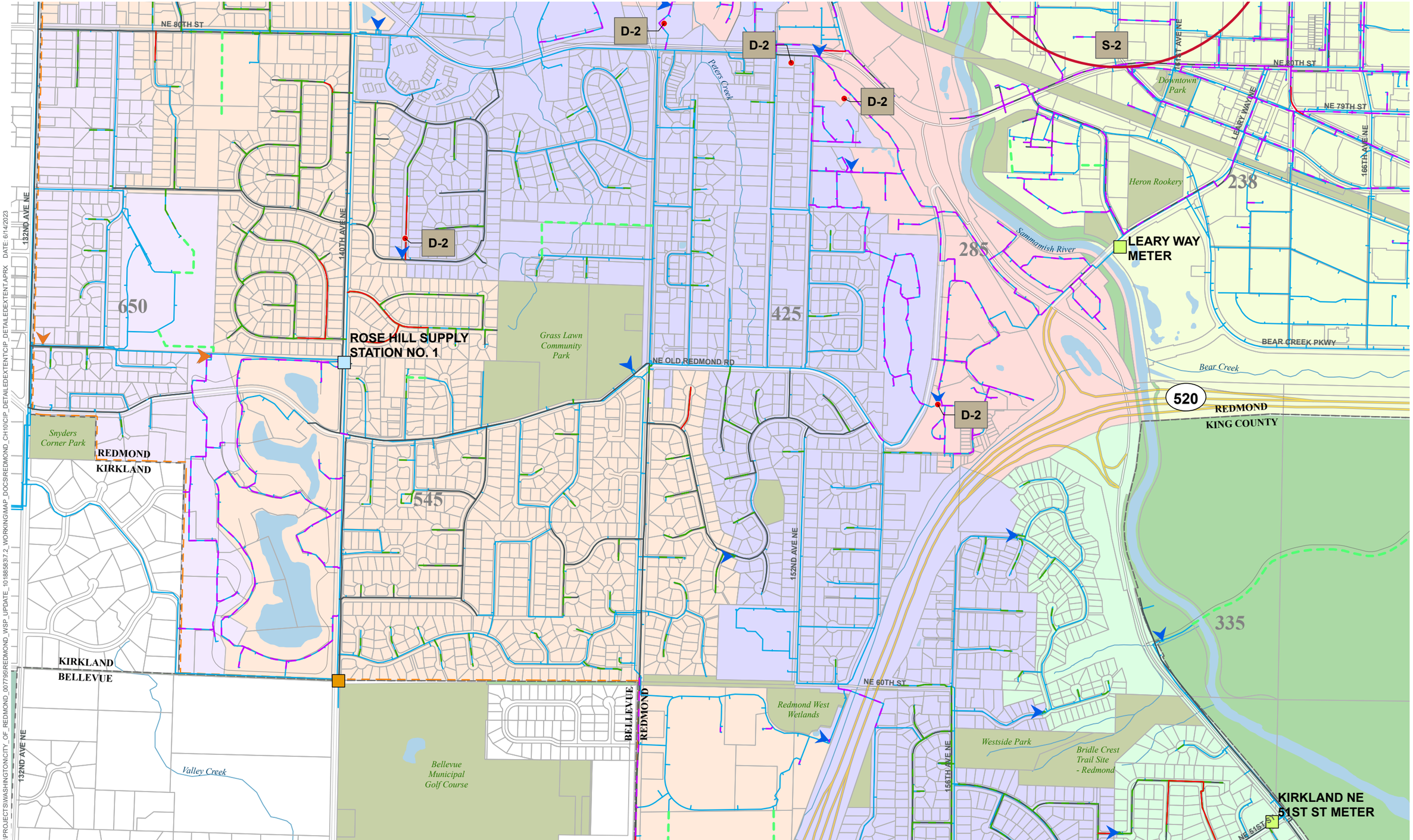
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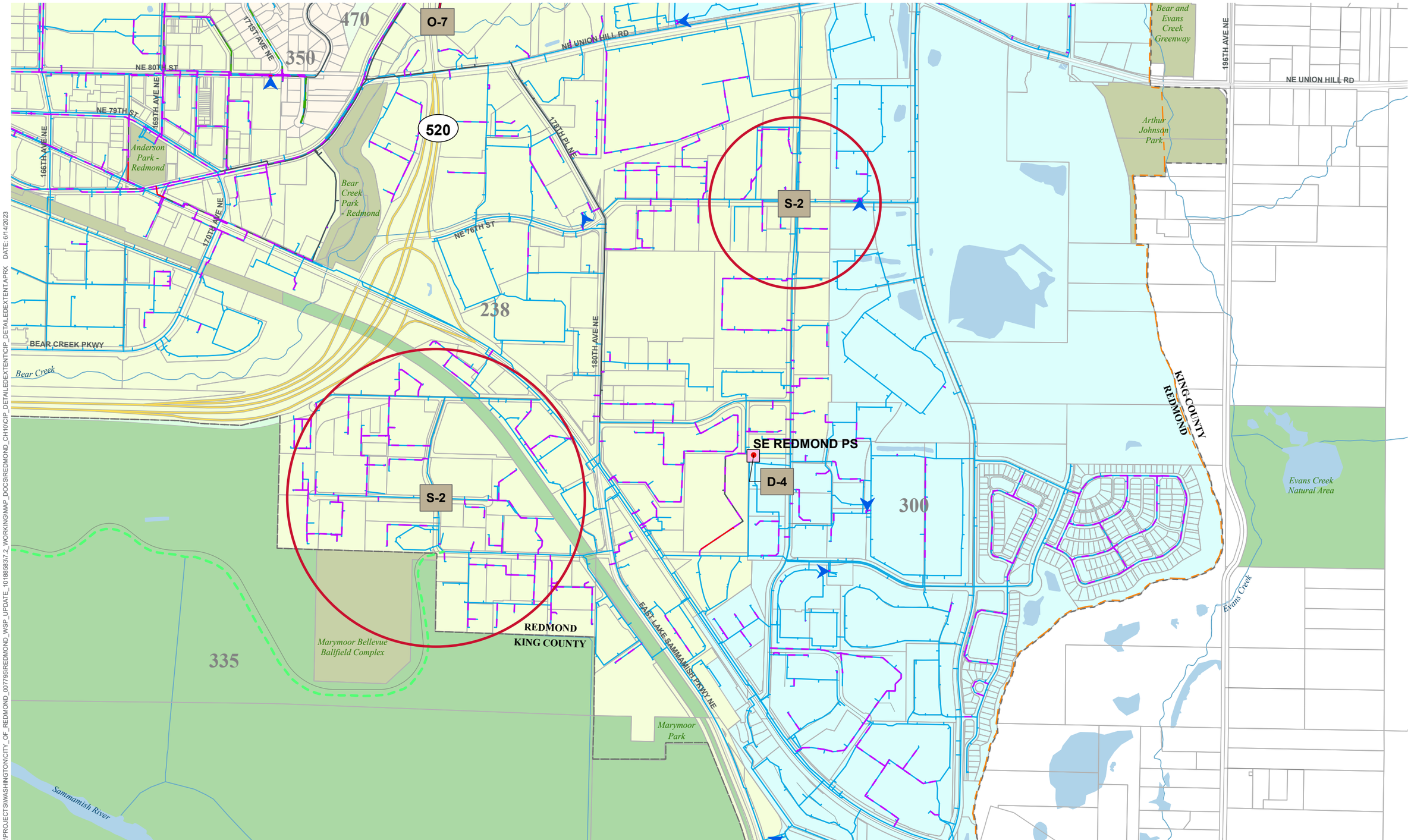
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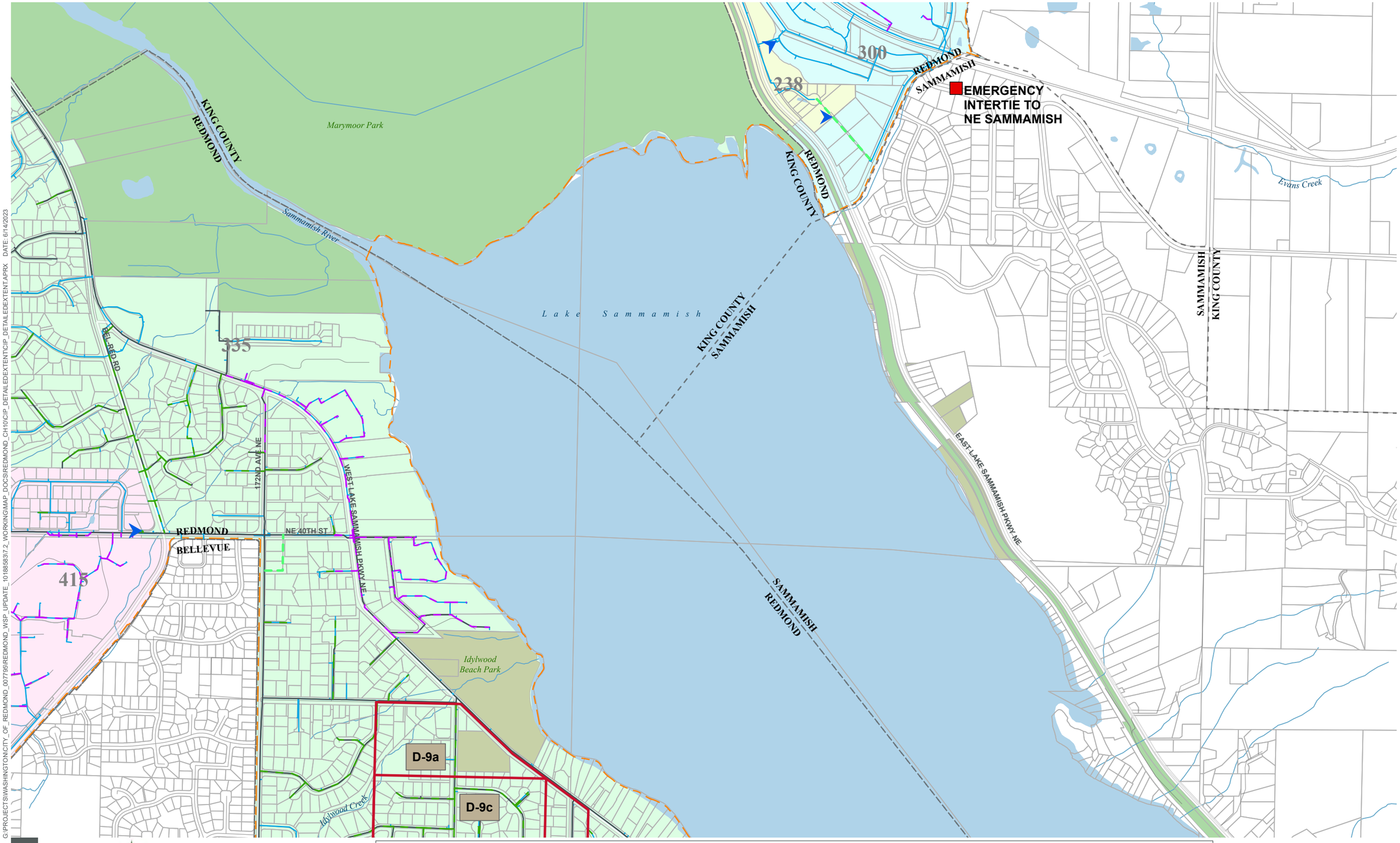
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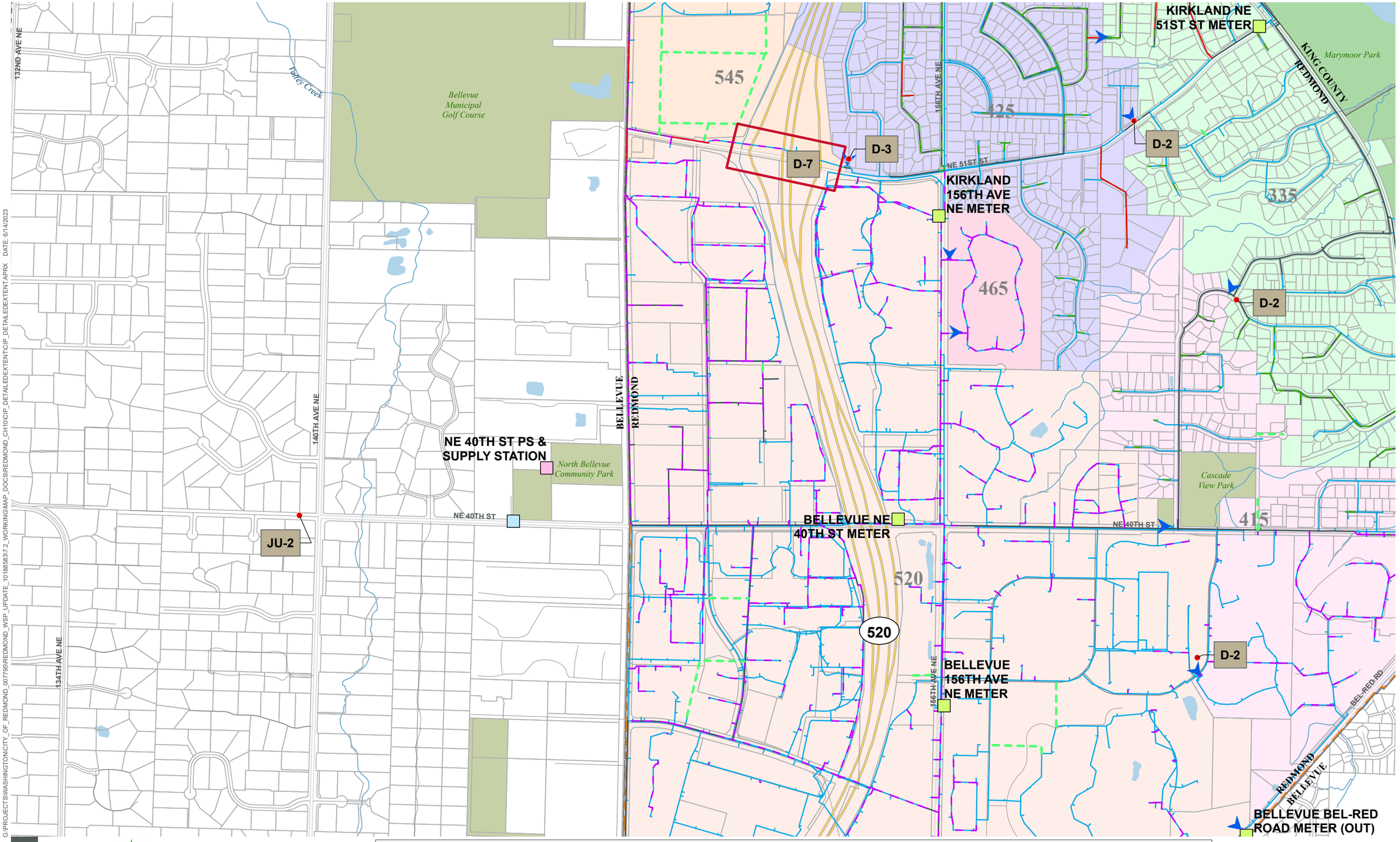
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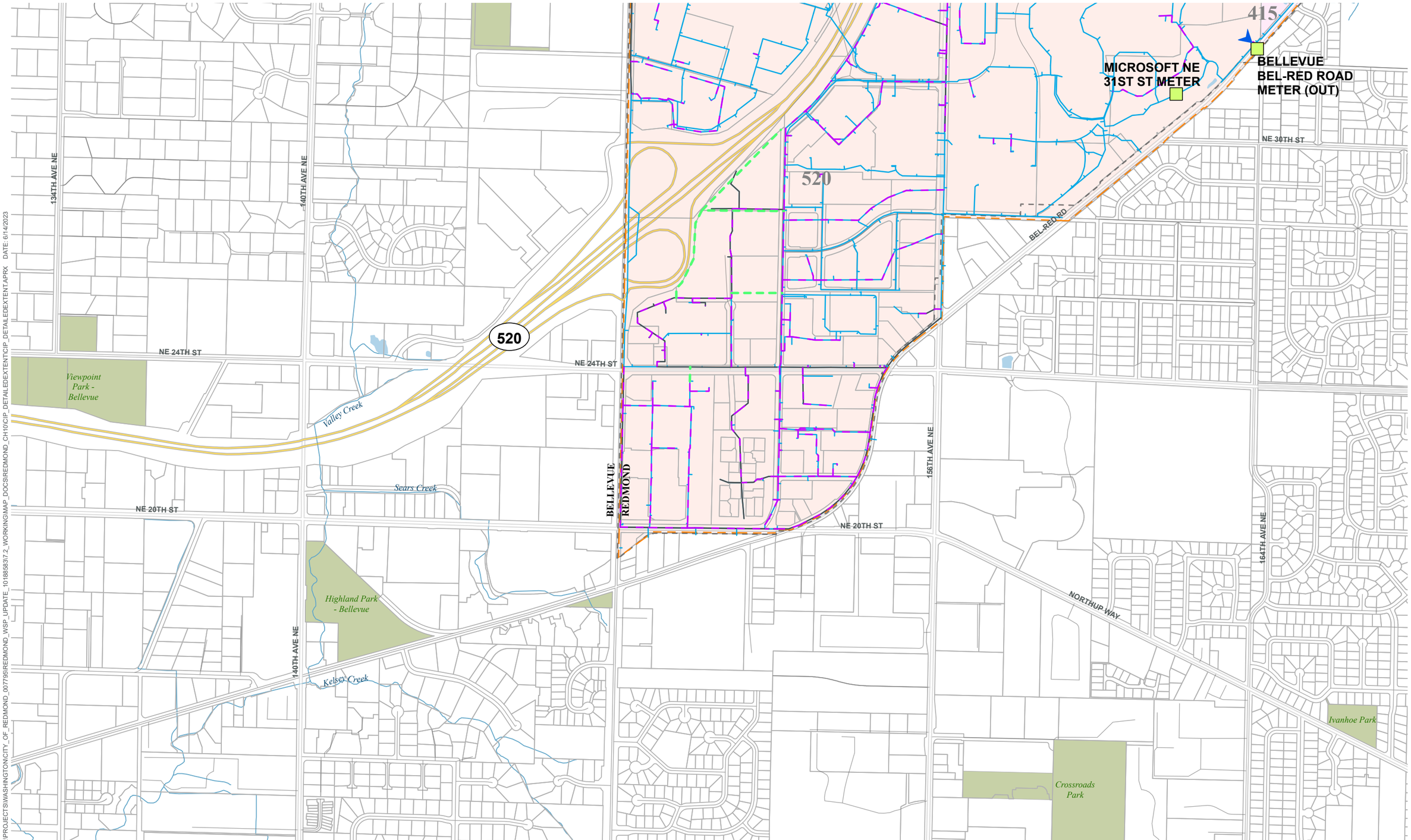


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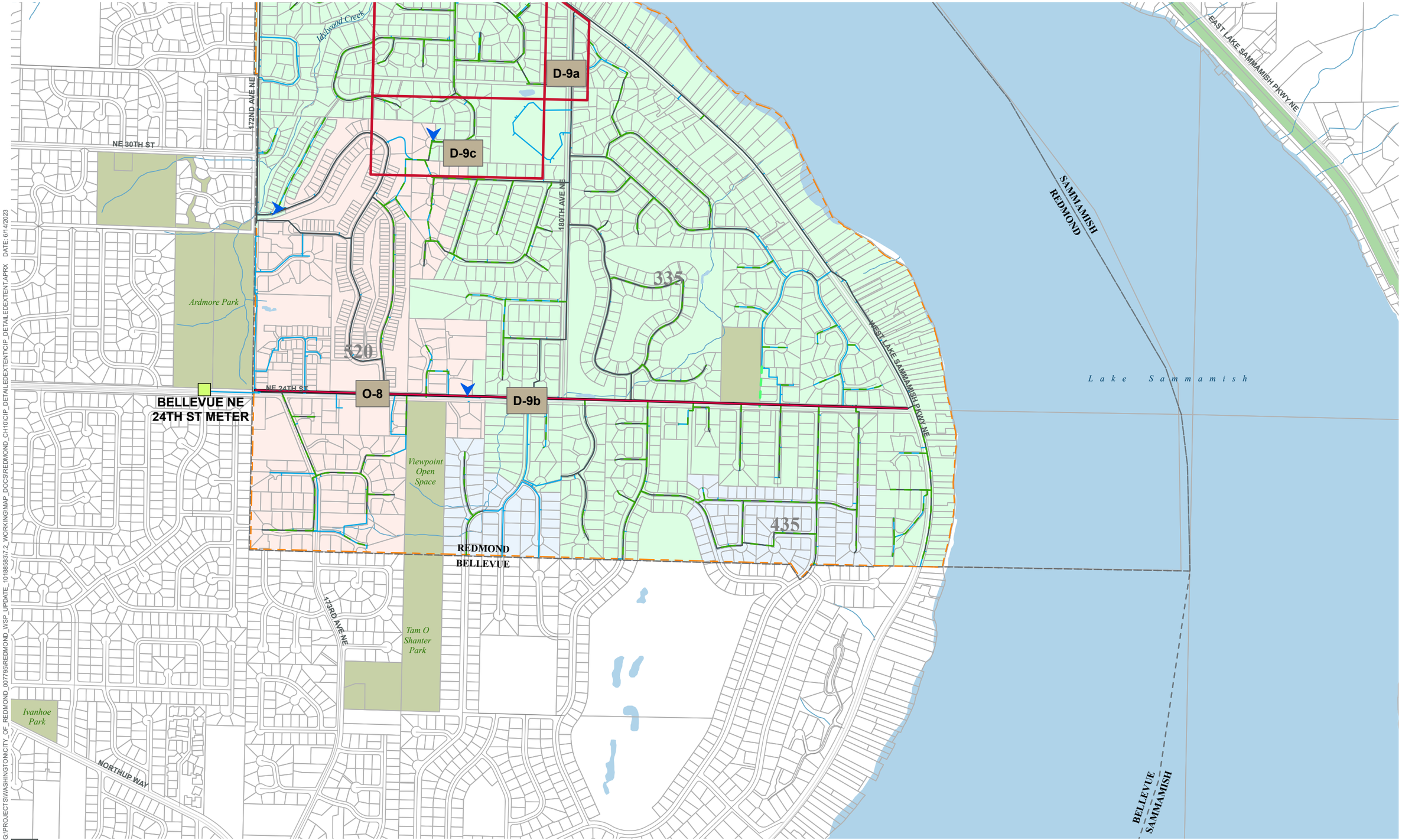


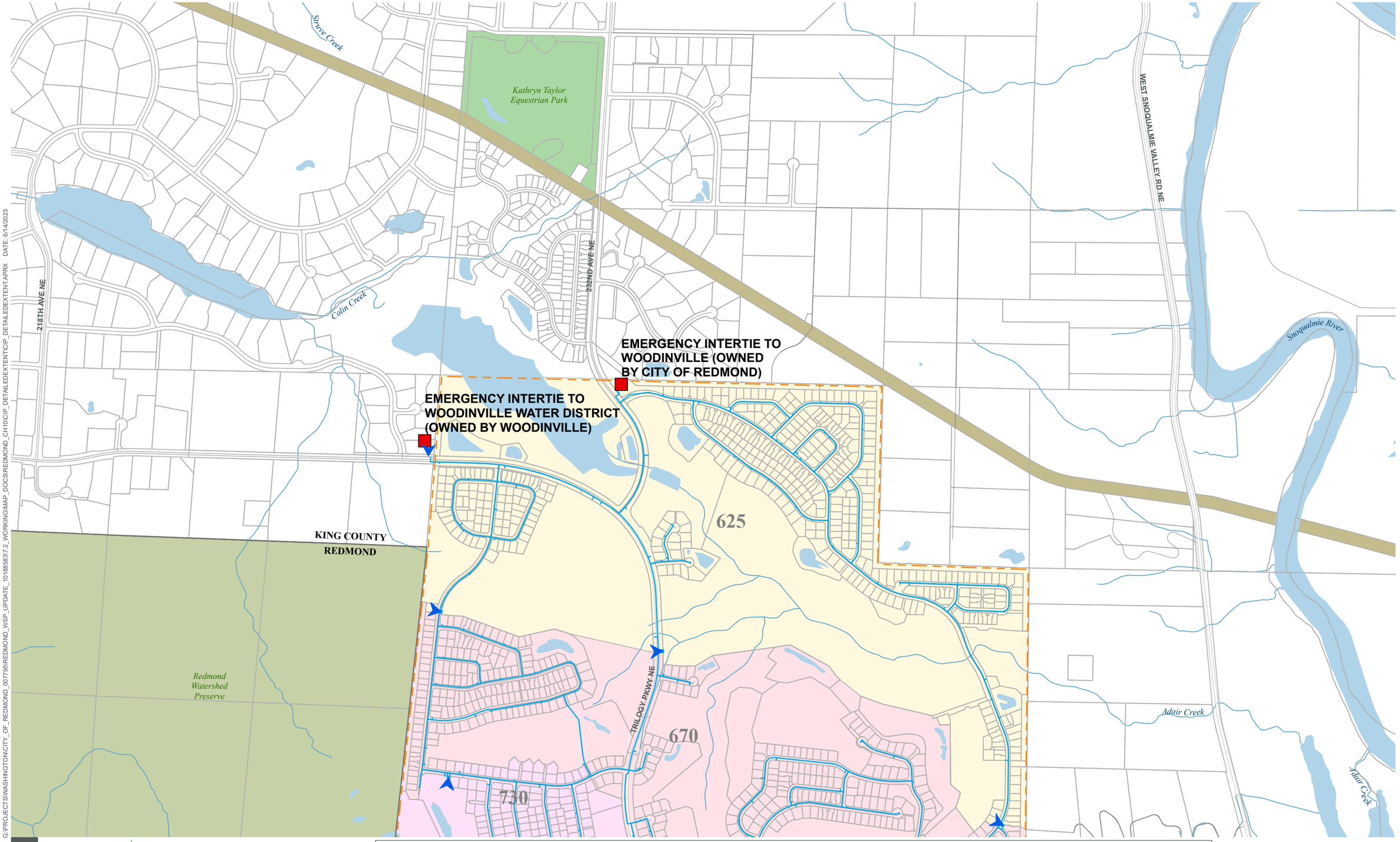
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132ND AVE NE
Tatley Creek
Bellevue Municipal Golf Course
545
D-7
D-3
156TH AVE NE
NE 51ST ST
KIRKLAND NE 51ST ST METER
KIRKLAND 156TH AVE NE METER
125
D-2
KING COUNTY
REDMOND
Marymoor Park
335
465
D-2
BELLEVUE
REDMOND
140TH AVE NE
NE 40TH ST PS & SUPPLY STATION
North Bellevue Community Park
NE 40TH ST
JU-2
BELLEVUE NE 40TH ST METER
520
520
Cascade View Park
415
134TH AVE NE
BELLEVUE 156TH AVE NE METER
D-2
BEL-RED-RD
REDMOND
BELLEVUE
BELLEVUE BEL-RED ROAD METER (OUT)
G:\PROJECTS\WASHINGTONCITY_OF_REDMOND_007795\REDMOND_WSP_UPDATE_101885837\2_WORKING\MAP_DOCS\REDMOND_CH10\CIP_DETAILEDEXTENTCIP_DETAILEDEXTENT.APRX DATE: 6/14/2023
0
750 Feet
Meter Station
Meter Station Maintained by Kirkland
Supply Intertie
Emergency Intertie
Pump Station
Well
PRV Station Mainted by Kirkland
PRV Station
Existing Pipes
AC Mains
High Priority Mains for Replacement
Undersized Mains (Multi-Family)
Undersized Mains (Single-Family)
Developer Extension Lines
Planned Capital Projects
Retail Service Area
City Limits
Parcel

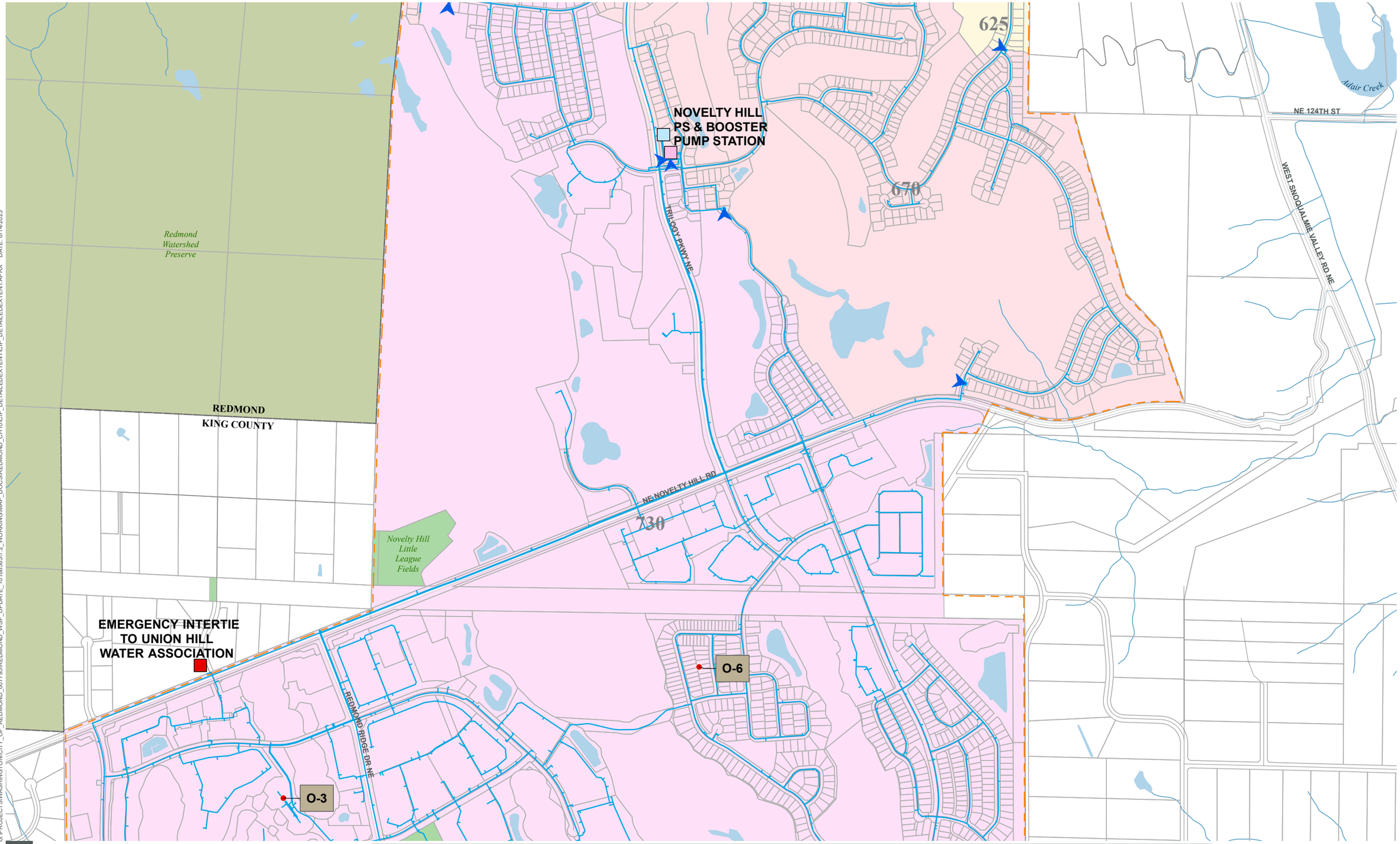


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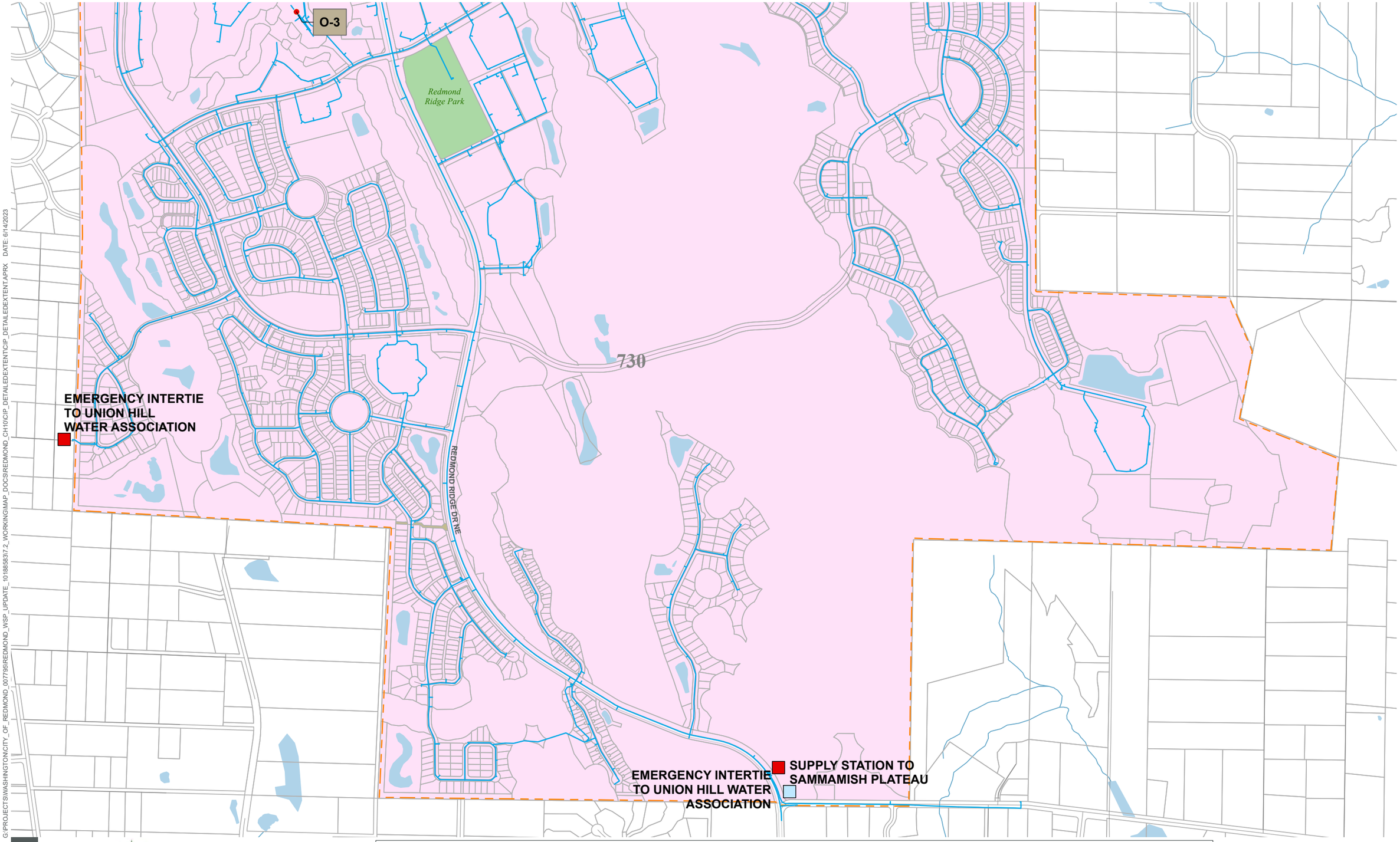

D-9a
D-9c
D-9b
O-8
BELLEVUE NE
24TH ST METER
NE 30TH ST
NE 24TH ST
172ND AVE NE
180TH AVE NE
173RD AVE NE
NORTHUP WAY
Ardmore Park
Viewpoint
Open
Space
Tam O
Shanter
Park
Ivanhoe
Park
Idylwood Creek
520
335
435
SAMMAMISH
REDMOND
REDMOND
BELLEVUE
BELLEVUE
SAMMAMISH
WEST LAKE SAMMAMISH PKWY NE
EAST LAKE SAMMAMISH PKWY NE
Lake Sammamish
G:\PROJECTS\WASHINGTON\CITY_OF_REDMOND_007795\REDMOND_WSP_UPDATE_101888317.2_WORKING\MAP_DOCS\REDMOND_CH10\CIP_DETAILEDEXTENTCIP_DETAILEDEXTENT.APRX DATE: 6/14/2023
0
750 Feet
Meter Station
Meter Station Maintained by Kirkland
Supply Intertie
Emergency Intertie
Pump Station
Well
PRV Station Mainted by Kirkland
PRV Station
Existing Pipes
AC Mains
High Priority Mains for Replacement
Undersized Mains (Multi-Family)
Undersized Mains (Single-Family)
Developer Extension Lines
Planned Capital Projects
Retail Service Area
City Limits
Parcel



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O-3
Redmond Ridge Park
730
REDMOND RIDGE DR NE
EMERGENCY INTERTIE TO UNION HILL WATER ASSOCIATION
SUPPLY STATION TO SAMMAMISH PLATEAU
EMERGENCY INTERTIE TO UNION HILL WATER ASSOCIATION
0
750 Feet
Meter Station
Meter Station Maintained by Kirkland
Supply Intertie
Emergency Intertie
Pump Station
Well
PRV Station Mainted by Kirkland
PRV Station
Existing Pipes
AC Mains
High Priority Mains for Replacement
Undersized Mains (Multi-Family)
Undersized Mains (Single-Family)
Developer Extension Lines
Planned Capital Projects
Retail Service Area
City Limits
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G:\PROJECTS\WASHINGTON\CITY_OF_REDMOND_007795\REDMOND_WSP_UPDATE_101885837-2_WORKING\MAP_DOCS\REDMOND_CH10\CIP_DETAILEDEXTENTCIP_DETAILEDEXTENT.APRX DATE: 6/14/2023

Appendix P
Standard Specifications and Design Requirements

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Redmond
WASHINGTON

STANDARD SPECIFICATIONS

An Addendum to the WSDOT/APWA
2020 Standard Specifications for
Road, Bridge, and Municipal Construction and Amendments
(English)

Adopted by the City of Redmond
Public Works Department
Original published: March 2020
Revised: October 2020

DocuSigned by:
Dave Juarez
21994E32DA804E0...

Dave Juarez
Director of Public Works

10/13/2020
Date

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Redmond
WASHINGTON

PREFACE

The revised 2020 edition of the City of Redmond Standard Specifications and Details (henceforth referred to as the revised *2020 Standard Specifications and Details*) has been prepared by the City of Redmond Public Works Department. This document supplements and in some cases, supersedes the 2020 WSDOT / APWA Standard Specifications for Road, Bridge, and Municipal Construction and Amendments.

For all work in the City of Redmond, the following apply on all individual projects and are considered as a whole:

- The printed hard copy version of the revised 2020 Redmond Standard Specifications and Details
- Work Zone Traffic Control Manual (used in conjunction with the MUTCD)
- 2020 WSDOT Standard Specifications for Road, Bridge, and Municipal Construction and Amendments
- Laws of the State of Washington
- Charter and Ordinances of the City of Redmond
- Project Manual and Drawings for the individual project
- Americans with Disabilities Act (ADA) Regulations

The revised 2020 Standard Specifications and Details shall govern all phases of work for, but not be limited to public and private streets, driveways, parking lots, commercial and industrial developments, residential construction, within the City of Redmond limits and any City of Redmond franchised utility. All requirements of the revised 2020 Standard Specifications and Details apply to such work in the same manner as though the work were being performed under a contract awarded by the City of Redmond, with the exception of those requirements or conditions pertaining to payment for the work performed or to withholding or receiving money due the Contractor. All matters relating to financing of such work shall be between the permittee and the Contractor, and the City will not enter into such matters. Where the Standard Specifications refer to the Engineer, the City Inspector shall have authority to inspect and direct work for compliance with City standards.

Despite considerable efforts to produce a completely error-free document, some mistakes seem to defy detection until after publication. Should you discover errors in this document, please bring them to our attention at City of Redmond, Public Works Department, PO Box 97010, MS:2NPW, Redmond, WA 98073, or by email at pwgen@redmond.gov.

This document is available on the City website, or a hard copy is available for purchase. Please request hard copies 24-hours in advance from Development Services, call 425-556-2900. The document will be available for pick up at the Customer Service Center on the 1st Floor of City Hall.

My sincere thanks and appreciation go to the individuals in the City's Public Works Department who provided input, review and evaluation of this document.

DocuSigned by:
Steve Flude
6D4C1AE6D77D4BE...

10/13/2020

Steve Flude — **Date**
City Engineer - Public Works

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Revisions to 2020 Standard Specifications & Details

What's new?

Added
Design Guidance DG27 – Old Town Small Cell Luminaire Pole *page 363*
Design Guidance DG28 – Overlake Village Small Cell Luminaire Pole – Full Conceal *page 364*
Design Guidance DG29 – Overlake Village Small Cell Luminaire Pole – Non-Conceal *page 365*
Design Guidance DG30 – Small Cell Steel Luminaire Pole *page 366*

Revised
Revised Standard Detail 303A – Concrete Shared Use Path *page 132*

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SECTION 2 CONSTRUCTION ALONG/ACROSS CITY ROW

Standard Plan	Detail Number	WSDOT Number	Revision Date	Newly Constructed Date	Revision
Typical Trench Detail	201		3/1/2019		
Asphalt Overlay for Roadway Trench Repair	202		3/1/2020		Detail edits
Pavement Restoration for Window Cut	203		3/1/2020		Signature update

SECTION 3 ROADWAY CONSTRUCTION

Standard Plan	Detail Number	WSDOT Number	Revision Date	Newly Constructed Date	Revision
Typical Roadway Section	301		3/1/2020		Detail & Text edits
Pavement Paving Details	302		3/1/2020		Signature update
Pavement Repair Details	302A		3/1/2020		Text edits
Curb & Sidewalk Joints	303		3/1/2018		
Concrete Shared Use Path	303A		10/13/2020		
Downtown Pedestrian Sidewalk	303B		3/1/2020		Text edits
Typical Curb and Gutter Details	304		3/1/2020		Detail edits
Extruded and Barrier Curb Section	304A		3/1/2020		Detail edits
Asphalt Thickened Edge	304B		3/1/2020		Signature update
Type "1" Driveway	305		3/1/2020		Detail & Text edits
Type "1A" Driveway with Adjacent Landscape Area	305A		3/1/2020		Detail & Text edits
Type "2" Driveway	306		3/1/2020		Detail & Text edits
Parallel Curb Ramp	307	F-40.12-02	3/1/2020		Detail edits
Combination Curb Ramp	308	F-40.14-02	3/1/2020		Detail edits
Perpendicular Curb Ramp	309	F-40.15	3/1/2020		Detail edits
Single Direction Curb Ramp	310	F-40.16-02	3/1/2020		Detail edits
Crosswalk Markings & Signs	311		3/1/2020		Text edits
Signalized Crosswalk and Stop Bar	311A		3/1/2020		Text edits
Crosswalk & Stop Bar, Downtown & Overlake	311B		3/1/2020		Text edits
Channelization Line Types	312		3/1/2020		Text edits
Patterned Concrete Crosswalk	313		3/1/2018		
Back of Sidewalk Bicycle Parking	317		3/1/2020		Text edit

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On Street Bicycle Parking	*318*		*3/1/2020*		*Text edit*
Bicycle Lanes	*319*		*3/1/2020*		*Draw to scale*
Bicycle Lane Channelization	*319A*		*3/1/2020*		*Draw to scale, Text edits*
Bicycle Lane Treatment at Drop Right Lane Turn	*319B*		*3/1/2020*		*Detail edits*
Bicycle Lanes at Intersection	*319C*		*3/1/2020*		*Detail edits*
Sharrow Lanes	*320*		*3/1/2020*		*Detail edits*
Bicycle Detector Pavement Marking	*320A*		*3/1/2020*		*Signature update*
Typical Pedestrian Railing	*321*		*3/1/2018*		
Rolled Curb and Gutter Section	*322*		*3/1/2020*		*Signature update*
Curb Transition	*323*		*3/1/2020*		*Signature update*
Concrete Bus Pad	*324*			*3/1/2020*	*New detail*

SECTION 4 TRAFFIC/TRANSPORTATION

Standard Plan	Detail Number	WSDOT Number	Revision Date	Newly Constructed Date	Revision
Speed Hump (1of 2)	*415*		*3/1/2020*		*Signature update*
Speed Hump (2of 2)	*416*		*3/1/2020*		*Detail edits, Text edits*
Bump Legend	*416A*		*3/1/2020*		*Signature update*
Mast Arm Street Name Signs	*417*		*3/1/2020*		*Text edit*
Advanced Warning Sign/Flasher	*418*		*3/1/2020*		*Text edit*
Lane-Use Pavement Markings	*419*		*3/1/2020*		*Signature update*
Luminaire Pole (Concrete Square)	*420*		*3/1/2020*		*Detail edits, Text edits*
Typical Luminaire Locations	*420A*		*3/1/2020*		*Text edit*
Uniform Luminaire Wiring	*421*		*3/1/2020*		*Text edit*
"J" Series Light Standard	*425*		*3/1/2020*		*Text edit*
Sign & Post Street Name Sign	*426A*		*3/1/2020*		*Text edit*
Street Light Pole Mounting Sign	*426B*		*3/1/2020*		*Text edit*
Sign & Post in Concrete/Asphalt	*426C*		*3/1/2020*		*Text edit*
Sign & Post in Ground	*426D*		*3/1/2020*		*Text edit*
Speed Table (1 of 2)	*427*		*3/1/2020*		*Detail edits*
Speed Table (2 of 2)	*428*		*3/1/2020*		*Detail edits, Text edits*
Bullet-nose & C-Curb Detail	*429*		*3/1/2020*		*Text edits*
Concrete Octagonal Pole	*430*		*3/1/2020*		*Text edits*

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Pedestrian Scale Pole	*430B*		*3/1/2020*		*Text edits*
Type 3 Barricade	*431*		*3/1/2020*		*Signature update*
Private Address Sign Detail	*432*		*3/1/2020*		*Text edits*
Pedestrian Push Button Orientation	*453*		*3/1/2020*		*Text edits*
Approved Bicycle Racks	*454*		*7/1/2014*		
Loop Detector Spacing	*454A*		*3/1/2020*		*Detail edits, Text edits*
Loop Detector Sawcut	*455*		*3/1/2020*		*Signature update*
Sawcut and Conduit Under Curb	*456*		*3/1/2020*		*Text edits*
Loop Detector Splice and Wiring Label	*457*		*3/1/2020*		*Text edits*
Service Disconnect	*458*		*3/1/2020*		*Detail edits, Text edits*
Cabinet Foundation	*459A*		*3/1/2020*		*Signature update*
Service Cabinet Foundation	*459C*		*3/1/2020*		*Signature update*
Controller and Service Cabinet Footprint	*460*		*3/1/2020*		*Signature update*
Service Cabinet	*461*		*3/1/2020*		*Signature update*
Interconnect Junction Box	*462*		*3/1/2020*		*Signature update*
Junction Box on Grade or Landscaped Areas	*464*		*3/1/2020*		*Signature update*
CCTV Camera Mounting	*465*		*3/1/2020*		*Signature update*
CCTV Video Cable Connection	*465A*		*3/1/2020*		*Text edits*
Junction Box Details (1 of 2)	*467A*		*3/1/2020*		*Text edits*
Junction Box Details (2 of 2)	*467B*		*3/1/2020*		*Signature update*
Fiber Splice and Storage (2 of 3)	*468B*		*3/1/2020*		*Signature update*
Fiber Splice and Storage (3 of 3)	*468C*		*3/1/2020*		*Signature update*
Roadway Luminaire and Pole	*470*		*3/1/2020*		*Text edits*
Pedestrian Luminaire and Pole	*471*		*3/1/2020*		*Text edits*
Downtown & Overlake Tree Grate Detail for Furniture Zones	*473*		*3/1/2018*		
Pedestrian Luminaire Location and Pavement Scoring	*474*		*3/1/2020*		*Text edits*
Rumble Strip and 25 MPH Legend	*476*		*3/1/2020*		*Signature update*
Traffic Circle Details	*478*		*3/1/2020*		*Signature update*

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Raised Crosswalk	*479*		*3/1/2020*		*Signature update*
Raised School Crosswalk Signing	*480*		*3/1/2020*		*Signature update*
Raised Crosswalk Signing	*481*		*3/1/2020*		*Signature update*
Speed Cushion (1 of 2)	*482*		*3/1/2020*		*Signature update*
Speed Cushion (2 of 2)	*483*		*3/1/2020*		*Detail edits, Text edits*
Rectangular Rapid Flashing Becon	*484*		*3/1/2020*		*Detail edits, Text edits*
School Zone Speed Radar Sign	*485*		*3/1/2020*		*Text edits*
Speed Check Radar Sign	*486*		*3/1/2020*		*Signature update*
Overlake Village Street Light	*487*		*3/1/2020*		*Text edits*
Overlake Village Ped Light	*488*		*3/1/2020*		*Text edits*
Pedestrian Wayfinding Sign	*489*		*3/1/2017*		
Standard and Overlake Wayfinding Sign Pole	*490*		*3/1/2020*		*Text edits*
Old Town Wayfinding Sign Pole	*491*		*3/1/2020*		*Text edits*
Public Access Sign	*492*		*3/1/2020*		*Text edits*
Shared Use Path Wayfinding Sign	*493*		*3/1/2020*		*Text edits*
End of Trail Sign	*494*		*3/1/2020*		*Text edits*
Time Restricted Parking Sign	*498*		*3/1/2019*		
Fire Lane Sign	*499*		*3/1/2020*		*Text edits*

SECTION 5 CLEARING, GRADING, AND TEMPORARY EROSION CONTROL

Standard Plan	Detail Number	WSDOT Number	Revision Date	Newly Constructed Date	Revision
Filter Fabric Fence	*502*		*3/1/2019*		
Stabilized Construction Entrance	*503*		*3/1/2020*		*Text edits*
Temporary Swale	*504*		*3/1/2017*		
High Visibility Fence		*I-10.10-01*	*8/11/2009*		
Tree Protection Fence	*507*		*2/21/2019*		*Text edits*
Storm Drain Inlet Protection	*508*		*3/1/2020*		*New Detail*

SECTION 6 STORMWATER

Standard Plan	Detail Number	WSDOT Number	Revision Date	Newly Constructed Date	Revision
Concrete Inlet		*B-25.60-02*	*3/1/2018*		
Catch Basin - Type 1		*B-5.20-02*	*3/1/2018*		
Catch Basin - Type 1L		*B-5.40-02*	*3/1/2018*		

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Catch Basin - Type 2		*B-10.20-01*	*3/1/2018*		
Typ. Orientation of Type 2 Catch Basin in City Street	*609A*		*3/1/2017*		
Typical Catch Basin Placement	*609B*		*3/1/2017*		
Flow Control Structure	*610*		*3/1/2018*		
Rectangular Solid Metal Cover		*B-30.20-03*	*3/1/2018*		
Miscellaneous Details for Drainage Structures		*B-30.90-02*	*3/1/2018*		
Manhole Type 3		*B-15.60-02*	*3/1/2018*		
Stormwater Valve	*611*		*3/1/2017*		
Valve Box Extension	*612*		*3/1/2017*		
Stormwater Shear Gate	*613*		*3/1/2017*		
Stormwater Manhole/Catch Basin Adjustment Detail	*615*		*3/1/2020*		*Detail edits, Text edits*
~~Detention Vault Access Manhole Lid Over Low Point~~	*~~616~~*		*~~3/1/2018~~*		*Moved to DG25*
~~Filter Vault Access~~	*~~617A~~*		*~~3/1/2017~~*		*Moved to DG26*
Thru-Curb Inlet Frame Installation	*618*		*3/1/2020*		*Detail edits, Text edits*
Combination Inlet		*B-25.20-01*	*3/1/2018*		
Rectangular Vaned Grate		*B-30.30-02*	*3/1/2018*		
Rectangular Herringbone Grate		*B-30.50-02*	*3/1/2018*		
Headwall & Rip Rap	*620*		*3/1/2017*		
Lot Drain Trench	*621*		*3/1/2020*		*Detail edits, Text edits*
Stenciling Detail	*622*		*3/1/2020*		*Detail edits, Text edits*
Cleanout	*623*		*3/1/2020*		*Detail edits, Text edits*
Sidewalk Underdrain System	*630*		*3/1/2019*		*Text edits*
Catch Basin Frame and Grate Replacement	*631*		*3/1/2017*		
Rectangular Frame (Reversible)		*B-30.10-02*	*3/1/2018*		
Soil Amendment and Depth	*632*		*3/1/2018*		
Permeable Pavement Section	*643*		*3/1/2020*		*Text edits*
Pervious Sidewalk Alternative Design	*645*		*3/1/2020*		*Text edits*
Pervious Concrete Sidewalk	*646*		*3/1/2020*		*Text edits*
Permeable Pavement on Slopes	*647*		*3/1/2020*		*Text edits*
Roof Rain Harvesting	*650*		*3/1/2019*		
Bioretention Facility	*655*		*3/1/2020*		*Text edits*
Bioretention Plant Palette	*657*		*3/1/2019*		
Bioretention Curb Extension	*659*		*3/1/2020*		*Text edits*
Bioretention Check Dam	*661*		*3/1/2020*		*Text edits*

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Bioretention In-line Curb Cut	*663*		*3/1/2020*		*Detail edits*
Bioretention Side Curb Cut	*665*		*3/1/2020*		*Text edits*
Bioretention Outlet Structure	*667*		*3/1/2020*		*Text edits*
Bioretention Clean-Out	*669*		*3/1/2020*		*Text edits*
Bioretention Hydrant Access	*671*		*3/1/2020*		*Text edits*
Perforated Pipe Connection	*673*		*3/1/2020*		*Detail edits, Text edits*

SECTION 7 WATER

Standard Plan	Detail Number	WSDOT Number	Revision Date	Newly Constructed Date	Revision
Corporation Stop Service Connections	*701A*		*3/1/2020*		*Pipe angle change*
Curb Stop Connection	*701C*		*3/1/2020*		*Tracer wire change*
3/4" to 2" Meter Setter Details	*702*		*3/1/2020*		*Tracer wire change & meter depth change*
Standard Meter Locations 3/4" to 2" Meters	*703*		*3/1/2020*		*Tracer wire change*
Double Service Manifold	*703A*		*3/1/2020*		*Tracer wire change*
Triple Service Manifold	*703B*		*3/1/2020*		*Tracer wire change*
Meter Box Location within Planting Area	*703C*		*3/1/2020*		*Tracer wire change*
Residential Fire Sprinkler Details	*704*		*3/1/2020*		*Tracer wire change & add dimension*
Water Meter Vault with 3 Inch Meter	*705*		*3/1/2019*		
Water Meter Vaults with 4- and 6-Inch Meters	*705A*		*3/1/2019*		
Water Meter Vault Section with 3 Inch Meter	*705B*		*3/1/2020*		*Add bypass table, slope drain & dimension change*
Water Meter Vault Plan View with Sump Pump	*705C*		*3/1/2020*		*Text change*
Water Meter Vault Section View (Sump Pump)	*705D*		*3/1/2020*		*Text change*
Combination Air Release & Vacuum Valve Assembly	*706*		*3/1/2019*		
Blow-off Assembly	*707*		*3/1/2020*		*Tracer wire change*

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6" & 8" PRV Station Plan	*708*		*3/1/2017*		
6" & 8" PRV Station Plan and Section	*709A*		*3/1/2018*		
6" AND 8" PRV Station Section	*709B*		*3/1/2018*		
6" & 8" PRV Station Misc. (Catch Basin) Details	*710A*		*3/1/2020*		*Text change*
6" & 8" PRV Station Misc. (Ladder) Details	*710B*		*3/1/2015*		
Irrigation BackFlow Preventor (3/4"-2")	*711*		*3/1/2020*		*Dimension change*
Fire Hydrant and Standpipe Location	*712*		*3/1/2015*		
Fire Hydrant Assembly	*713*		*3/1/2020*		*Text change*
Fire Sprinkler System Back Flow Preventer	*714*		*3/1/2020*		*FDC change from 4 to 1*
Fire Sprinkler System Back Flow Preventer	*714A*		*3/1/2020*		*FDC change from 4 to 1*
Hydrant Location within Planting Area	*716*		*3/1/2014*		
Valve Box Detail	*718*		*3/1/2015*		
Exempt Irrigation Meter Location Requirements	*719*		*3/1/2017*		
5/8" X ¾" and 1" Meter in Sidewalk	*720*		*3/1/2020*		
5/8" X ¾" and 1" Double Meters in Sidewalk	*721*		*3/1/2020*		
1-1/2" and 2" Meter in Sidewalk	*722*		*3/1/2020*		
Thrust block	*730*			*3/1/2020*	*New detail*

SECTION 8 SEWER

Standard Plan	Detail Number	WSDOT Number	Revision Date	Newly Constructed Date	Revision
Side Sewer Cleanout Detail	*810*		*3/1/2019*		
Drop Connection Detail	*820*		*3/1/2017*		
Side Sewer	*830*		*3/1/2015*		
Side Sewer Marker	*832*		*3/1/2015*		
48" Standard Manhole	*840*		*3/1/2020*		*Text change & drawn proportionally*
48" Saddle Manhole	*841*		*3/1/2020*		
Intersection of Sewers at Manholes	*842*		*3/1/2015*		
Sewer Manhole Frame and Cover	*843*		*3/1/2018*		

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SECTION 9 MISCELLANEOUS

Standard Plan	Detail Number	WSDOT Number	Revision Date	Newly Constructed Date	Revision
Mailbox Standard	901		3/1/2018		
Cluster Box Mailbox Standard	901A		3/1/2018		
Double Mailbox Standard	902		3/1/2018		
Survey Monument Case and Cover	903		3/1/2020		Signature update
6' Wood Fence	904		3/1/2018		
Structural Soil for Street Trees	907		3/1/2018		
Rock Wall Under 4 Feet	909		3/1/2020		Detail edits, Text edits
Removable Bollard	911		3/1/2019		
Irrigation Control Panel	920		7/1/2014		
Double Check Valve	921		3/1/2016		
Irrigation Trench	922		7/1/2014		
Thrust Block	923		3/1/2018		
System Gate Valve	925		3/1/2018		
Control Valve	926		3/1/2018		
Quick Coupler	927		3/1/2018		
Rainbird 3500/500/6400 Series Swing Joint	928		3/1/2020		Text edits
Rainbird 1800 Series Swing Joint	929		3/1/2020		Text edits
Valve Box Installation	930		3/1/2018		

SECTION 99 DESIGN GUIDANCE

Standard Plan	Detail Number	WSDOT Number	Revision Date	Newly Constructed Date	Revision
Sidewalk Ramp Layout	DG01		3/1/2020		Text edits
Crosswalk Accessibility Design Standards	DG02		3/1/2020		Text edits
Sight Distance Triangle	DG03		3/1/2020		Signature update
Standard Intersection Head Numbers & Phasing	DG04		3/1/2020		Text edits
Traffic Circle Dimensions	DG05		3/1/2020		Text edits
120' Hammerhead Alternate	DG06		3/1/2020		Text edits
120' Hammerhead	DG07		3/1/2020		Text edits
60' Y	DG08		3/1/2020		Text edits
90' Cul-de-Sac	DG09		3/1/2020		Text edits

Typical Rockery Details Post Const. Guides	*DG10*		*3/1/2020*		*Detail & Text edits*
Utilities Access Road	*DG11*		*3/1/2020*		*Detail & Text edits*
Pedestrian Clear Zone	*DG12*		*3/1/2017*		
46' Rustic Street Plan	*DG13*		*3/1/2020*		*Detail & Text edits*
46' Rustic Street Sections	*DG14*		*3/1/2020*		*Detail & Text edits*
53' to 55' Rustic Street Plan	*DG15*		*3/1/2020*		*Detail & Text edits*
53' to 55' Rustic Street Section	*DG16*		*3/1/2020*		*Detail & Text edits*
Pond Sign	*DG17*		*3/1/2018*		
Encroachment Detail Below Grade (ROW)	*DG18*		*3/1/2019*		
Encroachment Detail Awnings, Canopies, Marquees & Signs 8-Feet To 15-Feet (ROW)	*DG19*		*3/1/2019*		
Encroachment Detail	*DG20*		*3/1/2019*		
Utility Locations 28' Local Street	*DG21*			*3/1/2019*	
Utility Locations 20' Half Street "A"	*DG22*		*3/1/2020*		*Text edit*
Utility Locations 20' Half Street "B"	*DG23*		*3/1/2020*		*Text edit*
4-Axle Vactor Truck Loading	*DG24*			*3/1/2019*	
Detention Vault Access Manhole Lid Over Low Point	*DG25*		*3/1/2020*		*Moved from 616*
Filter Vault Access	*DG26*		*3/1/2020*		*Moved from 617A*
Old Town Small Cell Luminaire Pole	*DG27*		*10/13/2020*		
Overlake Village Small Cell Luminaire Pole – Full Conceal	*DG28*		*10/13/2020*		
Overlake Village Small Cell Luminaire Pole – Non-Conceal	*DG29*		*10/13/2020*		
Small Cell Steel Luminaire Pole	*DG30*		*10/13/2020*		

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HOW TO USE THESE SPECIFICATIONS

The 2020 City of Redmond Standard Specifications are modifications to the 2020 WSDOT Standard Specifications for Road, Bridge, and Municipal Construction and Amendments. Modifications by paragraph are noted in the margin as follows:

New – New section, not already in Standard Specifications.

Supplement – Add new sentence or paragraph to existing section.

Revision – Revise sentence, replace portion or all of paragraph.

Deleted – Delete entire section.

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DIVISION 1 - GENERAL REQUIREMENTS

1-01 DEFINITIONS AND TERMS

1-01.3 Definitions

Supplement

All references in the Standard Specifications to the terms “State,” “Department of Transportation,” “Washington State Transportation Commission,” “Commission,” “Secretary of Transportation,” “Secretary,” “Headquarters,” and “State Treasurer” shall be revised to read “Contracting Agency.”

All references to “State Materials Laboratory” shall be revised to read “Contracting Agency designated location.”

The venue of all causes of action arising from the advertisement, award, execution, and performance of the contract shall be in the Superior Court of the County where the Contracting Agency’s headquarters are located.

Traffic

Both vehicular and non-vehicular traffic, such as pedestrians, bicyclists, wheelchairs, and equestrian traffic.

1-04 SCOPE OF THE WORK

1-04.2 Coordination of Contract Documents, Plans, Special Provisions, Specifications, and Addenda

Revision

Revise the second paragraph to read:

Any inconsistency in the parts of the contract shall be resolved by following this order of precedence (e.g., 1 presiding over 2, 2 over 3, 3 over 4, and so forth):

1. Addenda,
2. Proposal Form,
3. Special Provisions, including APWA General Special Provisions, if they are included,
4. Contract Plans,
5. Amendments to the Standard Specifications,
6. City of Redmond Standard Specifications,
7. WSDOT/APWA Standard Specifications for Road, Bridge, and Municipal Construction,
8. City of Redmond Standard Details, and
9. WSDOT/APWA Standard Plans for Road, Bridge, and Municipal Construction.

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1-04.11 Final Clean-up

Supplement

Final clean-up, including complete restoration of shoulders, cleaning of ditches, culverts and catch basins, removal of loose material from back slope of ditches, shall not exceed 1500 lineal feet behind excavating operations.

1-05 CONTROL OF WORK

1-05.3 Plans and Working Drawings

1-05.3(1) Record Drawings

New

During the construction phase of the project, the Contractor shall maintain one set of full-size plans for record drawings. The contractor's superintendent or authorized representative, together with the City's construction inspector, shall update the plans with record information daily. Record information includes the final locations of all constructed items and existing improvements encountered during the work.

Upon completion of construction, the record information plan set will be provided to the City along with Contractor/Developer completed electronic record drawings.

1-05.11(1) Operational Testing

New

It is the intent of the Contracting Agency to have at the Physical Completion Date a complete and operable system. Therefore, when the work involves the installation of machinery or other mechanical equipment; street lighting, electrical distribution or signal systems; irrigation systems; buildings; or other similar work it may be desirable for the Engineer to have the Contractor operate and test the work for a period of time after final inspection but prior to the physical completion date. Whenever items of work are listed in the Contract Provisions for operational testing, they shall be fully tested under operating conditions for the time period specified to ensure their acceptability prior to the Physical Completion Date. During and following the test period, the Contractor shall correct any items of workmanship, materials, or equipment which prove faulty, or that are not in first class operating condition. Equipment, electrical controls, meters, or other devices and equipment to be tested during this period shall be tested under the observation of the Engineer, so that the Engineer may determine their suitability for the purpose for which they were installed. The Physical Completion Date cannot be established until testing and corrections have been completed to the satisfaction of the Engineer.

The costs for power, gas, labor, material, supplies, and everything else needed to successfully complete operational testing, shall be included in the unit contract prices related to the system being tested, unless specifically set forth otherwise in the proposal.

Operational and test periods, when required by the Engineer, shall not affect a manufacturer's guaranties or warranties furnished under the terms of the contract.

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1-05.14 Cooperation with Other Contractors

Supplement

The Contractor shall coordinate the work with other contractors and utility companies which may have facilities in the project area. The Contractor shall also coordinate activities with the City. No water mains, individual water services, street, or private drives may be closed off without a minimum of forty-eight (48) hours' notice to the Engineer, the appropriate utility and the private property owner.

Notification shall be written, with a copy delivered to the Engineer, within a minimum of two working days prior to the commencement of work and must be in such detail as to give the time of the commencement and completion of work, names of streets or locations of alleys to be closed, schedule of operations, routes of detours where possible.

Should the property owner or the Engineer have adequate reason, as determined by the Engineer, to avoid access or water service shutoff at the scheduled time, the Contractor shall reschedule his work to meet the new condition.

1-06 CONTROL OF MATERIAL

1-06.1 Approval of Materials Prior to Use

Supplement

The source of supply of each of the materials furnished by the Contractor shall be submitted to the City for approval prior to delivery. Only materials conforming to the requirements of the Standard Specifications and approved by the City shall be used in the work. Testing of materials may include tests of actual samples, manufacturer's certifications, and approval of catalog cuts or field acceptance reports.

Placement of fill within City of Redmond Wellhead Protection Zones 1 and 2 requires certification that the fill is not contaminated. See Redmond Municipal Code 15.24.095.

1-06.4 Handling and Storing Materials

Supplement

The Contractor shall not store any materials, equipment, excavated material, or demolition debris within rights-of-way and/or easements.

Private properties shall be used by the Contractor only if he makes his own arrangements with the legal owner or owners of each property. Use and restoration of such property shall be in accordance with the stipulations of the agreement between the Contractor and the legal owner or owners of the property. Before using any private property, the Contractor shall file with the Engineer a written permission of the property owner, and upon vacating the premises, the Contractor shall furnish the Engineer with a release from all damages, properly executed by the property owner. The Contractor shall save the Owner harmless from all suits and actions of every kind and description that might result from use of private property.

Overnight storage of equipment, materials, trailers, and vehicles on or adjacent to streets is prohibited. The Contractor shall locate private property in the vicinity of the project and obtain permission from the property owner to store equipment, materials, trailers, and vehicles. Copies of permission granted by the property owner shall be provided to the City.

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1-07 LEGAL RELATIONS AND RESPONSIBILITIES TO THE PUBLIC

1-07.1 Laws to be Observed

Supplement

In cases of conflict between different safety regulations, the more stringent regulation shall apply.

The Washington State Department of Labor and Industries shall be the sole and paramount administrative agency responsible for the administration of the provisions of the Washington Industrial Safety and Health Act of 1973 (WISHA).

The Contractor shall maintain at the project site office, or other well-known place at the project site, all articles necessary for providing first aid to the injured. The Contractor shall establish, publish, and make known to all employees, procedures for ensuring immediate removal to a hospital, or doctor's care, persons, including employees, who may have been injured on the project site. Employees should not be permitted to work on the project site before the Contractor has established and made known procedures for removal of injured persons to a hospital or a doctor's care.

The Contractor shall have sole responsibility for the safety, efficiency, and adequacy of the Contractor's plant, appliances, and methods, and for any damage or injury resulting from their failure, or improper maintenance, use, or operation. The Contractor shall be solely and completely responsible for the conditions of the project site, including safety for all persons and property in the performance of the work. This requirement shall apply continuously, and not be limited to normal working hours. The required or implied duty of the Engineer to conduct construction review of the Contractor's performance does not, and shall not, be intended to include review and adequacy of the Contractor's safety measures in, on, or near the project site.

1-07.5(1) General

Supplement

Supplement this section with the following:

All equipment that has prior contact with surface waters shall be cleaned before entering the site, to remove invasive species, per Bureau of Reclamation 2012 Manual.

Aquatic Invasive Species Decontamination Protocols

New Zealand Mudsnails (Potamopyrgus antipodarum) have been detected in one stream in Redmond, several streams in Bellevue and other nearby locations. To prevent the spread of this invasive species in accordance with RCW 77.15.253, 77.15.290, and 77.15.250, all projects shall meet the following requirements:

- Contractor shall ensure that all equipment is clean and decontaminated of any potential invasive species prior to and after working in Redmond streams. Equipment with mud or debris shall not be allowed to be deployed.
- In-stream workers shall follow the procedures in the Washington Department of Fish and Wildlife's (WDFW) Invasive Species Management Protocols, dated July 27, 2011, or the latest version of this document.

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- All equipment that has been exposed to surface waters and has not yet been decontaminated shall be quarantined in an area where mud, debris or water cannot be tracked into other streams or storm drainage catch basins.

- All equipment shall be brushed or sprayed on-site so no invasive species can be dislodged during transport prior to full decontamination. The on-site cleaning shall occur in a way that mud, debris or water cannot be tracked into other streams or storm drainage catch basins.

Additional information regarding New Zealand Mudsnails can be found at the WDFW website at:

http://wdfw.wa.gov/ais.

1-07.6 Permits and Licenses

Supplement

The Contractor shall ensure that all necessary permits are obtained and is responsible for reviewing all permits to become familiar with the requirements. All specific permits, licenses, inspections, etc., which may be required, shall be obtained and paid for by the Contractor, including but not limited to a City business license.

Permits and licenses required may include, but are not limited to, the following:

- City of Redmond Right of Way Use Permit
- Disposal or Recycling Site Permit
- City of Redmond Business License (Contractor and subcontractors)
- Puget Sound Clean Air Agency (PSCAA) Permit
- King County Metro Sewer Discharge Permit
- Building Permit
- Electrical Permit for Work within Right-of-Way (e.g., streetlights, traffic signals)
- Electrical and Plumbing Permit
- Certificate of Occupancy
- Site Construction Permit
- Demolition Permit
- Tank Removal Permit
- Side Sewer Permit

1-07.16 Protection and Restoration of Property

Supplement

Survey Monuments:

The Contractor shall protect all existing survey monuments including the City horizontal and benchmark system and property corner markers from movement. All existing markers and/or monuments that must be removed for construction purposes are to be referenced by survey ties and then replaced by a professional land surveyor registered in the State of Washington. All existing property corner markers disturbed or removed by the Contractor's operations which, in the opinion of the Engineer, were not required to be removed for construction purposes shall be replaced at the Contractor's own expense by a Professional Land Surveyor registered in the State of Washington. The City benchmark system monuments that are disturbed must be reset to second order, first class specifications. If construction work or excavations occur within 50 ft. of any survey monument, said monument shall be checked and restored if necessary, to meet City requirements.

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1-07.23 Public Convenience and Safety

1.07.23(1) Construction under Traffic

Supplement

Unless otherwise approved by the Engineer, work within the traveled way of any streets shall be limited to the hours between 9:00 am and 3:30 pm.

The Contractor shall provide for cleaning all surfaced roadways as a result of the execution of this project. Flushing shall not be used.

No signalized intersection will be rendered inoperable by the Contractor. All signalized intersections will remain in operation unless shut down by City. The Contractor may request the Engineer to shut down a traffic signal with 48 hours advanced notice. A police officer is required to direct traffic at all signalized intersections during times of shut down. All costs associated with signal shut down are included in the lump sum price for “Project Temporary Traffic Control.”

1. All signs, barricades and related equipment and their use must be in accordance with Part 6, “Temporary Traffic Control” of the Manual on Uniform Traffic Control Devices.
2. A City of Redmond Approved Traffic Control Plan shall always be onsite during construction activities.
3. Particular attention should be made to the following items:
    a) There shall, always, be reasonable pedestrian and vehicular access to and from the properties impacted by the project. Where pedestrian routes are closed, alternate pedestrian routes shall be provided. When existing pedestrian facilities are disrupted, closed, or relocated in a TTC zone, the temporary facilities shall be detectable and shall include accessibility features present in the existing pedestrian facility.
    b) During non-working hours, the contractor shall keep the existing traffic lanes clear for traffic without interference from his operations.
    c) Signs and barricades shall be supplemented by flasher units, during the hours of darkness, at construction sites in close proximity to vehicular and pedestrian ways.
    d) All unattended excavations shall be properly covered, barricaded, or fenced. Any asphalt concrete pavement, crushed surfacing, gravel base, or water, required for maintaining traffic during the project, shall be placed by the Contractor prior to end of work shift upon request by the City. Steel plates will be allowed if approved by Engineer, and must be secured and supported properly, pinned, shimmed, welded, with cold mix asphalt transitions added to prevent movement and provide smooth transitions to adjacent roadway. Steel plates to be 8’ x 20’ with skid resistant coating unless otherwise approved by the City.
4. Any construction work on a major arterial roadway or within a controlled intersection which will impact the flow of traffic may be required to take place during off-peak hours (8:00 pm to 5:30 am) or on weekend days as determined by the City of Redmond. This work shall also require the assistance of an off-duty police officer for traffic control purposes. The need for City inspection outside of normal working hours (7:00 am to 3:30 pm) may require the Contractor/Owner to reimburse the City for overtime costs in accordance with the Policy on Overtime Rate Reimbursement.
5. The procedure for temporary closure or restriction of any street, road, or highway is subject to Section 10.24.047 of the Redmond Municipal Code.

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1-07.23(2) Construction and Maintenance of Detours

Supplement

There shall always be access to and egress from the properties adjacent to the project. Such access shall be maintained as near as possible to that which existed prior to the commencement of construction. The Contractor shall notify all property owners and tenants of street and alley closures, or other restrictions which may interfere with their access. Notification shall be at least twenty-four (24) hours in advance for residential property, and at least forty-eight (48) hours in advance for commercial property. When the abutting owners' access across right-of-way line is to be eliminated and replaced under the contract by other access, the existing access shall not be closed until the replacement access facility is available.

1-08 PROSECUTION AND PROGRESS

1-08.0 Preliminary Matters

New

1-08.0(1) Preconstruction Conference

New

Prior to the Contractor beginning the work, a preconstruction conference will be held between the Contractor, the Engineer, and such other interested parties as may be invited. One week's notice is required for scheduling pre-construction meetings. For private development projects contact Development Engineering at (425) 556-2760 or (425) 556-2730 to coordinate the meeting. The purpose of the preconstruction conference will be:

1. To review the initial progress schedule;
2. To establish a working understanding among the various parties associated or affected by the work;
3. To establish and review procedures for progress payment, notifications, approvals, submittals, etc.;
4. To establish normal working hours for the work;
5. To review safety standards and traffic control; and
6. To discuss such other related items as may be pertinent to the work.

1-08.0(2) Inspection

New

For private development projects, the Development Engineering Division shall be notified 48 hours prior to starting any type of construction including clearing and grading, sanitary sewers, water mains, fire sprinkler, supply mains, fire standpipes, fire department connections, storm drains, curb and gutters, sidewalks, driveways, street grading and paving or utilities and surface improvements. All inspections shall be scheduled through the EnerGov Inspection Portal. Any questions regarding inspections of private development projects should be coordinated with appropriate inspectors or by calling (425) 556-2760.

1-08.0(3) Hours of Work

New

The Contractor is alerted to the City's Noise Standards RMC 6.36, which includes:

Work hours are limited for activities that exceed the noise standards to the following:

Monday through Friday	7:00 a.m. to 7:00 p.m.
Saturday	9:00 a.m. to 6:00 p.m.

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Sunday or legal holiday	Prohibited

Work not impacting residential areas shall be 7:00 am to 10:00 pm Monday through Saturday. Under extremely limited conditions work hours may be expanded, as approved by the Engineer, for work that cannot be undertaken during standard work hours.

1-10 TEMPORARY TRAFFIC CONTROL

1-10.1 General

Revision

Revise the first paragraph to read:

The Contractor shall provide flaggers, signs, and other traffic control devices. The Contractor shall erect and maintain all construction signs, warning signs, detour signs, and other traffic control devices necessary to warn and always protect the public from injury or damage as a result of the Contractor's operations which may occur on highways, roads, streets, sidewalks, or paths. No work shall be done on or adjacent to any traveled way until all necessary signs and traffic control devices are in place.

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DIVISION 2 - EARTHWORK

2-03.13(A) ACCEPTANCE OF FILL MATERIAL

Supplemental

Projects that import 10 or more cubic yards of fill material must provide proof that fill material is from a WSDOT approved site, create a Source Statement as per RMC 15.24.080.R, or conduct Source Sampling and Analysis. (Guidance for compliance with RMC 15.24.080(r) and 15.24.095, refer to full code for all local requirements. See Appendix 1 for City of Redmond, Fill Material Acceptance Guideline Worksheet.)

2-03.13(B) SOURCE STATEMENT REQUIREMENTS

Supplemental

Source Statements must be prepared by a Washington State licensed geologist or engineer. The preparation and documentation of the source statement shall include:

1. Performance of an onsite visit to view present conditions at the source site (noting evidence of spills, stressed vegetation, hazardous substances or petroleum products usage, or risk of contamination from nearby sources).
2. Evaluation of environmental hazard history of the site. Reviewing federal, state, local records including municipal or county planning, fire, and health files.
3. Interview(s) of knowledgeable person(s) regarding the property history.
4. Examinations of historic aerial photography and maps of the vicinity.
5. Examinations of chain-of-title for Environmental Liens and/or Activity and Land Use Limitations (AULs).
6. Submissions of any ASTM E 1527 Phase 1, ASTM E 1903 Phase 2, and geotechnical reports for the source site.

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2-03.13(C) SOURCE SAMPLING AND ANALYSIS

Supplemental

If Source Statement is not accepted by the City and the project proponent still wishes to use the source site, the following must occur:

- The project proponents will develop for City approval a sampling and analysis plan, to characterize the source of materials. The City will only approve sampling plans that will produce representative sampling and confirmation that source material is not contaminated (see MTCA guidance).
- Sample analysis will include the parameters listed in the table below.
- The City will determine, based on sample results and project proponent sample analysis, if the source material can be imported into the City.

Analyte	Method	Reporting Limit
Gasoline	**NWTPH-Gx**	
Diesel and Oil	**NWTPH-Dx**	
Volatile Organic Compounds (full list)	**EPA 8260B**	**½ the cleanup level**
Semi-Volatile Organic Compounds	**EPA 8270D**	
Total Metals (13 priority pollutant metal list	**EPA 6010B OR EPA 6020**	
Mercury	**EPA 7471A**	
PCBs	**EPA 8082**	
Total Organic Carbon (TOC)	**EPA 9060**	

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DIVISION 3 - PRODUCTION FROM QUARRY AND PIT SITES AND STOCKPILING

There are no amendments or modifications.

DIVISION 4 - BASES

There are no amendments or modifications.

DIVISION 5 - SURFACE TREATMENTS AND PAVEMENTS

5-03 PERVIOUS PAVEMENT REPAIR

Repairs of asphalt and concrete permeable pavements less than 60 square feet shall be made with standard materials (i.e., the repairs will result in impervious pavement). Repairs over 60 square feet shall be installed in kind (i.e., with porous pavement materials).

5-05 CEMENT CONCRETE PAVEMENT

5-05.3 Construction Requirements

5-05.3(11) Finishing

Supplemental

Section 5-05.3(11) is supplemented with the following:

As the finishing machine progresses along the placed concrete, the surface must be given a final finish by texturing with a comb perpendicular to the centerline of the bridge. The texture must be applied immediately behind the finishing machine. The comb must consist of a single row of metal tines capable of producing 1/8-inch wide striations approximately 0.015 foot in depth at approximately 1/2-inch spacing. The combs may be operated manually or mechanically, either singly or in gangs (several combs placed end to end). This operation must be done in a manner that will minimize the displacement of the aggregate particles. The texture must not extend into areas within 2 feet of the curb line. The non-textured concrete within 2 feet of the curb line must be hand finished with a steel or magnesium trowel.

DIVISION 6 - STRUCTURES

There are no amendments or modifications.

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DIVISION 7 - DRAINAGE STRUCTURES, STORM SEWERS, SANITARY SEWERS, WATER MAINS AND CONDUITS

7-01 DRAINS

7-01.2 Materials

Revision

Replace the first paragraph and materials list with the following:

Drain and under drain pipe materials shall be as indicated on the plans. In general, the following materials will be used:

Drain Pipe – Polyvinyl Chloride (PVC) Drain Pipe, 6-inch through 8-inch diameter maximum	9-05.2(6)
Drain Pipe – Solid Wall PVC Storm Sewer Pipe 10-inches and larger	9-05.12(1)
Underdrain Pipe – Perforated Polyvinyl Chloride (PVC) Drain Pipe, 6-inch through 8-inch diameter maximum	9-05.2(6)
Underdrain Pipe – Perforated Solid Wall PVC Storm Sewer Pipe, 10-inches and larger	9-05.12(1)
Tracer Wire	9-30.6(8)

Other materials may be permitted with approval from the City's Stormwater Engineer. Drain and underdrain pipes shall be 6-inch minimum diameter. Flexible tubing shall not be used.

7-01.3 Construction Requirements

Supplement

Add the following:

Installation of drain or underdrain pipe beneath unpaved surfaces where the pipe does not terminate at each end within a drainage structure shall include a tracer wire. The wire shall be installed within twelve (12") inches of the finished surface. Securely attach the wire to the storm drain pipe into which the underdrain connects.

7-02 CULVERTS

7-02.2 Materials

Supplement

Add the following:

Culverts that convey stormwater shall be of materials as noted in Section 7-04 Storm Sewers. Fish-passable culverts may be concrete box culvert, aluminum culvert pipe, or aluminized steel pipe arch.

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7-04 STORM SEWERS

7-04.2 Materials

Revision

Replace the first paragraph and materials list with the following:

Storm sewer conveyance pipe materials shall be as indicated on the plans. The following materials shall be used unless otherwise approved by the Stormwater Engineer:

Standard Installation

Solid Wall PVC Storm Sewer Pipe - 9-05.12(1)

Polypropylene Storm Sewer Pipe – 9-05.24

Dual Wall Corrugated PVC Storm Sewer Pipe – 9-05.12(2) (dual wall only)

Shallow Bury Installation (18” or less of cover)

Ductile Iron Pipe (nonrestrained joint) - 9-30.1(1)

Steep Slope Installation (surface grade application only and requires anchoring system)

Polyethylene (PE) Pressure Pipe - 9-30.1(6)

Larger diameter pipe used for storm sewer flow control or treatment facilities shall be as indicated on the plans. The following materials shall be used unless otherwise approved by the Stormwater Engineer:

Corrugated Polyethylene Storm Sewer Pipe	9-05.20
Polypropylene Storm Sewer Pipe	9-05.24

Note that the pressure testing requirements of 7-04.3(1) apply to both conveyance pipe and to flow control or treatment facilities. Pressure testing of joints may be waived for systems designed to infiltrate.

If patching existing pipe, use the same material.

7-04.3 Construction Requirements

Supplement

Add the following:

The minimum cover over storm sewer pipe from outside top of pipe to finished grade is 18-inches, except ductile iron pipe is 12 inches. Maximum cover for PVC pipe is 15 feet.

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7-04.3(1) Cleaning and Testing

Supplement

Add the following:

Prior to inspection and testing, pipes and storm drain structures shall be cleaned and flushed. Any obstructions to flow within the storm drain system (such as rubble, mortar, and debris) shall be removed at the nearest structure. Obstructions shall not be discharged into receiving waters or wetlands.

Storm Sewer pipe shall be tested using low pressure air test methods in accordance with 7-17.3(2) E or 7-17.3(2) F as appropriate. Thermoplastic storm sewer pipe shall be deflection tested in accordance with 7-17.3(2) G.

7-04.3(1) A General

Supplement

Add the following:

The City revisions to 7-17.3(2) A shall also apply here.

7-04.3(1) B Exfiltration Test – Storm Sewers

Deleted

7-04.3(1) C Infiltration Test – Storm Sewers

Deleted

7-04.3(1) E Low Pressure Air Test for Storm Sewers Constructed of Air-Permeable Materials

Revision

Replace entire paragraph with the following:

Air-Permeable storm sewer pipe shall be tested in accordance with the requirements of 7-17.3(2) E.

7-04.3(1) F Low Pressure Air Test for Storm Sewers Constructed of Non- Air Permeable Materials

Revision

Replace entire paragraph with the following:

Non- air-Permeable storm sewer pipe shall be tested in accordance with the requirements of 7-17.3(2) F. Reaches of thermoplastic pipe containing no joints shall be exempt from testing requirements.

7-04.3(1) G Deflection Test for Thermoplastic Pipe

New

All thermoplastic storm sewer pipe shall be tested in accordance with 7-17.3(2) G.

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7-04.3(1) H Television Inspection

New

All storm sewer pipe shall be subject to television inspection prior to acceptance. Television inspection may be identified at the preconstruction meeting, or later during the project if the inspector has any concerns about the proper installation of the pipe. If television inspection is required by the City, Contractor shall bear all costs incurred in making the inspection and shall bear all costs incurred correcting any deficiencies found during television inspection. Deficiencies that will require pipe removal and replacement include, but are not limited to:

- Visible damage to the pipe.
- Failure of mandrel test.
- Reverse flow.
- Bird baths between pipe joints due to deflected pipe.
- Open joints.
- Foreign material that cannot be removed by other means.

7-04.3(1) I HDPE Fusion Testing

New

High Density polyethylene pipe is subject to conformance testing of fusion welds performed in the field. The Contractor shall ensure the field set-up and operation of the fusion equipment, and the fusion procedure used by the Contractor's fusion operator while on site. Upon request by the Engineer, the Contractor shall verify field fusion quality by making and testing a trial fusion weld. The trial fusion weld shall be allowed to cool completely; then test straps shall be cut out and bent strap tested in accordance with ASTM D 2657. If the bent strap test of the trial fusion fails at the joint, the field fusions represented by the trail fusion shall be rejected. The Contractor shall make all necessary corrections to equipment, set-up, operation and fusion procedure, and shall re-make the rejected fusions at Contractor's expense.

7-04.3(2) Utility Clearances

New

An Ethafoam pad is required for installations where other utilities are closer than 12-inches to provide additional protection between the adjacent utilities. The size of the pad shall be based on the outside diameter (O.D.) of the larger crossing pipe. The pad shall be O.D. long by O.D. wide by 2.5 inches thick minimum or as required to protect the pipes. The pad shall be a strong, resilient, medium-density, closed-cell, polyethylene foam plank (Dow Ethafoam 220, or accepted equivalent.)

7-05 MANHOLES, INLETS, AND CATCH BASINS

7-05.3 Construction Requirements

Supplement

Replace third paragraph as follows:

> The cover or grating of a manhole, catch basin, or inlet shall not be grouted to final grade until the final elevation of the pavement, gutter, ditch, or sidewalk in which it is to be placed has been established, and until permission thereafter is given by the Engineer to grout the cover or grating in place. Covers shall be seated properly to prevent rocking.

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Leveling and adjustment of stormwater manholes and catch basins shall be in accordance with City of Redmond Standard Detail 615.

Add the following to the end of the section:

All catch basins and manholes for storm sewers shall be grouted water tight, including under frames, rims, manhole barrel, riser sections, and pipe collars.

Solid lids in road travel lanes shall be ring and cover.

For stormwater catch basins, vaned grates shall be used on all slopes over five percent and on all public systems. Herringbone grates may be used on flatter slopes in private systems.

For stormwater catch basins and manholes, the first ladder rung, or step shall be between 12 and 18 inches below the rim and shall be reflectorized. A ladder is required for all stormwater catch basins and manholes and shall extend to within 1-foot of the structure bottom. Ladder shall be placed such that it does not impede maintenance access to pipes. If site constraints make it impossible to avoid pipes, the inspector may permit a ladder that hangs from a step to be installed without bolting in place, to allow for future removal to facilitate maintenance access

Mark pavement near catch basins with City-approved public education storm drain marking to indicate that the area drains to a stream, lake, or to the groundwater as appropriate. Marking shall be per Standard Detail 622.

7-05.3(1) Adjusting Manholes and Catch Basins to Grade

Supplement

Add the following:

All manholes and catch basins in asphalt roadway shall be adjusted to grade after final paving operations are complete. The Contractor shall adjust manholes with concrete adjusting rings, mortar, and shims in accordance with the City's standards. Shims shall be Meadow Burke RL-76, or approved equivalent.

7-05.3(2) Abandon Existing Manholes

Revision

Replace this section with the following:

Where it is required that an existing manhole or catch basin be abandoned, the Structure shall be broken down to a depth of at least 4 feet below the revised surface elevation, all connections plugged, and the manhole or catch basin filled with CDF. The ring and cover shall be salvaged, and all other surplus material disposed of.

7-05.3(4) Drop Manhole Connection

Revision

Modify this section by deleting the last sentence and substitute the following:

Ductile iron pipe shall be used for all drop connections and shall be extended to the next upstream manhole.

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7-08 GENERAL PIPE INSTALLATION REQUIREMENTS

7-08.3 Construction Requirements

7-08.3(1) A Trenches

Supplement

Insert the following into paragraph one, after the first sentence:

The length of open trench on streets shall be a maximum of 200 lineal feet.

Add the following to the end of the section:

Final clean-up, including complete restoration of shoulders, cleaning of ditches, shall not exceed 1500 lineal feet behind excavating operations.

Trench construction outside of the roadway (landscaped areas, utility strips, etc.) shall be accomplished as follows:

a. Pipe shall be bedded in granular material meeting section 9-03.9(3) CSTC of the Standard Specifications.

b. Backfill shall be compacted to a minimum of 85% of maximum density as determined by Modified Proctor (ASTM DI557) at or below optimum moisture content using a maximum of one-foot lifts.

c. Topsoil meeting section 8-02.3(4) B shall be placed on all areas requiring seed or sod. Refer to Standard Detail #632 for soil amendment and depth.

7-08.3(2) Laying Pipe

7-08.3(2) A Survey Line and Grade

Revision

Delete the first subparagraph and substitute the following:

Survey line and grade control hubs shall be provided by a survey crew working under the direction of a licensed land surveyor or licensed Engineer and shall be provided by the contractor.

Delete the second subparagraph and substitute the following:

The grade shall be maintained by use of a laser. Grades shall be constantly checked and, in the event the grade is not maintained, work shall be immediately stopped, the Engineer notified, and the cause remedied before proceeding with the work. Any other procedure shall be approved by the Engineer.

7-08.3(2) B Pipe Laying – General

Supplement

Add the following:

All pipe placed along City right-of-way for future installation shall be kept a safe distance from the roadway, sidewalks, and paths and in such a manner as to prevent accidental rolling onto roadway, sidewalk, or path areas.

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7-08.3(2) G Jointing of Dissimilar Pipe

Revision

Delete the paragraph and substitute the following:

There shall be no jointing of dissimilar pipe materials on City mains. If any section of a manhole-to-manhole run is to be ductile iron, the entire pipe run shall be ductile iron. Jointing of dissimilar pipe materials for side sewers shall be made with flexible couplings as specified in Section 9-30.2(7), Bolted, Sleeve-type Couplings for Plain End Pipe.

7-08.3(2) I Side Sewer Connections

Revision

Delete the paragraph and substitute the following:

Side sewers shall connect to a new City main with a tee fitting. Side sewers shall connect to an existing City main with a Romac CB style sewer saddle, Ford sewer tapping saddle, or equal. Side sewers shall connect to manholes only when shown on the project drawings.

7-08.3(3) Backfilling

Revision

Delete the first sentence of the first paragraph and substitute the following:

Placement of pipe zone backfill shall be performed in accordance with these requirements and City of Redmond Standard Details.

Delete the fifth sentence of the fourth paragraph and substitute the following:

All compaction shall be in accordance with the Compaction Control Test of Section 2-03.3(14)D.

Delete the sixth and seventh sentences of the fourth paragraph.

Add the following:

Under paved right-of-way, backfill material above the pipe zone shall be controlled density fill, unless specifically approved by the Engineer. In areas outside of the roadway (landscaped areas, utility strips, paths, and private parking lots, etc.) backfill material shall be Gravel Borrow per Section 9-03.14(1).

7-08.3(4) Plugging Existing Pipe

Revision

Delete the first paragraph and substitute the following:

Where shown in the Plans or where designated by the Engineer, existing pipes shall be cut 1-foot from the existing structure and capped with a water tight mechanical pipe plug. The pipe at the structure shall be removed and the remaining hole filled with brick and mortar. The hole shall be completely sealed to avoid seepage into the structure. Depending on site conditions, alternative methods and/or materials may be required by the Inspector.

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7-09 WATER MAINS

7-09.2 Materials

Revision

Modify this section by deleting the following pipe and fitting materials:

Polyvinyl Chloride (PVC) Pressure Pipe (4 inches and over)

7-09.3 Construction Requirements

7-09.3(2) Ungraded Streets

Revision

Modify the first subparagraph by deleting the words "and as staked ".

7-09.3(5) Grade and Alignment

Revision

Modify the third subparagraph as follows:

"...a minimum cover of 36-inches over the top of the pipe for pipe smaller than 12-inches and 48-inches over the top of the pipe for pipe 12-inches and larger."

7-09.3(10) Backfilling Trenches

Revision

Delete the third subparagraph and substitute the following:

Special construction methods shall be used where a water main crosses within 6-inches of new or existing pipelines or conduits. These methods shall include sand backfill, concrete encasement, dense foam or other methods as directed by the Engineer.

7-09.3(13) A Removal and Disposal of Asbestos Cement Pipe

New

All work shall be done in accordance with the requirements of the Puget Sound Clean Air Agency (PSCAA), the Department of Labor and Industries (L&I) and the Occupational Safety and Health Agency (OSHA). The Contractor shall acquire and follow the requirements of all necessary permits. The Contractor shall remove existing asbestos cement (AC) pipe and appurtenances and dispose of the pipe and appurtenances in an approved manner at a disposal site authorized to accept such waste. Contractor disposing the waste shall provide a copy to the City of the waste shipment record to the approved disposal site.

7-09.3(13) B Asbestos Cement Pipe Crossings

New

Existing asbestos cement (AC) pipe may be required to be removed and replaced with ductile iron when crossed under or over by other utilities or where grading or other construction activities may subject the pipe to damage. AC pipe should be replaced approximately ten feet on each side of the crossing. Refer to 7-09.3(13) A - Removal and Disposal of Asbestos Cement Pipe for additional requirements.

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7-09.3(14) Cutting Pipe

Revision

Modify the paragraph by adding the following:

Cutting of asbestos cement pipe shall conform to all local, state, and federal requirements.

7-09.3(15) Laying of Pipe on Curves

7-09.3(15) A Ductile Iron Pipe

Revision

Modify the second, third, fourth sentences of the first subparagraph by deleting and replacing with the following:

... can be made by deflecting the joints. The contractor shall determine the length of pipe that must be used so that the amount of deflection at each pipe joint shall not exceed one half (1/2) the manufacturer's printed recommended deflections.

7-09.3(15) B Polyvinyl Chloride (PVC) Pipe (4 inches and over)

Deleted

7-09.3(19) Connections

7-09.3(19) A Connections to Existing Mains

Revision

Modify subparagraph five as follows:

If the connection to the existing system involves turning off the water, the City shall be responsible for notifying the residents affected by the shutoff. The Contractor shall coordinate turning off the water with the Engineer and shall give two business days’ notice of intended service interruptions.

7-09.3(19) B Maintaining Service

Revision

Delete the first subparagraph and substitute with the following:

Where existing services are to be abandoned and new services installed which connect to new mains, the contractor shall plan and coordinate its work so that service will be available with the least possible inconvenience to customers. The existing main shall not be abandoned until such time as existing customers are connected to the new main.

7-09.3(19) C Connections to Existing Main -- Wet Tap

New

Connections to the existing water main shall not be made without first making the necessary arrangements with the Engineer in advance. Work shall not be started until all the materials, equipment and labor necessary to properly complete the work are assembled on the site. The tapping tee and valve shall be installed in a horizontal position so that the valve nut is vertical.

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7-09.3(20) Detectable Marking Tape

Revision

Delete the first sentence of the paragraph and substitute with the following:

Detectable marking tape shall be installed where specified and as directed by the Engineer.

7-09.3(23) Hydrostatic Pressure Test

Revision

Modify subparagraph 9 by adding the following:

The pressure loss shall not be greater than 15 psi. Tests on short runs of pipe or fire hydrants shall be 5 minutes and the pressure loss shall not be greater than 5 psi.

Modify subparagraph 13 by adding the following:

The contractor shall schedule the test with the Engineer a minimum of 24 hours in advance of test.

7-09.3(25) Controlled Density Fill

New

Controlled density fill shall be placed full depth and width of trench excavation less any pavement repair section, within the public right-of-way subject to vehicular traffic unless otherwise shown on the plans or directed by the Engineer.

7-12 VALVES FOR WATER MAINS

7-12.1 Description

Supplement

Add the following subparagraph:

Valves shall be installed within 90 calendar days of delivery.

7-12.2 Materials

Revision

Modify this section by substituting the name of the following section:

Tapping Tee.....9-30.3(8)

7-12.3 Construction Requirements

Revision

Modify the fourth sentence, subparagraph 2 as follows:

"... as to be supported by a minimum backfill or by a Styrofoam collar not less ...."

Add the following to the second subparagraph:

A two-foot diameter, 4-inch deep pad of concrete in accordance with Section 5-04, shall be placed around all valve boxes located in unpaved areas unless directed otherwise by the Engineer.

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7-12.3(1) Installation of Valve Marker Post

Supplement

Add the following to the paragraph:

Valve marker posts are required for valves located in unpaved areas, blow off assemblies, and air release/air vacuum valve assemblies. Valves not in right-of-way shall have valve marker posts located as near to the valve as practical in a location as directed by the Engineer.

7-12.3. (2) Adjustment of Water Valve Box

New

New water valve boxes shall be adjusted in accordance with Standard Detail 718.

In the event existing water valve boxes need to be adjusted due to pavement overlay or patching, it is a requirement that each valve box be inspected by the City prior to work commencing. For inspection purposes, the Contractor shall excavate around all valve boxes selected by the Engineer prior to pavement work. Excavation for inspection is anticipated to be a maximum of 36 inches in diameter by 24 inches in depth. The actual excavation will vary depending upon field conditions.

After inspection, and prior to pavement work, valve boxes, as designated by the Engineer, shall receive one or more of the following repairs:

Remove existing valve box and replace with a new valve box meeting the requirements of Section 9-30.3(4) Valve Boxes of the Standard Specifications and be installed in accordance with Standard Detail 718.

Reuse and clear the valve box of all debris and leave the valve in a fully operable condition.

Center valve box. Where the existing valve box is to remain, and is not centered over the valve, the Contractor shall excavate to the water valve and center the valve box over the valve nut.

For each valve box that has been removed or replaced, the Contractor shall install an Ethafoam ring, or approved equal, between the valve box and the water valve as per Standard Detail 718.

Excavation voids resulting from repair or inspection work shall be backfilled with CDF to within 3 inches of finished grade. The top 3 inches shall be Hot Mix Asphalt Class ½” until final paving.

After final paving, valve boxes shall be adjusted to grade. All valve boxes shall be lowered prior to final paving then adjusted to grade after final paving.

Excavation voids resulting from adjustment shall be backfilled with CDF to within 4 inches of finished grade. The top 4 inches shall be Hot Mix Asphalt Class ½”.

The internal nubs on the valve box upper section shall be aligned in the direction of flow of the water main. The Contractor shall assure the valve box remains clear of all debris and the valve nut is accessible.

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7-14 HYDRANTS

7-14.3 Construction Requirements

7-14.3(1) Setting Hydrants

Revision

Modify subparagraph one as follows:

"...a minimum 4-foot radius unobstructed..."

Modify subparagraph four as follows:

"...be painted with two coats of first quality industry quick dry enamel or approved equal. Do not paint Storz Adaptor."

7-14.3(2) A Hydrant Restraints

Revision

Delete this paragraph in its entirety and substitute with the following:

Hydrant laterals shall be restrained in accordance with paragraph 9-30.2(6).

7-14.3(2) B Auxiliary Gate Valves and Valve Boxes

Revision

Delete this section in its entirety and substitute the following:

Auxiliary gate valves and valve boxes shall be installed in accordance with Section 7-12. End connections shall be as shown on the standard plan and shall be compatible with the restraint system.

7-14.3(2) C Hydrant Guard Posts

Revision

Delete the second sentence of the paragraph.

7-14.3(3) Resetting Existing Hydrants

Revision

Delete this section in its entirety and substitute with the following:

Resetting of existing hydrants shall not be allowed. Hydrant assembly shall be constructed as shown on the plans or as directed by the Engineer with all new material. Removed hydrants shall be delivered to the City maintenance and operation facility.

7-14.3(4) Moving Existing Hydrants

Revision

Delete this section in its entirety and substitute the following:

Moving existing hydrants shall not be allowed. Hydrant assembly shall be constructed as shown on the plans or as directed by the Engineer with all new material. Removed hydrants shall be delivered to the City maintenance and operation facility.

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7-14.3(5) Reconnecting Existing Hydrants

Revision

Delete this section in its entirety and substitute the following:

Reconnecting of existing hydrants shall not be allowed. Hydrant assembly shall be constructed as shown on the plans or as directed by the Engineer with all new material. Removed hydrants shall be delivered to the City maintenance and operation facility.

7-15 SERVICE CONNECTIONS

7-15.1 General

Revision

Add the following to the paragraph:

This section includes abandonment of service connections.

7-15.2 Materials

Revision

Add the following materials:

Tracer Wire.....9-30.6(8)

7-15.3 Construction Requirements

Revision

Modify the first and second sentence of subparagraph one as follows:

All service connections to water mains shall be made using saddles and shall be of the size and type suitable for use with the pipe being installed.

Modify subparagraph two as follows:

Excavating and backfilling for service connections shall be as specified in Section 7-09, except that the service pipeline shall be installed under pavement, curbs, and sidewalks by boring methods when required in the Plans or Special Provisions. Additionally, the contractor may use boring methods at its option.

Delete the last sentence of the fourth subparagraph and substitute with the following:

The Contractor shall coordinate service interruptions with the Engineer and shall give two business days' notice of intended service interruptions.

Add the following paragraphs:

Service connections shall be constructed in accordance with the City of Redmond Standard Details. A blue tracer wire shall be connected to the main to make it electrically continuous and extended to the setter. Use fabricated spacers to install the setters the correct distance apart. All meter boxes shall be in unpaved areas unless otherwise shown.

Abandonment of service connections at the water main shall be accomplished by one of the following methods:

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1. Remove the water service line, corporation stop, and saddle. Repair water main with a stainless-steel repair band.

2. For direct taps, remove the water service line and corporation stop. Repair water main with a stainless-steel repair band.

3. Remove existing section of water main and replace with new ductile iron pipe. Connect to existing main with couplings.

The method of abandonment shall be as specified by the Engineer.

7-17 SANITARY SEWERS

7-17.2 Materials

Revision

Modify the first subparagraph by deleting the following pipe materials:

Vitrified Clay Sewer Pipe
ABS Composite
Polypropylene

Modify the fourth subparagraph by deleting the following pipe materials:

Vitrified Clay Sewer Pipe	9-05.8
ABS Composite Sewer Pipe	9-05.14
Polypropylene Sewer Pipe	9-05.25

7-17.3(2) Cleaning and Testing

7-17.3(2) A General

Revision

Delete the first subparagraph and substitute the following:

Sewers and appurtenances shall be cleaned after backfilling and prior to testing. Testing of sewer mains shall be by the low-pressure air test method.

Modify the second subparagraph as follows:

"... perform the tests under the direction of and in the presence..."

Add the following to the fourth subparagraph:

All side sewers constructed in combination with a sewer main shall be tested at the same time as the sewer main.

7-17.3(2) B Exfiltration Test

Deleted

7-17.3(2) C Infiltration Test

Deleted

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7-17.3(2) E Low Pressure Air Test for Sanitary Sewers Constructed of Air Permeable Materials

Revision

Modify the first subparagraph by deleting the words “and vitrified clay.”

7-17.3(2) F Air Pressure Test for Sanitary Sewers Constructed of Non-Air Permeable Materials

Revision

Modify the first subparagraph by deleting the words “ABS composite.”

7-17.3(2) H Television Inspection

Revision

Modify the first subparagraph by deleting the words “owner of the sanitary sewer” and substituting the word “City” for CIP projects and “Developer” for development projects.

7-18 SIDE SEWERS

7-18.3 Construction Requirements

7-18.3(5) End Pipe Marker

Revision

Delete this paragraph and substitute with the following:

> The location of the end of side sewers shall be marked by the contractor with a 2” x 4” wooden stake and green tracer wire as shown in the Standard Detail 832.

7-18.3(6) Abandonment of Existing Side Sewer

New

Abandonment of side sewers at the sewer main shall be accomplished by one of the following methods:

1. Capping the side sewer at the tee on the main, or;
2. Capping the side sewer as shown on the approved construction drawings.
3. For approved projects or projects going through the City’s permitting system, capping the side sewer at the property line is acceptable on a temporary basis.

7-19 SEWER CLEANOUTS

7-19.3 Construction Requirements

Supplement

Add the following to the third subparagraph:

> Cleanouts shall be extended to grade for all projects except a single-family residential side sewer located on the property being served. All cleanouts extended to grade shall be as

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shown in the Standard Detail 810. Cleanout castings shall be East Jordan Iron Works #00367502 or approved equal.

7-20 LARGE METER INSTALLATIONS

New

7-20.1 General

New

This work consists of installing the service connection from the water main to the customer's service meter. Service connections for commercial users, as well as residential users, are included. This section includes meter sizes greater than 2-inch.

7-20.2 Materials

New

Materials shall meet the requirements of the following sections:

Controlled Density Fill	7-09.3(25)
Ballast	9-03.9(1)
Crushed Surfacing Top Course	9-03.9(3)
Bank Run Gravel for Trench Backfill	9-03.19
Drain/Storm Sewer Pipe	9-05
Ductile Iron Pipe	9-30.1(1)
Ductile Iron Pipe Fittings	9-30.2(1)
Restrained Joints	9-30.2(6)
Flanged Coupling Adapters	9-30.2(8)
Gates Valves	9-30.3(1)
Precast Concrete Vaults	9-30.4(4)
Adjustable Pipe Support	9-30.4(12)
Painted Surfaces	9-30.4(14)
Post Indicator Valve	9-30.4(16)
Meters	9-30.6(9)

7-20.3 Construction Requirements

New

The excavation for vaults shall be sufficient to leave 1-foot clear between the outer surfaces of the vault and the trench wall. If the material in the bottom of the trench is unsuitable for supporting the vault, remove the unsuitable material as directed by Engineer and replace with ballast. Set the vault to the grade and location shown on the plans. The meter vaults shall be installed plumb and level on the crushed surfacing base pad shown on the plans.

All vault openings shall be blocked out prior to casting. No field cutting shall be allowed without prior approval of the Engineer. Pipe, fittings and fixtures shall be installed and located as shown on the plans, with types of mountings indicated in the specifications. Make sure fixtures are thoroughly clean and free of any foreign material. Connections shall be made so as to be water tight. Flush and disinfect as specified. Furnish all required personnel and equipment and make all tests required to demonstrate the integrity of the finished installation to the approval of the

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city. Exposed pipe, fittings, valves, and accessories within the vault shall be painted. See Paragraph 9-30.4(14), Painted Surfaces.

Excavation for the meter vaults and piping shall be in accordance with Section 7-09.

Installation, testing, and disinfection of pipe and fittings shall be in accordance with Section 7-09. Installation of valves shall be in accordance with Section 7-12.

Where the City has determined large meter, vaults are unable to be served by a gravity drain system and a pumped system is necessary, the Liberty 287 VMF ½ hp sump pump, or approved equal, shall be installed. Special easements and agreements shall apply and be executed prior to construction drawing approval.

Backfill shall be borrow structural fill material placed and compacted to 95% in accordance with Section 7-09.

Surface restoration shall be in accordance with Section 8-01 or 8-02, as applicable.

7-21 PRESSURE REDUCING VALVE STATION

New

7-21.1 General

New

This work consists of installing pressure reducing valve (PRV) stations at locations as shown on the plans. The station shall be adjusted to control downstream pressure as determined by the Engineer.

7-21.2 Materials

New

Materials shall meet the requirements of the following sections:

Controlled Density Fill	7-09.3(25)
Ballast	9-03.9(1)
Crushed Surfacing Top Course	9-03.9(3)
Bank Run Gravel for Trench Backfill	9-03.19
Precast Concrete Catch Basin	9-12.5
Ductile Iron Pipe	9-30.1(1)
Fittings	9-30.2
Gate Valves	9-30.3(1)
Air Release/Vacuum Valve	9-30.3(7)
Precast Concrete Vault	9-30.4(4)
Pressure Reducing Valve	9-30.4(6)
Pressure Relief Valve	9-30.4(7)
Pressure Gauge Assembly	9-30.4(8)
WYE Strainer	9-30.4(9)
Adjustable Pipe Supports	9-30.4(12)
Painted Surfaces	9-30.4(14)

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7-21.3 Construction Requirements

New

The excavation for vaults shall be sufficient to leave 1-foot clear between the outer surfaces of the vault and the trench wall. If the material in the bottom of the trench is unsuitable for supporting the vault, remove the unsuitable material as directed by Engineer and replace with ballast. Set the vault to the grade and location shown on the plans.

All vault openings shall be blocked out prior to casting. No field cutting shall be allowed without prior approval of the Engineer. Pipe, fittings and fixtures shall be installed and located as shown on the plans, with types of mountings indicated in the specifications. Make sure fixtures are thoroughly clean and free of any foreign material. Connections shall be made so as to be water tight. Flush and disinfect as specified. Furnish all required personnel and equipment and make all tests required to demonstrate the integrity of the finished installation to the approval of the city. Exposed pipe, fittings, valves, and accessories within the vault shall be painted. See Section 9-30.4(14), Painted Surfaces.

Excavation for the PRV stations and piping shall be in accordance with Section 7-09.

Installation, testing, and disinfection of pipe and fittings shall be in accordance with Section 7-09. Installation of valves shall be in accordance with Section 7-12.

Where the City has determined PRV stations are unable to be served by a gravity drain system and a pumped system is necessary, the Liberty 287 VMF ½ hp sump pump, or approved equal, shall be installed. Special easements and agreements shall apply and be executed prior to construction drawing approval.

Backfill shall be borrow structural fill material placed and compacted to 95% in accordance with Section 7-09.

Surface restoration shall be in accordance with Section 8-01 or 8-02, as applicable.

7-22 BIORETENTION

New

7-22.1 Description

New

This Work shall consist of constructing bioretention cells (swales or planters) intended to receive stormwater runoff. This work typically includes:

1) protection of subgrade from compaction and silt laden runoff during construction;
2) excavation of subgrade;
3) in some cases, a geomembrane may be required for groundwater protection;
4) in some cases of poorly draining subgrade or if required by the drawings, placement of Bioretention Underdrain Gravel and Slotted Underdrain Pipe;
5) placement of Bioretention Soil Mix;
6) planting the plants;
7) placement of Screened Wood Chip Mulch; and
8) protection of the bioretention cell while the Project Site is stabilized.

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7-22.2 Materials

New

Materials shall meet the requirements of the following special provisions:

Screened Wood Chip Mulch	9-14.4(8) E
Bioretention Soil Mix	9-14.1(4)
Bioretention Compost	9-14.4(8) C
Bioretention Coconut Fiber	9-14.4(8) D
Bioretention Mineral Aggregate	9-03.12(7)
Bioretention Underdrain Gravel	9-03.12(6)
Slotted Underdrain Pipe	9-05.2(9)
Geomembrane	7-22.3(2) B

7-22.3 Construction Requirements

New

7-22.3(1) General

New

Bioretention cells are especially susceptible to failure due to compaction of subgrade and/or the introduction of silt-laden construction runoff. Runoff shall not be allowed to enter the bioretention cell (before or after Bioretention Soil Mix installation) until authorization is given by the Engineer. The Contractor shall include proposed methods to prevent silt laden construction runoff in the Temporary Erosion and Sedimentation Control (TESC) Plan.

The laboratory used by the Contractor for testing shall be a Washington State Department of Ecology accredited laboratory with current and maintained certification (Seal of Testing Assurance (STA), AASHTO, ASTM or other standards organization, or as designated in the contract). The testing laboratory shall be accredited to perform all tests to the standards specified and shall provide test results with an accompanying Manufacturer's Certificate of Compliance. All reporting shall include test methods and quality assurance data as specified by the method.

7-22.3(1) A Submittals for Bioretention

New

Contractor shall provide submittals for the following materials proposed to be installed:

- Bioretention Soil Mix: Sample (5-gallon bucket); Lab Analysis
- Bioretention Underdrain Gravel: Sample (5-gallon bucket); Lab Sieve Analysis
- Screened Wood Chip Mulch: Description of source; Sample (5-gallon bucket); Lab Sieve Analysis
- Geomembrane: Manufacturer Data

At least 10 working Days prior to placement of Bioretention Soil Mix, the Contractor shall submit to the Engineer the following in accordance with Section 1-06:
For Bioretention Underdrain Gravel, provide laboratory analysis as follows:

Parameter	Method	As Specified
Gradation	ASTM D422	9-03.12(4)

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For Bioretention Mineral Aggregate, provide laboratory analysis as follows:

Parameter	Method	As Specified
Gradation	ASTM D422	9-03.12(5)

For Bioretention Compost (if used), provide laboratory analysis as follows:

Parameter	Method	As Specified
Carbon: Nitrogen	TOC – TMECC 04.01 TKN – TMECC 04.02D	9-14.4(8)
Gradation	TMECC 02.02-B	9-14.4(8)
pH	TMECC 04.11-A	9-14.4(8)
Inert Material	TMECC 03.08-A	9-14.4(8)
Organic Content	TMECC 05.07A	9-14.4(8)

For Bioretention Soil Mix, provide laboratory analysis as follows:

Parameter	Method	As Specified
Organic Matter Content	TMECC 05.07A or ASTM D 2974	9-14.1(4)
Cation Exchange Capacity	EPA 9081	9-14.1(4)
Dissolved Copper	EPA 200.8	9-14.1(4)
Dissolved Zinc	EPA 200.8	9-14.1(4)
Nitrate-Nitrite	EPA 353.2	9-14.1(4)
Total Phosphorous	EPA 365.2	9-14.1(4)

For Screened Wood Chip Mulch, provide laboratory analysis as follows:

Parameter	Method	As Specified
Gradation	TMECC 02.02-B	9-14.4(9)

Also provide the following:

1. A five (5) gallon sample of the Bioretention Soil Mix
2. A five (5) gallon bucket of the arborist wood chip mulch.
3. The Manufacturer's Certificate(s) of Compliance per Section 1 -06.3 accompanying the test results from the Supplier of the Bioretention Soil Mix and its components.
4. List of feed stock by percentage for the Bioretention Compost.

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5. The Suppliers (if different) of the mineral aggregate and compost components, including their name(s) and address(es);

6. A written description of the equipment and methods to mix the Bioretention Mineral Aggregate and Bioretention Compost to produce Bioretention Soil Mix.

7. The following information about the testing laboratory(ies):

    a. name of laboratory(ies) including contact person(s),
    b. address(es),
    c. phone contact(s),
    d. e-mail address(es);
    e. qualifications of laboratory and personnel including date of current certification by STA, ASTM, AASHTO, or approved equal.

8. A copy of the Solid Waste Handling Permit issued to the Bioretention Compost supplier by the Jurisdictional Health Department as per WAC 173-350 (Minimum Functional Standards for Solid Waste Handling).

9. The Bioretention Compost supplier shall verify in writing and provide lab analyses that the Materials comply with the processes, testing, and standards specified in WAC 173-350 and these Specifications. An independent STA Program certified laboratory shall perform the analysis.

10. A copy of the Bioretention Compost producer's current STA certification as issued by the U.S. Composting Council.

A second sample and Supplier information, for comparison by the Engineer with Bioretention Soil Mix and delivery tickets actually delivered during the project, shall be maintained by the Contractor at the project site as follows:

1. A 5-gallon sample of the same mixed Bioretention Soil Mix; and

2. A copy of the names and address of Supplier(s) of the mixed Bioretention Soil Mix, aggregate and compost components

3. The test results submitted for the mixed Bioretention Soil Mix, the Mineral Aggregate, and the compost, along with the accompanying Manufacturer's Certificate of Compliance.

If the source of any Material included in the Bioretention Soil Mix design changes, including compost stock pile, then a new submittal for Bioretention Soil Mix design shall be submitted.

7-22.3(2) Bioretention Cells and Earth Berms

New

Bioretention cells and earth berms shall be constructed as shown on the Drawings.

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7-22.3(2) A Grading and Placement for Bioretention Cells

New

Grading and placement for bioretention cells shall be performed as follows:

1. The Contractor shall not start bioretention cell grading until the Project Site draining to the bioretention area has been stabilized and authorization is given by Engineer. No heavy equipment shall operate within the cell or earth berm perimeter once bioretention cell excavation has begun, including during excavation, backfilling, tree pit preparation, mulching, or planting. At the locations shown on the Drawings, bioretention cells shall be excavated to accommodate the placing of materials as shown on the Drawings. There shall be no grading within the dripline of trees to be retained, unless otherwise specified in the Drawings. The Contractor shall notify the Engineer of conflicts with tree protection standards and/or other site conditions prior to proceeding with the Work. The Contractor shall provide the Engineer the opportunity to inspect the excavation prior to placement of any material or subgrade soil scarification.

2. After excavation to subgrade, if any sediment laden runoff has entered the cell, the sediment deposition shall be removed by over excavating the cell by a 3-inch minimum and replacing it with 3-inches of Gravel Backfill for Bioretention Underdrains, at the Contractor’s expense.

3. The Contractor shall scarify the surface of the prepared subgrade to a minimum depth of 3 inches prior to placement of Bioretention Soil Mix or Gravel Backfill for Bioretention Underdrains.

4. If applicable, after placement of Bioretention Underdrain Sand, if any sediment laden runoff has entered the cell, the sediment deposition shall be removed by excavating Bioretention Underdrain Sand in the cell by a 3-inch minimum and replacing it with clean Bioretention Underdrain Sand, at the Contractor’s expense.

5. The Contractor shall place Bioretention Soil Mix loosely upon a prepared subgrade (or upon Type – 26 Sandy Gravel if an underdrain is specified) in accordance with these Specifications and in conformity with the lines, grades, depth, and typical cross-section shown in the Drawings or as established by the Engineer.

6. Locations and grading requirements to support new plants as a component of the bioretention system shall be per the drawings or as directed by the Engineer. Planting will be field marked by the Engineer when identified as “field locate by the Engineer” on the Drawings. Provide advance notice for Engineer to locate plantings per Section 8 -02.3(7).

7. Prior to placement of Screened Wood Chip Mulch in each cell, the Contractor shall notify the Engineer to inspect the bioretention cell. If any sediment laden runoff has entered the cell, the Contractor shall remove the top 3 inches of Bioretention Soil Mix and replace with Bioretention Soil Mix per design, at the Contractor’s expense.

No materials or substances shall be mixed or dumped within the cell or earth berm area that may be harmful to plant growth or prove a hindrance to the planting or maintenance operations.

The finished elevation shall be one (1) inch below walks, curbs, pavements and driveways, unless adjacent to a bermed area, or otherwise specified. Upon completion of finish grading work, all excess Material shall be removed from the Project Site and disposed of accordingly.

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7-22.3(2) B Bioretention Geomembrane Liner

New

When shown on the drawings, a geomembrane liner shall be installed below the Bioretention Underdrain Gravel. Geomembrane liners shall be impermeable, high density polyethylene (HDPE), UV resistant, and have a minimum thickness of 30 mils. Geomembrane shall be bedded and anchored according to manufacturer's recommendations. Underdrain pipes and all other punctures in liner will be booted/sealed water tight by an approved liner installation company.

7-22.3(2) C Slotted Underdrain Pipe

New

Slotted underdrain pipes should be sloped at a minimum of 0.5 percent unless otherwise specified by an engineer.

Unless otherwise specified, a 6-inch rigid non-perforated observation pipe or other maintenance access with a cap should be connected to the slotted underdrain pipe every 250 to 300 feet to provide a clean-out port, as well as an observation well to monitor dewatering rates.

7-22.3(2) D Grading for Earth Berm

New

The Contractor shall construct earth berms in accordance with these Specifications and in conformity with the lines, grades, depth, and typical cross-section shown in the Drawings or as established by the Engineer.

Prior to the placement of Screened Wood Chip Mulch, the Contractor shall notify the Engineer one (1) Working Day in advance for approval of finished grading.

7-22.3(3) Bioretention Soil Mix Placement

New

Bioretention Soil Mix shall be protected from all sources of additional moisture at the Supplier's site, in covered conveyance, and at the Project Site until incorporated into the Work.

The Contractor shall not place Bioretention Soil Mix until the Project Site draining to the bioretention area has been stabilized and authorization is given by Engineer.

Soil placement and consolidation shall not occur when the Bioretention Soil Mix is excessively wet.

Mixing or placing Bioretention Soil Mix shall not be allowed if the area receiving Bioretention Soil Mix is frozen, excessively wet or saturated or has been subjected to more than 1/2-inch of precipitation within 48-hours prior to mixing or placement. The Engineer will have final authority to determine if wet or saturated conditions exist.

The Contractor shall not place Bioretention Soil Mix until the soil mix delivery ticket(s) have been reviewed and accepted by the Engineer. At first delivery of Bioretention Soil Mix, and for deliveries thereafter as determined by the Engineer, the Contractor will make available to the Engineer:

1. The 5-gallon sample of Bioretention Soil Mix described in 7 -22.3(1) A SUBMITTALS, for comparison with the delivered soil.

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2. The Manufacturer's Certificate(s) of Compliance and test results described in 7 -22.3 (1) A SUBMITTALS, for comparison with the delivery tickets to verify the Suppliers.

3. Access to the delivered Bioretention Soil Mix, before placement, to verify that it is homogeneously mixed and matches the submitted sample.

The Engineer may stop Bioretention Soil Mix delivery and placement if the Engineer determines that the delivered soil does not appear to match the submittals, and require sampling and testing of the delivered soil, before authorizing Bioretention Soil Mix placement.

Place Bioretention Soil Mix specified for landscape areas loosely. Final soil depth shall be measured and verified only after the soil has been water consolidated, which requires filling the cell with water in a controlled manner, without creating any scour or erosion, to at least 1 inch of ponding. Do not allow uncontrolled runoff from adjacent impervious areas to enter cells. Repeat until final depth is achieved.

Place Bioretention Soil Mix specified for berm areas in loose lifts. Lightly compact Bioretention Soil Mix (only in berm areas) to a maximum relative compaction of 85 percent of modified maximum dry density (ASTM D 1557)

After placement of Bioretention Soil Mix, and before planting or mulching, the Contractor shall notify the Engineer at least one (1) Working day in advance, so that the Engineer can perform compaction testing.

Rake soil to final grade. Cell shall be approved by Engineer prior to planting.

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DIVISION 8 - MISCELLANEOUS

8-01 EROSION CONTROL AND WATER POLLUTION CONTROL

8-01.3(9) D Inlet Protection

Supplement

Only inlet devices with large overflow bypass openings are approved for below inlet grate protection. Inspector may require removal of inlet protection during large storm events to prevent flooding.

8-20 ILLUMINATION, TRAFFIC SIGNAL SYSTEMS, AND ELECTRICAL

8-20.1 Description

Supplement

The work associated with the traffic signal system consists of furnishing, installing and field testing of a fully equipped NEMA TS2, Type 1, “P” controller cabinet, service cabinet, and a fully functional traffic signal system including foundations, traffic signal and pedestrian poles, vehicle and pedestrian signal heads, pedestrian push buttons, luminaries on mast arm poles, emergency vehicle detectors, junction boxes, conduit, conductors, and other incidental materials as may be required to comply with the Plans and these Specifications.

Work associated with the illumination system consists of furnishing and installing foundations, conduit, wire, junction boxes, decorative and standard poles, decorative and standard luminaries, and service cabinets (if not served from a signalized intersection).

8-20.1(1) Regulations and Code

All materials and methods required under this section, unless otherwise superseded herein, shall conform to the latest edition of the Washington State Department of Transportation Standard Specifications for Road, Bridge, and Municipal Construction and Amendments (herein referred to as Standard Specifications), to all current amendments to the Standard Specifications, to the latest edition of the State of Washington Standard Plans for Road, Bridge, and Municipal Construction (herein referred to as the Standard Plans), to the State of Washington Sign Fabrication Manual, to the City of Redmond Standard Specifications and Details, to the latest edition of the National Electric Code (NEC), and to the current edition of the Manual on Uniform Traffic Control Devices (MUTCD) as adopted by the State of Washington.

8-20.1(3) Restrictions on the Schedule of Work

New

A. Mast Arm Erection.

   Mast arms shall not be erected more than 14 calendar days prior to the signal system being turned on.

B. Signal Head Installation.

   The vehicle and pedestrian signal heads and push buttons shall be covered immediately with “Out of Service” bags upon installation and shall remain covered until the signal is turned on.

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C. Work in Roadway.

The roadway shall be kept open to traffic at all times, except when specific tasks required by this Contract require construction in the roadway. All work within the traveled way of any roadway shall be limited to the hours between 9 a.m. to 3 p.m. Work shall be accomplished such that at least 1 lane of traffic is open in each direction on every leg during working hours, except for mast arm erection. Exceptions to this will require a 3-day advance approval from the Engineer and approval of a special traffic control plan to be developed by the Contractor.

D. Traffic Control during Construction.

The Contractor shall submit a detailed traffic control plan and obtain approval from the Engineer prior to roadway trenching, erection of mast arms, installation of induction loops, and other activities requiring lane closures or detours. During traffic interruptions, traffic will be controlled by qualified flag persons unless otherwise specified.

During the erection of mast-arm assemblies, the Contractor, with the authorization of the Engineer, may block all traffic lanes for a maximum of 5 minutes between 9 and 11 a.m. on any day of the week. Work performed on Saturday, Sunday, or holidays require the presence of a City inspector.

Unless otherwise approved by the Engineer, the Contractor shall furnish an off-duty police officer for traffic control during all roadway work performed at night, for all roadway work performed within 150 feet of an intersection, and for all other conditions where the Engineer deems it necessary for safety. The off-duty police officer shall be in addition to all other personnel required for flagging.

E. Traffic Signal Turn-On

Prior to schedule of turn-on, City electrical inspector must approve all work, and a copy of the Electrical Permit shall be posted in the service cabinet.

Before the controller is connected and the traffic signal made operational, the Contractor shall perform all field tests specified in Section 8-20.3(11) of the Standard Specifications, these Special Provisions, and the Redmond Traffic Signal Construction Checklist.

Once all work has been completed for the installation of the traffic signal or illumination system, the Contractor shall notify the City of Redmond Traffic Engineer that the system is ready for Turn-On. Such notice shall not be given until all work has been completed and the Redmond Traffic Signal Construction Checklist has been completed and signed by the City inspector. The Redmond Traffic Signal Construction Checklist will be provided to the Contractor at the pre-construction conference.

The Traffic Engineer will then have up to 10 working days to completely check the operation of the system. Any deficiencies noted during the check shall be immediately corrected by the Contractor.

When the system check is satisfactory to the Traffic Engineer, the signal will be turned on by the City with the heads still covered. This operation will occur on a week end. If the system functions properly for this period, the Contractor will return to the

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site the following week on the official turn-on date to uncover and align the signal heads.

The official signal turn-on shall not be allowed on Mondays, Fridays, weekends, holidays, and the weekday immediately before and after a holiday. Signal turn-on shall be completed between the hours of 9 a.m. and 2 p.m. on the day of the turn-on.

The signal turn-on shall be by the City of Redmond Traffic Engineer. A City of Redmond Traffic Engineer or his representative shall enter all signal-timing parameters as supplied by the Traffic Engineer and shall certify the intersection is operating and functioning in accordance with the specifications. The Contractor shall be present during the turn-on with adequate equipment to repair any deficiencies in operation.

F. Flashing Beacon, Speed Radar Sign, and RRFB Turn-On

Prior to schedule of turn-on, an electrical inspection must be passed with a copy of the Electrical Permit.

Once all work has been completed for the installation of the system, the Contractor shall notify the City of Redmond Traffic Engineer that the system is ready for Turn-On. The Contractor shall set programming as directed by the Engineer.

All electrical components such as traffic signal cabinets, speed radar signs, RRFBs, school-zone flashers, etc., shall not be installed in the field before service cabinet is energized by Puget Sound Energy.

The Traffic Engineer will then have up to 7 calendar days to completely check the operation of the system. Any deficiencies noted during the check will be immediately corrected by the Contractor.

When the system check is satisfactory to the Traffic Engineer, the system will be turned on by the City.

G. Permits

The Contractor will be responsible for coordinating, obtaining, and paying for all permits necessary to complete this work in a timely fashion. An electrical permit shall be obtained before beginning trench excavation.

8-20.1(4) Errors and Omissions

New

The Contractor shall immediately notify the Engineer upon discovery of any errors or omissions in the Contract Documents, in the layout as given by survey points and instructions, or of any discrepancy between the Contract Documents and the physical conditions of the locality. If deemed necessary, the Engineer shall rectify the matter and advise the Contractor accordingly. Any work done after such discovery without authorization by the Engineer will be done at the Contractor's risk.

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8-20.1(5) Warranties

New

The Contractor shall provide a warranty for all material to be furnished under this Bid for a period of 1 year, unless otherwise specified, from the date of actual turn-on. The warranty shall apply to all material including those items not manufactured by the Contractor.
The warranty shall provide that all material at the time of delivery shall be free from defects in material and workmanship and shall be fit for the uses set forth in these Specifications.
The warranty shall assign responsibility to the Contractor for all costs of replacement or repair of defective materials except those materials supplied by the City. Replacement or repair shall be made within 5 working days following notification of a discrepancy.

8-20.2 Materials

Supplement

The Engineer reserves the right to inspect the manufacturing process of all materials. Final inspection and acceptance of the installed materials will not be given until final installation and testing has been completed on the systems. Approval to install materials and equipment must be obtained from the Engineer at the job site before installation.

8-20.2(1) Equipment and Qualifications Submittals

Revised

Manufacturer's technical information shall be submitted for all poles, mast arms, wire, splice kits, conduit, junction boxes, control equipment, cabinets, audible pedestrian button system, fiber equipment, CCTV cameras, RRFB, speed radar, mounting hardware and all other items to be used on the Project. All approvals by the Engineer must be received by the Contractor before material will be allowed on the job site.

Illumination, Traffic Signal Systems and Electrical Installer's Qualifications Data:

The persons installed the work for this section and their supervisor shall be personally experienced in roadway illumination systems and shall have been engaged in the installation of streetlight systems for a minimum of 3 years. Qualifications shall be submitted to the Engineer at least 30 calendar days prior to the start of the illumination systems for approval of qualifications.

1. The contractor shall submit the name of each licensed electrician who will be performing the work and their employer's name, business address and telephone number.

2. The contractor shall submit the name, address, and contact information of five similar projects that the foregoing people have worked on during the past 3 years.

The Engineer shall have 14 calendar days to review information for each submittal that is made.

Approval of shop drawings does not constitute final acceptance or guarantee of the material but is solely to assist the Contractor in providing the specified materials.

All shop drawings for street light poles, including concrete and decorative, that are not listed on the WSDOT Pre-Approved plans shall be stamped by a registered civil or structural engineer.

All materials to be approved for the signal and illumination systems shall be submitted in a single package.

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8-20.2(2) Fiber Optic Cable Submittals

New

Submit the product data, samples, and qualification submittals specified below in one package at the same time.

A. Product Data:

1. Catalog sheets, specifications and installation instructions for all products.
2. Complete manufacturer's construction details and specifications for the cables. Include for each type of cable:
    a. Physical and optical characteristics of the optical fibers including cable manufacturer's certified test data (attenuation, bandwidth).
    b. Physical characteristics of strength members, and jackets.
    c. Maximum pulling strain allowed.
    d. Crush resistance.
    e. Overall dimension of cable.

B. Splicing and termination data, including the following:

1. List of materials.
2. Method of connecting cables.
3. Details of cable preparation.
4. Method of applying materials, including quantities.
5. Written statement from cable manufacturer that splices and terminations submitted are acceptable for use with their cable.
6. Written statement from splicing/termination manufacturer that the connectors submitted are suitable for the proposed application.
7. Written statement from cable manufacturer that the cable breakout and splitter kits submitted are acceptable for use with their cable.
8. Written statement from cable manufacturer indicating recommended pulling compounds.

C. Cable Installer's Qualifications Data: The persons installing the Work of this Section and their Supervisor shall be personally experienced in optical fiber cable systems and shall have been engaged in the installation of optical fiber cable systems for a minimum of 3 years. Qualifications shall be submitted to the Engineer at least 30 calendar days prior to the start of fiber installation for approval of qualifications.

1. The Contractor shall submit the name of each person who will be performing the Work and their employer's name, business address and telephone number.

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2. The Contractor shall submit the name and addresses of 5 similar projects that the foregoing people have worked on during the past 3 years.

D. Cable Splicer's Qualifications Data: Personnel that have at least three years field experience in single-mode fiber optic cable splicing shall accomplish all cable splicing. Qualifications shall be submitted to the Engineer at least 30 calendar days prior to the splicing for approval of qualifications.

1. Name of each person who will be performing the Work and their employer's name, business address and telephone number.

2. All information required showing that the experience criteria have been met.

3. List of Completed Installations: If brand names other than those specified are proposed for use, furnish the name, address, and telephone number of at least 5 comparable installations that can prove the proposed products have operated satisfactorily for one year.

8-20.2(3) Contracting Agency-Supplied Materials

New

The Contractor shall notify the Engineer at least two weeks in advance of the approximate date the Contracting Agency-supplied materials are required. The Contractor shall contact the City again two working days prior to schedule exact day and time for pick-up.

Contracting Agency-supplied materials will be available for pick up at:

Contact: Redmond Traffic Signal Technician, (425) 556-2830
City of Redmond Traffic Signal Lab
Redmond City Hall
15670 NE 85th Street
Redmond WA 98052

8-20.3 Construction Requirements

8-20.3(2) Excavating and Backfilling

Supplement

Underground utilities of record will be shown on the construction plans insofar as information is available. These, however, are shown for convenience only and the City assumes no responsibility for improper locations or failure to show utility locations on the construction plans.

The location of existing underground utilities, when shown on the plans, is approximate only, and the Contractor shall be responsible for determining their exact location. The Contractor shall check with the utility companies concerning any possible conflict prior to commencing excavation in any area, as not all utilities may be shown on the plans.

The Contractor shall be entirely responsible for coordination with the utility companies and arranging for the movement or adjustment, either temporary or permanent, of their facilities within the project limits.

If a conflict is identified, the Contractor shall contact the Engineer. The Contractor and City shall locate alternative locations for poles, cabinet, or junction boxes. The Contractor shall get

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approval from the Engineer prior to installation. The Contractor may consider changing depth or alignment of conduit to avoid utility conflicts.

Before beginning any excavation work for foundations, vaults, junction boxes or conduit runs, the contractor shall confirm that the location proposed on the Contract Plans does not conflict with utility location markings placed on the surface by the various utility companies. If a conflict is identified, the following process shall be used to resolve the conflict:

1. Contact the Engineer and determine if there is an alternative location for the foundation, junction box, vault or conduit trench.
2. If an adequate alternate location is not obvious for the underground work, select a location that may be acceptable and pothole to determine the exact location of other utilities. Potholing must be approved by the Engineer.
3. If an adequate alternate alignment still cannot be identified following potholing operations, the pothole area should be restored and work in the area should stop until a new design can be developed.

The Contractor shall not attempt to adjust the location of an existing utility unless specifically agreed to by the utility owner.

8-20.3(4) Foundations

Supplement

A. General Requirements

All excess materials shall be removed from the construction site and disposed of at the Contractor's expense.

Concrete foundations shall be placed against undisturbed earth if possible. CDF shall be used to backfill around signal pole foundations that are not placed against undisturbed earth. Before placing the concrete, the Contractor shall block out around any other underground utilities that lie in the excavated base so that the concrete will not adhere to the utility line. Concrete shall be promptly cleaned from the exposed portion of the anchor bolts and conduit after placement.

After a curing period of 1 week, the Contractor may install the traffic signal poles, controller cabinet, and service cabinet on the new foundations.

Where a foundation is placed adjacent to the back edge of the sidewalk, the top of the foundation shall be poured flush with the finished sidewalk grade. Where round foundations are allowed, the top 4-inches shall be square in shape with sides equal to the diameter. If necessary, the sidewalk shall be notched around the foundation and a 3/4 inch through expansion joint shall be provided at all points where the foundation and sidewalk are in contact, such that the foundation can be removed without damage to the surrounding sidewalk. If no sidewalk exists, the top of the foundation shall be as shown on the Plans.

Location of all concrete foundations shall be approved by the City of Redmond Traffic Engineer prior to excavation.

B. Controller Cabinet

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The controller foundation shall conform to Redmond Standard Drawings No. 459A and 460.

C. Service Cabinet

The foundation for the service cabinet shall be attached to the controller cabinet foundation as shown in Redmond Standard Drawings No. 459C and 460.

8-20.3(5) Conduit

Supplement

Schedule 80 polyvinyl chloride (PVC) shall be used in the roadway and at other locations specified on the Plans. Schedule 40 polyvinyl chloride (PVC) conduit may be used at all other locations.

PVC conduit shall be assembled using the solvent cement specified in Section 9-29.1

Aluminum conduit shall not be used.

When copper or fiber optic interconnect cable is part of a project, the conduit sweeps bringing the interconnect cable into and out of the junction boxes shall be offset as directed by the Engineer to accommodate the cable's tendency to curl. The conduit sweep shall have a minimum bend radius of 24-inches and terminate in junction boxes per City of Redmond Standard Drawing No. 467A. Conduits entering through the cabinet foundation shall be arranged toward the front of the cabinet for maximum accessibility or as directed by the Engineer.

Conduits shall be capped during construction using manufactured seals to prevent entrance of water and debris. Spare conduits shall be capped and labeled as City of Redmond conduits and include detectable pull tape conforming to Section 9-29.27 of these Special Provisions. Detectable pull tape shall also be added to conduits occupied with non-electrical cables.

Where intercepting and splicing to an existing conduit is called out on the plans, the Contractor shall verify the conduit size and schedule before ordering the new conduit sections. The size provided on the plans is an estimation.

8-20.3(5) B Directional Boring

New

All directional boring requires approval by the City of Redmond. Bored conduit shall be High Density Polyethylene (HDPE). All utilities in the bore path shall be potholed and located. A bore profile showing located utilities shall be submitted to the City for approval prior to boring. All piping system components shall be the products of one manufacturer. The conduit and fittings shall be free, within commercial tolerances of objectionable lines, striations, bubbles, welds or other manufacturing defects which would impair the service of the conduit or fittings. Conduit shall be appropriate for the stress generated by the selected equipment and field conditions. Bored conduit couplings shall meet or exceed all ASTM strength and composition standards for the particular type used. All couplings shall be leak proof. Drilling fluid used for directional boring shall be an inert mixture of water and bentonite clay conforming to the drilling equipment manufacturer's recommendations.

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8-20.3(6) Junction Boxes, Cable Vaults, and Pull boxes

Supplement

The locations of the junction boxes as shown in the Plans are approximate and the exact locations shall be determined in the field. Junction boxes shall be located outside the traveled way, wheelchair ramps and landings, and driveways. The new junction box shall not interfere with any other previous or relocated installation. The lid shall also be flush with its frame and with the surrounding area whether it is shoulder, sidewalk, or another surface. Placement of junction boxes in soft surfaces shall include a concrete collar and shall conform to the Redmond Standard Drawing No. 464.

Existing junction boxes that are adjusted, or to which new conductors or fiber optic cable is added, shall be considered “modified.” Modified boxes shall be:

- upgraded to proper size per WSDOT Standard Plans J-40.10 and J-40.30,
- provided a new lid with non-skid finish if located in a pedestrian area,
- adjusted to final grade, and
- provided with concrete collars per Redmond Standard Detail 464 if located in a landscaped area.

Wiring shall not be pulled into any conduit until all associated junction boxes have been adjusted to, or installed in, their final grade and location, unless installation is necessary to maintain system operation. If wire is installed for this reason, sufficient slack shall be left to allow for future adjustment.

When junction boxes are installed or adjusted prior to construction of finished grade, pre-molded joint filler for expansion joints may be placed around the junction boxes. The joint filler shall be removed prior to adjustment to finished grade.

Adjustments involving raising or lowering the junction boxes shall require conduit modification if the resultant clearance between top of conduit and the junction box lid becomes less than 6 inches or more than 9 inches as shown in the junction box details on the Plans. Wiring shall be replaced if sufficient slack as specified in Section 8-20.3(8) of the Standard Specifications is not maintained.

The Contractor shall not damage any existing conduits when replacing or excavating existing junction boxes. The Contractor is to maintain the integrity of all junction boxes during reconfiguration of the conduits, installation of new conduits or when excavating.

The Contractor shall reconfigure conduits in existing junction boxes as shown in the details in the Plans where the minimum bend radius of the fiber is not achievable. The integrity of the junction box shall be maintained. If damage occurs, the Engineer shall be contacted immediately.

Unless otherwise shown on the Plans, junction boxes for interconnect cable shall be Type 8 and shall be installed at every intersection or at a maximum of 800 feet.

8-20.3(8) Wiring

Supplement

A. General

All wires terminated at a terminal block shall have an open end, crimp style solderless, insulated terminal. All terminals shall be installed with a tool designed for

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the installation of this type of terminal. Crimping with pliers, wire cutters, etc., will not be allowed. Terminals shall be color coded to the wire and sized to fit snugly on wire ends. No exposed conductor will be allowed. All wiring inside the controller cabinet and at intermediate points shall be trimmed and cabled together to make a neat and clean-appearing installation.

All illumination circuits shall be labeled with a PVC marking sleeve bearing the circuit number at each junction box whether splices are present or not. Terminal strips in cabinets, or when used as a connection device between conductors, shall bear the circuit numbers.

For installing new cables in existing occupied or empty conduit, the Contractor shall be responsible for the following steps: 1) Install a new pull rope using a rod/fish tape in the conduit for pulling in the new cabling if a pull rope does not already exist. 2) If the Contractor cannot get the rod/fish tape to pass through the conduit, the Contractor shall blow air through the conduit to remove any debris blocking the rod/fish tape path. The Contractor shall be careful not to blow air into controller or service cabinets. 3) If the rod/fish tape still does not pass through the conduit after blowing air, the Contractor shall disconnect a single existing wire as agreed to by the Engineer (if the conduit is occupied) and use that wire to pull the new wiring plus a new cable to replace the existing cable that is being used for pulling. 4) If no existing wire can be used to pull in the new wire, the Contractor shall try another conduit run if one exists or pull out all existing wiring from the conduit and use to pull in the new wiring plus all new cabling to replace existing cabling. Rodding, fish taping, blowing air, and disconnecting/ reconnecting cable shall be the Contractor’s cost responsibility. In an event that none of these steps led to successful wire installation, the Contractor shall install new conduit as directed by the Engineer.

When removing existing cabling, if the cable won’t initially move, the contractor shall attempt to blow air through the conduit to loosen debris around the cable. Blowing air into the conduit is considered incidental to the cable removal. If the cable will not move after blowing air into the conduit, the Contractor shall contact the Engineer.

B. Loop Lead-In Cable

When installing new loops to replace existing loops, new loop lead-in cables conforming to section 9-29.3(2) E shall be installed to the cabinet.

The drain wire shall be snipped at each end and shall not be landed.

C. Illumination

All splices for illumination shall use SEC 1791-DP splice kits and conform to Redmond Standard Detail No. 421, including the last luminaire on a circuit.

Splices to extend circuits in multiple directions shall use SEC 0791-0 splice boxes.

D. When a street light or traffic signal electrical circuit is modified, old conductors no longer in use shall be completely removed from all conduits, raceways, and cabinets, unless directed otherwise by the inspector.

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8-20.3(9) Bonding, Grounding

Supplement

Location wires shall not be connected to the equipment-grounding system. See Section 8-20.3 (5) B Detectable Pull Tape of these Special Provisions for attachment of location wires. Contractor shall provide and install bonding and grounding wires as described in Standard Specifications and the National Electric Code for any new metallic junction boxes and any modified existing junction boxes. For the purposes of this section, a box shall be considered "modified" if new cables or conductors are installed, including low-voltage and non-metallic cable, or if the box is adjusted to grade, or if the box lid is modified.

8-20.3(10) Service Transformer, Intelligent Transportation System Cabinet

Supplement

A 3-wire electrical service shall be used at 120/240 volts, single phase, 60-hertz AC between the power source and the service cabinet. The unfused power shall enter the service cabinet through a separate conduit.

The Contractor shall furnish and install a service cabinet as specified. The service cabinet shall be mounted on a concrete base with anchor bolts fastening to the inside of the base of the cabinet. The illumination components shall be connected to the 240-volt, 60-hertz power. The traffic signal components shall be connected to one of the 120-volt, 60-hertz elements. No modifications to the cabinet will be allowed.

The Contractor shall have the service inspected by the City of Redmond Building Department Electrical Inspector and shall be solely responsible for coordination with the power company to have the service energized.

The service cabinet shall be shipped and delivered to the job site in a protective covering with suitable dunnage to prevent damage to the exterior surface.

New breakers installed in an existing service cabinet shall be provided with phenolic labeling (e.g., "SIGNAL", "LIGHTING 2", "ITS CABINET").

8-20.3(11) Testing

Supplement

All work shall be completed in a manner that provides the inspector and Engineer with full knowledge of the construction. The work shall proceed in accordance with the approved construction schedule previously supplied to and approved by the City of Redmond. The inspector and Engineer may, at their option, cause work completed without their knowledge or inspection to be dismantled so that it can be inspected to their satisfaction. Loop tests for megger, resistance, continuity, and inductance in accordance with Section 8-20.3(14) D of the WSDOT Standard Specifications shall be performed in accompaniment with a City Traffic Signal Technician and City Inspector present.

8-20.3(13) Illumination Systems

Supplement

Existing illumination shall not be removed until the new illumination system is completed and operational. If an existing street light is in conflict with construction sequencing, a temporary lighting system shall be installed prior to removal of the existing street light.

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Each individual luminaire shall be furnished with and controlled by a GE Lightgrid photocell control node.

All arm-mounted roadway luminaires shall be mounted level with centerline grade of roadway.

8-20.3(14) Signal Systems

8-20.3(14) B Signal Heads

Supplement

All vehicle and pedestrian signal heads shall be securely covered with opaque (nontranslucent) light colored material between installation and signal turn-on. Signal heads shall also be completely covered after testing and prior to signal turn-on. Visqueen duct tape shall not be allowed to secure the covers to the signal heads.

Vehicle heads that are to remain covered for a period AFTER turn-on of the signal, shall be covered with a heavy, waterproof, opaque canvas, white, yellow, or khaki in color, securable by braided nylon rope labeled “OUT OF SERVICE”.

All signal heads shall be mounted using a Type M, Type L or Type K mount. The Contractor shall provide and install all new vehicular signal head mounting hardware. Mounting hardware will provide for a rigid connection between the signal head and mast arm or pole.

Position of the signal heads shall be as specified on the Pole Schedule. All signal heads mounted on Type M mounts shall have the plumbizer between the top and second display. The bottom housing of a signal face shall conform to the requirements as stated in the current approved edition of the MUTCD.

The highest intensity of the red lens in the signal head shall be aimed at a point 4 times the posted speed limit from the stop bar (measured in linear feet). Final orientation of signal heads shall be approved by the City of Redmond Traffic Engineering in the field.

8-20.3(14) C Induction Loop Vehicle Detectors

Supplement

1. General

   All loops shall be installed a minimum of two days after final pavement lift is complete. Install loop detectors during conditions of zero precipitation and when the pavement temperature is between 40 degrees F and 100 degrees F.

   Clean roadway surface of debris, standing water, or other material which may enter the saw cut and thereby degrade the quality of the installation.

   The Contractor shall mark the location of all loops. The Contractor shall consider any pavement degradation or utilities that may interfere with the proper installation of the loop detector. The Contractor shall notify the City of Redmond Traffic Engineer 24 hours in advance to obtain approval of the location of the loop detectors as laid out prior to any cutting. At no time shall any of the saw cuts pass closer than 1 foot to any utility cover.

   The Contractor shall determine the depth of the pavement section where the loop is to be installed. If the pavement section is less than the required depth of the saw cut, the Contractor shall consult the Engineer or the inspector for directions.

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2. Saw Cutting Round Loops

Round loops shall be constructed in accordance with the requirements noted for Method A (Circular Saw). Construction shall conform to WSDOT Standard Plan J-8a as modified by the following:

Method A (Circular Saw)

1. Round saw cuts shall be 6 feet in diameter and shall be constructed using equipment designed for cutting round loops. The equipment shall use a concave, diamond-segmented blade. The saw cuts shall be vertical and shall be a minimum of 0.25 inches wide. The saw cut depth shall be a minimum of 2.5 inches measured at any point along the perimeter. Other methods of constructing the round saw cut, such as anchoring a router or flat blade saw, will not be allowed.

2. The bottom of the saw cut shall be smooth. No edges created by the differences in saw cut depths will be allowed.

3. All saw cut corners shall be rounded to a minimum 1.6-inches radius.

4. All saw cuts shall be cleaned with a 1000-psi high-pressure washer. Wash water and slurry shall be vacuumed out. Saw cut shall be blown dry with compressed air.

5. Loops shall be installed after paving the final lift of asphalt.

6. The loop shall be constructed using 4 turns of conductor. Bike lanes shall be constructed using 5 turns of conductor. The conductor shall be installed 1 turn on top of the previous turn. All turns shall be installed in a clockwise direction.

7. Loop sealant shall be MSI 34271. Loop sealant shall be installed in 2-layers. The first layer shall be allowed to cool before the second layer is applied. Installation of the sealant shall completely encapsulate the loop conductors. A minimum of 1-inch of sealant shall be provided between the top of the conductors and the top of the saw cut.

In areas where no conduit exists between the junction box and the edge of roadway, conduit stub outs shall be installed. This installation may require curb and/or sidewalk replacement to install the required conduit sweeps. Holes greater than 3.5-inches in diameter shall require an asphalt patch. Existing stub outs not being reused shall be plugged or removed from the junction box. Install a 2-inch conduit between each saw cut in the pavement surface and the junction box.

The Engineer or Inspector shall approve the quality and location of all saw cuts and conduits installed.

3. Loop Wire Installation

A minimum of 2-inch-diameter PVC conduit as shown in the Plans shall be used to contain the loop lead-ins from the saw cut in the roadway surface to the junction box.

The Contractor shall coil at least 10 feet of extra wire at the junction box prior to placing it in the saw cut so that the loop wire will not require any splices.

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The loop wires shall be placed in the saw cut so that at no time is any tension placed on the wires. The wires shall not bind against the pavement at any point in the saw cut.

The loop wires in the lead-in saw cut and loop conduit shall be twisted in a symmetrical fashion with a minimum of 3 twists per foot at a uniform rate of turns per foot between the loop saw cut and the junction box. The twisted loop wire shall be pulled into the junction box through the conduit placed between the saw cut and the junction box. Unless specified otherwise by the Engineer, there shall be wiring for no more than 3 loops (6 twisted loop wire conductors) in each lead-in (home run) saw cut.

Both ends of the conduit between the saw cut and the junction box shall be sealed to prevent water and loop sealant from entering the conduit and to prevent the wire from moving.

Application of the MSI-34271 loop sealant shall be applied in accordance with the manufacturer's recommendations using equipment recommended by the manufacturer. Application of hot-melt loop sealant shall be made with a pressure feed applicator in two equal lifts to a pavement having a surface temperature greater than 40 degrees F in accordance with the manufacturer's recommendations. CRACK POTS OR GRAVITY FEED EQUIPMENT SHALL NOT BE PERMITTED.

4. Connection to Loop Lead-In Cable

Prior to splicing new loop wires to loop lead-ins, the loops shall be tested at the junction per section 8-20.3 (11) Testing. Upon completion of the test, they shall be connected in series or parallel as required by the Plans or Standard Specifications.

For new loop installation replacing an existing loop, the loop lead-in cable from the junction box to the controller cabinet shall be replaced with new lead-in cable.

For new loop wires and new loop lead-in cable installation, testing shall be repeated at the controller cabinet prior to termination at the cabinet.

After all appropriate loop wires are brought into the junction box and labeled to identify which wire goes to each loop and in which direction the loop wires are wound, the individual wires shall be spliced together and to the individually twisted shielded pair cable and brought back to the controller cabinet. The splicing shall be made in accordance with Redmond Standard Drawing No. 457. The entire splice shall be encapsulated with nonvinyl-back 3M™ Scotchfill black mastic sealant. In summary it shall employ a compression butt joint, then covered with the sealant, then 3 layers of 3M™ 33+ electric tape.

5. Temporary Vehicle Detection

The Contractor is responsible for maintaining vehicle detection at all times on an existing signal system. The Contractor shall furnish and install temporary video detection that can plug directly into existing detector racks for approaches prior to disconnecting any existing induction loops. Video detection shall be positioned and installed as directed by the City of Redmond Traffic Engineer or Traffic Signal Technician. The video detection system shall be FLIR TrafiSense video detection system using TrafiSense Model 632 sensor, Ti BPL2 Edge Card, 4 I/O USB, 18-

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gauge wire (typically one 1,000-foot spool), AMP power supply, fuse and breaker on DIN rail, Pelco AstroBracket and Pelco Riser, or approved equal.

8-20.3(14) E Signal Standards

Supplement

After delivering the poles or arms to the job site and before they are installed, they shall be stored in a place that will not inconvenience the public. All poles and arms shall be installed in compliance with Washington State Utility and Electrical Codes.

The poles shall be installed on leveling nuts and washers secured to the anchor bolts and with locking nuts and washers on the top of the base flange. The side of the shaft opposite the load shall be plumbed by adjusting the leveling nuts or as otherwise directed by the Engineer. A barrier shall be placed around the anchor bolts to prevent grout from entering the conduits.

8-20.3(14) F Terminal Cabinets

New

The terminal cabinets shall be mounted on the pole using a 4-inch-wide aluminum channel away from the traffic side, with the bottom of the cabinet above the pedestrian signal heads where present and in no case less than 8 feet above the ground level.

8-20.3(14) G Emergency Vehicle Preemption System

New

The emergency vehicle preemption detectors shall be installed in a drilled and tapped hole in the top of the mast arm or on the pole. Prior to installation, the location of the detector shall be verified in the field by the City inspector. They shall be tightly fitted to point in the direction shown in the plan view.

8-20.3(14) H Pedestrian Push Button Assembly

New

The position and orientation of the pedestrian push buttons shall be located as shown on plans; however, final positioning for the optimum effectiveness shall be approved by the City of Redmond Traffic Engineer.

8-20.3(17) "As-Built" Plans

Supplement

Upon completion of the construction and prior to the turn-on of any traffic control equipment, the Contractor shall furnish an "as-built" plan of each intersection showing all signal heads, pole locations, detectors, junction boxes, miscellaneous equipment, conductors, cable wires up to the signal controller cabinet, and with a special symbol identifying those items that have been changed from the original Contract Drawings. All items shall be located within 1-foot horizontal distance and 6 inches vertical distance above, below, or at the surface.

8-20.3(18) Fiber Optic Networks

New

This work covers the supply, installation, and testing of fiber optic cable and related communications support facilities and equipment including termination panels, cabling and inner duct.

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8-20.3(18) A Fiber Optic Cable Pre-Installation Testing

New

Pre-installation tests shall be conducted on the cable reels prior to installation. These tests shall be performed in accordance with EIA/TIA-455-78 for single-mode fibers using an optical time domain reflectometer (OTDR). Both ends of the cable shall be accessible for the tests, and it may be necessary to remove a portion of the protective wooden lagging on the reel. Measurements shall be made using the 1310 nm and 1550 nm wavelengths and shall be compared to the factory test results. Test results shall be provided to the Engineer and approved before cable installation can begin.

8-20.3(18) B Fiber Optic Cable Installation

New

The installation of all materials shall be as specified on the Plans. The Contractor shall meet or exceed the following installation specifications.

Care will be exercised at all times to ensure that the fiber optic cable is not bent with a radius of less than 2 feet (610 mm) during installation and less than 18 inches (457 mm) after completion of the installation. When cable on a reel is to be installed in two directions from a central point, or the installation of a cable run is completed in stages, the Contractor shall utilize a figure eight method to coil cable. Any damaged cable sections shall be replaced from splice to splice by the Contractor at his expense.

The cable will be continuous between stations and/or splices as indicated on the Plans. The Contractor shall not cut the cable to aid in installation, unless approved in writing by the Engineer.

Fiber optic cable and innerduct shall be installed in underground conduit as identified in the Conduit and Wiring Schedule on the Plans. Installation procedures shall be in conformance with the procedures specified by the cable manufacturer for the specific cable being installed. The cable shall not be installed prior to the installation of vaults, cabinets or pull points/junction boxes.

The Contractor shall make a physical survey of the project site for the purpose of establishing the exact cable routing and cutting lengths prior to the commencement of any fiber optic work or committing any fiber optic materials. Fiber optic cable shall be installed in continuous lengths without splices except where specifically allowed on the Plans unless otherwise approved by the Engineer.

Conduits are to be hand-rodded or blown with compressed air to provide a detectable pull tape if one does not already exist. The detectable pull tape is to be non-abrasive such as “mule tape,” and in compliance with Special Provisions 9-29.27. The Contractor shall handle fiber optic cable carefully taking care not to pull cable along the ground, over or around obstructions or through unnecessary curves or bends. Manufacturer approved pulling grips, cable guides, feeders, shoes and bushings shall be used to prevent damage to the cable during installation.

When removing cable from the reel prior to installation, place it in a “figure-eight” configuration to prevent kinking or twisting. Take care to relieve the pressure on the cable at crossovers by placing cardboard shims (or equivalent method) or by creating additional “figure-eights.”

The Contractor shall ensure that the tensile load on the cable does not exceed the allowed maximum by using a system that includes a means of alerting the installer when the pulling

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tension approaches the limit and/or displays the actual tension on the cable. The Contractor may supplement this procedure with a breakaway tension limiter set below the recommended tensile limit of the cable being pulled. Cable pulling lubricant must be of a type solely used for pulling cables.

The cable shall be clearly marked with a permanent plastic tag in each junction box and vault it passes through and at each cable riser. The Contractor shall attach the cable to the racks and hooks with industry standard cable ties immediately upon entering the pull point/box. Each cable shall be looped and tied independently of one another. The fiber cable is to be routed in the top corners of vaults while ensuring proper bend radius. The cable is not to pass through any existing cable loop.

During installation the Contractor shall keep a log that notes the length marking on the cable at every pull point/junction box. This will help determine the exact location of problems along the cable run during the OTDR testing.

The Contractor shall replace any damaged conductors or cables in occupied conduits as a result of Contractor's operations at the Contractor's cost.

8-20.3(18) C Fiber Optic Cable Labeling

New

A. Fiber Optic Cable
   All fiber optic cable shall be identified whenever entering or leaving a cabinet, vault, pull point/box or enclosure and at all terminals.
   Permanent plastic marking tags fastened securely to the cables shall be used for identification.
   Cable designation shall consistently conform to the overall scheme approved by the City to indicate location, circuit, device, cable number, terminal branch, position etc. Letters and numbers shall be used. Identification shall be made with a clear, machine produced, indelible marking.
B. Conduit
   All conduits shall be numbered and documented on the site plan as-built drawings.
C. Splice Cases
   Splice cases will be labeled at each entry point with nomenclature that includes the cable origination point, strand count, and destination. Fiber splice cases will be labeled as “F-nnn”, where nnn = the vault number as shown on the conduit and vault site plan.
D. Innerduct
   Innerduct will be labeled at each end and where it is passed through a vault as “ccc - iii”, where ccc = the conduit number from the site as-built drawings and iii = the innerduct number, within the conduit.
E. Termination Panels
   All termination panels shall be labeled at each termination point for each fiber. Termination labels shall conform to the overall scheme approved by the City to indicate location, device and next access point. Identification shall be made with a clear, machine produced, indelible marking.

8-20.3(19) Flexible Fabric Innerduct

Deleted

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8-20.3(20) Caution Tape

Deleted

8-20.3(21) Communications Vault

New

The Contractor shall provide communications vaults for the purpose of storing slack cabling and installing splice enclosures. Communication vaults shall comply with Section 9-29.28 of the Special Provisions. The location of all communication vaults shall be as indicated on the Plans and shall be field verified by the Contractor.

Communication vaults shall be configured such that the tensile and bending limitations of the fiber optic cable are not compromised. Vaults shall be configured to mechanically protect the fiber optic cable against installation force as well as inert forces after cable pulling operations.

Where indicated on the Plans, new communication vaults shall be installed as described herein and shown in the details on the Plans. Where conflicts arise with the location of the vault and existing underground utilities, the Contractor shall follow the procedures as outlined in Section 8-20.3 of these Special Provisions. The Contractor shall furnish and install racking hardware for cable storage in all new vaults and in all existing vaults where cable storage is identified on the plans. The Contractor shall secure and store the cable in the racking hardware per manufacturer's instruction.

Existing conduits shall be located; hand excavation may need to be used so as to not damage the existing conduit and cables. All existing conduits will need to be open and exposed for access within the vault. Care shall be taken to identify which conduits have existing cables. All conduits will extend 2 inches within the vault walls. At the 2-inch mark the excess conduit on the existing structure will need to be removed and all cables exposed.

Once the conduits are located, excavate a hole large enough to install the communications vault. The vault shall have a concrete floor as indicated on the Plans. The floor shall be resting on firmly compacted ground and be level. Ensure that the existing conduits are at a minimum of 4 inches above the top of the floor. If the existing conduits contain existing cables, the new vault will need to be bottomless to allow the existing conduit and cables to be routed into the new vault.

The Contractor will cut out the knockouts to accommodate both new and existing conduits on the vault walls and place the vault over the conduits using a crane or similar mechanical device. Care shall be taken when lowering the vault as to not damage the existing conduits and cables. All knockouts will need to be sealed using a mortar concrete mix to prevent rodent and water from entering the vault.

The new vault shall be adjusted to be flush with the finished grade and such that water drainage will continue after the installation. In some instances, the soil grading will be sufficient, while in other instances gravel may have to be placed at specified depths. The location of the vault should be away from traffic conditions that could cause injury to personnel, yet it should be easily accessible for maintenance. All voids created in and around the vault while adjusting it to grade shall be filled with grout.

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8-20.3(22) Splicing and Termination

New

Splicing shall be completed in fiber optic splice enclosures or fiber optic termination panels with splicing trays as indicated on the Plans and details. All other materials required to provide an operational fiber optic network shall be considered as part of this section with the exception of the fiber cable itself and the installation hardware required to mount it.
In particular, the Contractor shall supply all consumable materials required for fiber optic splicing, including but not limited to:

- De-Natured Alcohol
- Fusion Splice Protection Sleeve
- Cable Ties
- Labels
- Sealing Tape

8-20.3(22) A Qualifications

New

Qualifications as defined in 8-20.2(2) shall be submitted to the Engineer at least 30 calendar days prior to the splicing for approval of qualifications. When performing a splice, the fusion set must be on a stable surface and the splicing area must be relatively dust free. Therefore, it is required that the splicing should be done in a van or tent and not in the open air, in a manhole or vault.

8-20.3(22) B Fiber Splices

New

The fiber optic network shall be spliced in fiber optic splice enclosures or fiber optic termination panels as shown on the Plans and details. All splicing shall be completed using fusion-splicing equipment, with each fusion, protected in a splice protection sleeve. All splices shall be securely stored in splice trays.

Generally, splices shall not be performed in vaults smaller than 2 feet x 2 feet x 5 feet. When it is determined by the Engineer that a splice is performed in a vault smaller than 2 feet x 2 feet x 5 feet, appropriate slack coils will be provided to allow the splice case to be removed from the vault. When splicing is required in communication vaults (25-TA or larger), the splice case will be affixed to the side of the vault using the unistrut rack fasteners cast into the wall of the vault. See the Plans for details.

At least 2 feet (610 mm) of bare fiber shall be coiled and stored in the splice tray in a protected manner. At least 3 feet (914 mm) of each buffer tube in the fiber optic cable shall be coiled and stored in the splice enclosure or patch panel. All cables shall be properly fastened to prevent against pulling out of the splice enclosure or patch panel.

All fusions shall be labeled with the fiber number using a pre-printed vinyl number tag. All splice trays shall be labeled with the range of fibers spliced in the tray. Cables at each location shall be designated with the next termination point at the other end of the cable.

All splicing in fiber optic splice enclosures shall be completed using “butt splicing”.

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8-20.3(22) C Fiber Optic Buffer Tube Fan-Out Kit

New

The Contractor shall install Buffer Tube Fan-Out Kits in the locations shown on the Plans and in the Details. The assembly shall be installed per manufacturer's specifications and include all necessary tools, consumables and cleaners required for the complete installation.

8-20.3(22) D Blank

New

Intentionally left blank

8-20.3(22) E Blank

New

Intentionally left blank

8-20.3(22) F Fiber Optic Termination Panel

New

The Fiber Optic Termination Panel shall provide for the termination of the outside plant fiber optic cable within the traffic signal controller cabinets as indicated on the Plans and details. The panel shall provide for the termination and protection of the fiber optic cable within the cabinets. Refer to section 9-29.29(3) for panel specifications. The Contractor shall verify with the Engineer the exact placement of the termination panel within existing cabinets prior to installation.

The Contractor shall provide all necessary tools, consumables, cleaners, mounting hardware and other materials required for the complete installation of this unit. The panel shall be installed per manufacturer's specifications. The Contractor shall install a Fiber Optic Buffer Tube Fan-Out Kit on the fiber optic cable and terminate all fibers with a Fiber Optic SC Connector. All fibers shall be connected to one side of the connectorized adapter plates. All fibers within the termination panel shall be neatly dressed, with slack length coiled as required.

The user side of the termination panel adapter plates shall be labeled with the fiber numbers for every fiber terminated at the panel. The user side of all fiber optic connectors shall be covered with a dust cap.

Where necessary, the Contractor shall furnish and install grounding kits for the bonding of armored fiber optic cable to the ground bar. The location for bonding to the armored sheath shall be inside the cabinet.

8-20.3(22) G Blank

New

Intentionally left blank.

8-20.3(22) H Fiber Optic LC Connector

New

The Fiber Optic LC Connector shall provide for the termination of the individual fiber optic strands and shall be installed in conjunction with the Buffer Tube Fan-Out Kit.

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The Contractor shall install the Fiber Optic LC Connectors on the Fiber Optic Buffer Tube Fan-Out Kits where required to terminate the fan-out kit onto the Termination Panels in the quantities and locations as shown on the Plans.

8-20.3(22) I Blank

New

Intentionally left blank

8-20.3(22) J Fiber Optic Splice Enclosure

New

The fiber splice enclosure shall provide for the termination and protection of the fiber optic cable in both aerial installations and within the communications vaults. The fiber splice enclosure shall be installed per manufacturer's directions and as shown in the details on the Plans. The Contractor shall provide the splice enclosures and make splices at locations shown on the Plans. The Contractor shall test all fiber optic cables, splices, and connectors as shown on the Plans and as specified in these Special Provisions.

The splice enclosure shall be mounted to allow the cable to enter the enclosure without exceeding the cable manufacturer's minimum bending radius. Sufficient cable shall be coiled with the splice enclosure to allow the enclosure to be removed from the vault or aerial span for splicing.

The unprotected fiber exposed for splicing within the enclosure shall be protected from mechanical damage using the fiber support tubes and shall be secured within the splice enclosure. The fibers shall be labeled with vinyl markers as directed by the City.

The enclosure shall be sealed following the splicing procedure as recommended by the manufacturer to provide a moisture proof environment for the splices. Care shall be taken at the cable entry points to ensure a tight and waterproof seal is made which will not leak upon aging.

The Contractor shall coil sufficient length of each cable in the communications vault that will allow the splice enclosure to be removed from the communications vault, and splices to be performed above ground in a vehicle specifically equipped for such work. Such coiled cable shall be located adjacent to the splice enclosure. Lengths of coiled cable shall be provided where shown on the Plans. The splice enclosure shall be bonded to the ground as per manufacturer's recommendations.

For aerial splice installations, the Contractor shall coil sufficient length of each cable in aerial fiber storage units that will allow the splice enclosure to be removed from the aerial enclosure and splices to be performed on the ground in a vehicle specifically equipped for such work. Such coiled cable shall be located adjacent to the aerial splice enclosure.

Existing aerial fiber optic cable is installed in aerial innerduct. The work includes the repair or replacement of the existing aerial innerduct at the splice locations, all necessary hardware to support the existing fiber cable and the new cables and to terminate the lashing wire on the existing aerial innerduct.

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8-20.3(23) System Acceptance Testing for Fiber Optic Networks

New

8-20.3(23) A Testing and Commissioning

New

The Contractor is responsible for demonstrating the functionality of the installed system through testing. These tests shall be conducted in accordance with an approved test plan that shall cover the key functional requirements of the Work.

The Contractor shall, at its cost, provide suitable test equipment, instruments and labor for the purpose of tests.

The Contractor shall provide sufficient notice of not less than three (3) working days prior to the commencement of the first test. The Contractor shall submit with this notice a schedule of all tests covered by this notice.

8-20.3(23) B Test Plans

New

The Contractor shall prepare an Acceptance Test Plan that outlines the procedures to be used, the required test equipment, and the expected results. The plan shall include copies of all test result forms to be completed.

The Contractor shall submit the test plan to the Engineer or its representative for approval. The test plan must be approved at least ten (10) working days before a test is conducted.

The Contractor shall submit the completed test forms to the Engineer as soon as practicable after the completion of the test whether witnessed by the Engineer or its representative or not.

8-20.3(23) C Final Inspection

New

Final Inspection will include the following activities:

- The ‘as-built’ drawings and manuals will be examined by the Engineer’s engineering personnel and involved parties for conformance to the Drawings, Codes, Regulations, and General Accuracy. Any variation from specifications will be highlighted.
- Acceptance test results will be reviewed.
- All aspects of the Work will be physically inspected to ensure that all work has been completed in accordance with the specifications.
- Upon completion of all final inspection activities, any deficiencies will be recorded. Deficiencies will be corrected by the appropriate party and may be then re-inspected by the Engineer.
- The Final Inspection shall not be deemed complete until all deficiencies are corrected.

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8-20.3(23) D OTDR Testing

New

Fiber Optic Testing that uses an Optical Time Domain Reflectometer (OTDR) shall adhere to the following specifications:

Use an OTDR that is capable of storing traces electronically and save each final trace.

The OTDR shall have suitable dynamic range and performance characteristics as determined by the Power Utility.

Use a patch cord of sufficient length to ensure that start of the fiber under test is not in the “dead zone” of the OTDR. The first connector of the link under test shall be visible on the trace.

Prior to testing, all fiber optic connectors and bare fiber ends are to be properly cleaned using a residue free alcohol solution (better than 91% de-natured alcohol and distilled water) and compressed air.

Expand the vertical and horizontal scales used on the OTDR to maximize the amount of detail shown on the OTDR trace, even if these parameters can be adjusted later using display software.

OTDR traces shall be recorded in suitable electronic format. As applicable, the software and applicable licenses required to read the OTDR traces shall be provided to the City at no extra charge.

Ensure that traces identify the end points of the fiber under test and the fiber designation. If this information is not provided by the trace itself, provide a cross-reference table between the stored trace file name and the fiber designation.

8-20.3(23) E OTDR Testing of Spliced Fiber Links

New

This describes the testing to be completed on all sections of the fiber network after splicing is completed. For this section, a fiber link shall be defined as a continuous section of fiber from connector to connector that may pass through a number of intermediate splices.

OTDR testing shall be completed as follows:

1. Test each fiber link in the cable at 1310 nm and 1550 nm, in each direction.
2. Verify that each completed fusion is less than 0.10 dB, measured as the average of splice loss measured in each direction through the link.
3. Re-make any fusions in excess of 0.10 dB, unless the Engineer specifically approves such high loss fusions, and re-test any fiber links that have been re-fused.

8-20.3(23) F Attenuation Testing

New

This describes the attenuation testing to be completed on all sections of the fiber network after splicing is completed. An optical power meter and light source shall be used to measure end-to-

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end attenuation that will include fiber patch panel assembly connector losses. Every spliced link with a connection at each end shall be tested at 1310 nm and 1550 nm.

Attenuation testing shall be completed as follows:

1. Test each fiber link in the cable at 1310 nm and 1550 nm.
2. Connect the optical source and meter together using a 10-foot patch cord. Record the optical power received by the optical meter as the reference reading.
3. Without removing the patch cord from the optical source, measure the recorded light level at the other end of the fiber link. Actual cable loss will be the measured loss minus the initial power source reading. Record the actual cable loss on the Acceptance Test Results forms.
4. Measure each fiber in both directions. (The loss over a fiber may not necessarily be the same in each direction).
5. Re-measure the reference attenuation after every 200 measurements or every 4 hours, whichever occurs first.

8-20.3(23) G Submittals

New

Provide one hard copy of the trace for every spliced fiber. Hard copy traces shall be organized and bound in a logical order.

Submit, after approval of the hard copy traces, soft copies of all traces and appropriate software to allow reading the traces.

Submit the results of every attenuation test.

8-20.3(28) CCTV

New

Video and Data Cable

The Contractor shall furnish and install shielded outdoor-rated Category 6 cable to each CCTV camera.

The video portion of the composite cable shall be terminated with BNC connectors. The Contractor shall ensure that the gender of the cable connectors is appropriate for the connectors on the CCTV camera and video encoder. The contractor shall furnish and install a video surge suppressor in the controller cabinet for the video cable to protect the CCTV camera. The data cable shall be terminated as required by the Pelco Spectra Dome installation requirements.

Power and Data Cabling

The Contractor shall furnish and install a multi-conductor Type TC cable for power to the CCTV assembly. The cables shall be rated for outdoor use and be UL-listed. The power cable shall be 600-volt insulated and have three stranded #14 conductors. Within the service cabinet, the Contractor shall remove the cable jacket, and terminate the power conductors at the power supply.

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8-20.3(29) Removal of Existing Signal and Illumination Equipment

New

Existing signal, RRFB, speed radar and illumination components shall not be removed prior to Engineer's approval.

All material from the existing signal and illumination system that will not be reused will become the property of the Contractor and shall be removed from the Project. The city may choose to have the Contractor salvage certain items as directed on the plans or at the City's discretion. The Contractor shall protect salvage items from damage and shall deliver these items immediately upon their removal to the City of Redmond. The Contractor shall coordinate delivery with City of Redmond Traffic Signal Technician at (425) 556-2830.

Any existing equipment and material designated for salvage that is damaged during removal or delivery shall be compensated for by the Contractor to the satisfaction of the City.

All existing wires from terminated circuits shall be removed from the conduit system after completion of the new signal system.

The Contractor shall remove all nonessential junction boxes. The Contractor shall remove all foundations that are not to be reused to a depth of at least 3 feet below the existing or finished grade, whichever is lower, or removed entirely, unless otherwise noted on the Plans. The conduits connecting to the foundation shall be cut off and capped or removed as designated by the Engineer. Any such foundation or conduit left below the surface shall be noted on the as-built plans provided to the City by the Contractor.

The Contractor shall be responsible for disposing of all other waste created by the required salvage and removal of items shown on the Plans or specified herein.

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DIVISION 9 - MATERIALS

9-03.12(3) Gravel Backfill for Pipe Zone Bedding

Supplement

Add the following:

Pipe zone bedding material shall be crushed surfacing top course (CSTC) in accordance with City of Redmond Standard Detail 201.

9-03.12(6) Bioretention Underdrain Gravel

New

Bioretention Underdrain Gravel shall be analyzed by an accredited lab using the sieve sizes noted below, and shall meet the following gradation using ASTM D 422:

Sieve size	Percent passing
3/4 inch	100
No. 4	28 – 56
No. 8	20 – 50
No. 50	3 - 12
No. 200	0 – 1

L.A. Abrasion (Max) % is 35.

9-03.12(7) Bioretention Mineral Aggregate

New

In general, soil aggregate shall be free of wood, waste, coating, or any other deleterious material, and all aggregate passing the No. 200 sieve size shall be non -plastic. Bioretention mineral aggregate shall be washed.
Bioretention Mineral Aggregate shall be analyzed by an accredited lab using the sieve sizes noted below, and shall meet the following gradation using ASTM D 422:

Sieve Size	Percent Passing
3/8 inch	100
No. 4	95 – 100
No.10	75 – 90
No. 40	25 – 40
No. 100	4 – 10
No. 200	2 – 5

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The Bioretention Mineral Aggregate shall be tested to confirm that it meets the following criteria:

Parameter	Method	Requirement
SPLP Copper	EPA 1312 then 200.8	<= 5 ug/L

9-03.21 Recycled Material

Revision

The use of recycled material as aggregate is prohibited.

9-05 DRAINAGE STRUCTURES AND CULVERTS

9-05.2(9) Slotted Underdrain Pipe

New

Slotted underdrain pipe shall be PVC pipe meeting the requirements of ASTM D1785, SCH 40. The minimum size pipe shall be 6 inches in diameter.

Slots should be cut perpendicular to the long axis of the pipe and be 0.04 to 0.069 inches by 1 inch long and be spaced 0.25 inches apart (spaced longitudinally). Slots should be arranged in four rows spaced on 45-degree centers and cover one half of the circumference of the pipe.

9-05.12 Polyvinyl Chloride (PVC) Pipe

9-05.12(1) Solid Wall PVC Sanitary Sewer Pipe

Revision

Delete the first subparagraph and substitute the following:

> Solid Wall PVC sanitary sewer pipe shall conform to meet requirements of ASTM D 3034, SDR 35 for pipe up to 15-inch diameter. 4-inch and larger diameters shall be rubber gasketed and are required to pass air and mandrel tests.

9-05.12(2) Profile Wall PVC Sanitary Sewer Pipe

Revision

Delete the first subparagraph and substitute the following:

> Profile Wall PVC sanitary sewer pipe shall meet the requirements of ASTM F 794 series 46. The maximum pipe diameter shall be specified in the Qualified Products List. 4-inch and larger diameters shall be rubber gasketed and are required to pass air and mandrel tests.

9-05.13 Ductile Iron Sewer Pipe

Revision

Modify the first subparagraph as follows:

Ductile iron pipe shall conform to ANSIA 21.51 or AWWA C151 and shall be ceramic epoxy lined with Protecto 401™. The ductile iron pipe shall be special thickness Class 52, or the class indicated on the plans or in the special provisions. Modify the third subparagraph as follows:

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Revise "Cast iron fittings may…" to read "ductile iron fittings shall…".

Add the following paragraph:

Ductile iron sewer pipe shall be used in instances where the depth to the invert of the pipe is greater than 15 feet, or as approved by the Engineer. Pipe material shall remain the same between manholes.

9-05.15 Metal Castings

9-05.15(1) Manhole Ring and Cover

Supplement

Add the following paragraph:

Ring and cover for sanitary sewer manholes shall be East Jordan Iron Works #003705009B01, Olympic Foundry No. MH30, or approved equal. Cover shall be marked "SEWER" in 3-inch raised letters and marked "CITY OF REDMOND". Cover shall be equipped with one pickhole and 3 boltholes for locking. Bolts shall be stainless steel Allen head 5/8” – 11 x 1.5” with stainless steel washers and replaceable nut using the EON bolting system. Ring shall be gray iron. Cover shall be ductile iron. Ring and cover shall be undipped. The castings shall meet AASHTO M306 certification.

Ring and cover for stormwater manholes shall be Olympic Foundry No. MH52C with cam lock, Sather Manufacturing 230L or approved equal. Cover shall be marked “DRAIN” in 3-inch raised letters and marked "CITY OF REDMOND".

Ring and cover countries of origin shall be United States and Canada. No other countries of origin shall be allowed.

9-05.15(2) Metal Frame, Grate, and Solid Metal Cover for Catch Basins or Inlets

Frame and grates shall be manufactured in the United States and Canada. No other countries of origin shall be allowed.

9-05.15(4) Cleanout Ring and Cover

New

Cleanout ring cover shall be gray iron conforming to ASTM A48, CL 30. Cover shall be marked “SEWER” for sanitary sewer cleanouts or “DRAIN” for stormwater cleanouts. Ring and cover shall be Olympic Foundry M1007, East Jordan Iron Works 00367585 or approved equal and shall be manufactured in the United States and Canada. No other countries of origin shall be allowed.

9-05.15(5) Stormwater Vault Hatch

New

Stormwater vault hatch shall be: Bilco aluminum hatch Model J-AL H20 or JD-AL H20 or LW Products Model HS or HD. Hatches above vaults greater than 4 feet deep shall include integrated, factory installed fall protection grating, meeting OSHA 29 CFR 1910.23. Hatch and ladder shall be installed such that the hatch can be opened to allow access to the ladder.

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9-05.91 Manhole Steps

New

Manhole steps shall be polypropylene plastic conforming to ASTM D401, injected molded around a one-half (½) inch diameter, Grade 60, steel reinforcing bar, conforming to ASTM A-615. Steps shall be M. A. Industries Incorporated, Model No. P52PS2-PF; or Lane International Corporation, Model No. P-14938; or approved equal.

9-05.92 Manhole Ladders and Stormwater Vault Ladders

New

Manhole ladders shall be polypropylene plastic conforming to ASTM D4101. Rungs of the ladder shall be injected molded polypropylene around a one-half (½) inch diameter, Grade 60, steel reinforcing bar, conforming to ASTM A-615. Rails of the ladder shall be polypropylene extruded over a nine-sixteenth (9/16) inch diameter cold drawn round bar conforming to ASTM C-1018. Ladders shall meet all ASTM C-497 load requirements and shall be Lane International Corporation, Model No. P-5625-50 or approved equal. Ladders shall be attached to the wall of the manhole with a ½" x 2¾" stainless steel stud anchor.

Stormwater vault ladders shall meet the requirements of manhole ladders. Ladders at vault hatches or grates shall include pull up handrail.

9-14 SPECIAL PROVISIONS EROSION CONTROL AND ROADSIDE PLANTING

Replace

9-14.1 Soil

9-14.1(1) References

Replace

A. Washington State Department of Ecology, Western Washington Stormwater Manual, BMP T5.13: Post-Construction Soil Quality and Depth

B. WAC Chapter 173-350, Definitions and Section 220

C. United States Department of Agriculture (USDA) Soil Texture System of Classification

9-14.1(2) Submittals

Replace

A. Soil Management Plan: Prior to commencement of site work, submit a copy of the project Soil Management Plan and an attached implementation schedule that have been approved by local jurisdiction for permit.

B. Samples: Submit samples of all soil amendments. Include a list of sources and certification as specified. Soil amendments shall be submitted in one-gallon containers.

C. At the time of Post-Construction Inspection, furnish copies of material verifications such as load tickets, invoices, sales slips, test results and similar items as specified.

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9-14.1(3) Quality Assurance

Replace

A. Qualifications of Contractor: The Contractor shall be active and experienced in work of the type specified, and upon request by the Contracting Agency, be able to show evidence of successful completion of projects of similar scope.

B. Regulatory Requirements: Obtain and pay for all permits and testing related to the work of this section.

C. Pre-Grading Inspection: In conjunction with the soil preparation specified herein, meet with the Contracting Agency to discuss and verify requirements, schedule, and proposed soil preparation methods.

9-14.1(4) Bioretention Soil Mix (BSM)

New

Bioretention soil mix shall one be either Redmond BSM or Ecology BSM, as directed by the Stormwater Engineer or shown on the approved plans.

Acceptable Redmond BSM (9-14.1(4) A) or Ecology BSM (9-14.1(4) B) sources include:

1. Cedar Grove Composting, Maple Valley and Everett, Washington
2. Other City of Redmond approved equal

The Bioretention Soil Mix shall be mixed by the soil mix provider at their facility. The Contractor shall not obtain mix components separately and mix it at the project site.

9-14.1(4) A Redmond BSM

New

Redmond BSM shall be a well-blended homogeneous mixture of Bioretention Mineral Aggregate and Coconut Fiber measured on a volume basis composed of:

4 Parts Bioretention Mineral Aggregate (Section 9-03.12(7))
1 Part Bioretention Coconut Fiber (Section 9-14.4(8) D)

The Redmond BSM shall be tested to confirm that it meets the following criteria:

Parameter	Method	Requirement
Cation Exchange Capacity	EPA 9081	≥ 1 meq CEC/100 g
Organic Matter Content	ASTM D 2974 or TMECC 05.07A	1-8% (by dry weight)
Permeability Rate	ASTM D 2434 (using 2012 SWMMWW procedure on BSM 85% compacted per ASTM D 1557)	Initial infiltration rate between 2 inches and 24 inches per hour.

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9-14.1(4) B Ecology BSM

New

Ecology BSM shall be a well-blended homogeneous mixture of Bioretention Mineral Aggregate and Bioretention Compost measured on a volume basis composed of:

3 Parts Bioretention Mineral Aggregate (Section 9-03.12(7))

2 Parts Bioretention Compost (Section 9-14.4(8) C)

The Ecology BSM shall be tested to confirm that it meets the following criteria:

Parameter	Method	Requirement
Cation Exchange Capacity	EPA 9081	≥ 5 meq CEC/100 g
Organic Matter Content	ASTM D 2974 or TMECC	4-8% (by dry weight)
Permeability Rate	ASTM D 2434 (using 2012 SWMMWW procedure on BSM 85% compacted per ASTM D 1557)	Initial infiltration rate between 6 inches and 12 inches per hour.

The Ecology BSM shall also be tested for the following advisory criteria:

Parameter	Method	Goal
Dissolved Copper*	EPA 200.8	< 6.0 ug/L
Dissolved Zinc*	EPA 200.8	< 20.0 ug/L
Nitrate-Nitrite	EPA 353.2	<10 mg/L
Total Phosphorous*	EPA 365.2	< 200 ug/L

**Analysis will be performed on leachate extracted using EPA SW-846 Method 1312.*

9-14.1(5) Guarantee

New

Guarantee: Guarantee materials and workmanship for a period of one-year following Owner's final acceptance.

9-14.1(6) Sequencing and Scheduling

New

A. Coordinate work of other trades specified elsewhere.

B. Do not perform soil preparation work in areas subject to the subsequent work of other sections, unless approved otherwise.

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9-14.1(7) Maintenance

New

Maintain the work as specified in this section until final acceptance of the work.

9-14.1(8) Compost

New

A. Composted material must be in compliance with WAC Chapter 173-350 Section 220; plus, the following additional requirements.

B. Additional Requirements

1. The carbon to nitrogen ratio of the compost shall be below 25:1, or below 35:1 if the proposed plantings are composed entirely of plants native to the Puget Sound Lowlands region.

2. The compost shall have an organic matter content of 35% to 65% as determined by “loss on ignition” test method.

C. Alternative organic materials may be used in lieu of the specified compost if they meet the criteria for carbon to nitrogen ratio, contaminants (as defined in WAC Chapter 173-350 Section 220), and when mixed with existing native soil can achieve a calculated organic content of 5% for turf areas or 10% for planting beds.

D. Submit one-gallon sample, source, and letter of certification from the supplier to the Contracting Agency for approval prior to installation.

9-14.1(9) Mulch

New

A. Specified compost, or fine ground freshwater bark, or stockpiled forest duff from the project site.

B. Submit one-gallon sample, source, and letter of certification from the supplier to the Contracting Agency for approval prior to installation.

9-14.1(10) Imported Topsoil

New

A. A mixture of compost, meeting requirements of Section 2.1 above, and sand or sandy loam per USDA soil texture classification. The mixture shall contain a minimum of approximately 5% organic matter for turf areas or a minimum of approximately 10% organic matter for planting beds. The sand or sandy loam shall be free of weeds, deleterious materials, rocks, and debris. 100% of the imported topsoil shall pass through a 3/4" screen, less than 25% shall pass through a #200 sieve.

B. Submit one-gallon sample, source, and letter of certification from the supplier to the Contracting Agency for approval prior to installation.

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9-14.1(11) Soil Management Plan

New

The Soil Management Plan (SMP) will be submitted as part of site development / building permit application, and will include the following:

1. An 11” X 17” or larger site map indicating:
   Option 1. Areas where native soil and vegetation will be retained in place,
   Option 2. Areas where topsoil or subsoil will be amended in place,
   Option 3. Areas that will be stripped and stockpiled prior to grading for reapplication, and
   Option 4. Areas where imported topsoil will be applied.

2. Calculations for volumes of soil to be stockpiled and amounts of amendment or topsoil to be imported to achieve specified minimum organic matter content.

3. Names and sources of specified organic amendments and topsoil products to be used, with copies of laboratory analyses documenting that organic matter content and carbon to nitrogen requirements will be achieved and that compost meets WAC Chapter 173-350 Section 220 definition of “Composted Material”.

4. IF CALCULATED AMENDMENT RATES ARE TO BE USED, characterize site soils to be amended and compost or alternative organic material for the following properties:

   A. Soil- Bulk density, organic matter content and depth of compacted layers to a depth of 12 inches.
   B. Compost or alternative organic material- Bulk density, organic matter content, carbon to nitrogen ratio, moisture content/percent solids.

Soil samples must be gathered following the distribution plan outlined in the Post-Construction Inspection below and be composed of material from the entire depth to be amended, excluding any surface mulch layers. Calculations by a Qualified Professional must be provided showing that the organic content requirements will be met based on the organic contents and densities of both the site soil and amendments. Qualified Professionals include Certified Soil Scientists, Crop Advisors or Agronomists; and Licensed Landscape Architects, Civil Engineers or Geologists.

9-14.1(12) Preparation

New

A. Protect surrounding construction from damage caused by the work of this section.

9-14.1(13) Subgrades

New

A. Prepare subgrades as specified in paragraph 9.14.1(14) Amendment Options

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9-14.1(14) Amendment Options

New

A. Select the soil preparation option which best suits the project site. Different options may be used in different areas of the project. Choose either the "default" pre-approved amendment rate, or a qualified professional may calculate a custom rate based on soil and amendment tests described in Section 9.14.1(11) A.4. The selected soil preparation option(s) shall be shown on the Soil Management Plan approved with site development permit.

OPTION 1: Leave Native Vegetation and Soil Undisturbed, and protect from compaction during construction
Identify areas of the site that will not be stripped, logged, graded or driven on, and fence those areas to prevent impacts during construction. If not impacted, either in soils or vegetation, these areas do not require amendment.

OPTION 2: Amend Existing Soil In-Place	
Scarification: Scarify or till subgrade to 8 inches depth (or to depth needed to achieve a total depth of 12 inches of uncompacted soil after calculated amount of amendment is added). Entire surface should be disturbed by scarification. Do not scarify within drip line of existing trees to be retained.	
A. Planting Beds	**B. Turf Areas**
i. pre-approved RATE: Place and rototill 3 inches of composted material into 5 inches of soil (a total amended depth of about 9.5 inches, for a settled depth of 8 inches); **ii.** Calculated RATE: Place and rototill calculated amount of composted material or approved organic material into depth of soil needed to achieve 8 inches of settle soil at 10% organic content	**i.** pre-approved RATE: Place and rototill 1.75 inches of composted material into 6.25 inches of soil (a total amended depth of about 9.5 inches, for a settled depth of 8 inches); **ii.** Calculated RATE: Place and rototill calculated amount of composted material or approved organic material into depth of soil needed to achieve 8 inches of settled soil at 5% organic content.
Rake beds to smooth and remove surface rocks larger than 2 inches diameter.	Water or roll to compact soil to 85% of maximum.
Mulch planting beds with 2 inches of organic mulch.	Rake to level, and remove surface woody debris and rocks larger than 1-inch diameter

OPTION 3: Stockpile site topsoils prior to grading for reapplication. Amend with organic matter or add topsoil if necessary, to achieve required organic content to 8 inches depth.
Scarification: If placed topsoil plus compost or other organic material will amount to less than 12 inches: Scarify or till subgrade to depth needed to achieve 12 inches of loosened soil after topsoil and amendment are placed. Entire surface should be disturbed by scarification. Do not scarify within drip line of existing trees to be retained.

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A. Planting Beds	**B. Turf Areas**
Stockpile and cover soil with weed barrier material that sheds moisture yet allows air transmission, in approved location, prior to grading.	Stockpile and cover soil with weed barrier material that sheds moisture yet allows air transmission, in approved location, prior to grading.
Replace stockpiled topsoil prior to planting.	Replace stockpiled topsoil prior to planting.
i. PRE-APPROVED RATE: Place and rototill 3 inches of composted material into 5 inches of replaced soil (a total amended depth of about 9.5 inches, for a settled depth of 8 inches); ii. CALCULATED RATE: Place and rototill calculated amount of composted material or approved organic material into depth of replaced soil needed to achieve 8 inches of settled soil at 10% organic content	i. PRE-APPROVED RATE: Place and rototill 1.75 inches of composted material or into 6.25 inches of replaced soil (a total amended depth of about 9.5 inches, for a settled depth of 8 inches); ii. CALCULATED RATE: Place and rototill calculated amount of composted material or approved organic material into depth of replaced soil needed to achieve 8 inches of settled soil at 5% organic content.
Rake beds to smooth and remove surface rocks larger than 2 inches diameter.	Water or roll to compact soil to 85% of maximum
Mulch planting beds with 2 inches of organic mulch or stockpiled duff.	Rake to level,and remove surface rocks larger than 1-inch diameter.

OPTION 4: Import topsoil meeting organic matter content standards.	
Scarify or till subgrade in two directions to 6 inches depth. Entire surface should be disturbed by scarification. Do not scarify within drip line of existing trees to be retained.	
A. Planting Beds: Use imported topsoil mix containing 10% organic matter (typically around 40% compost).	**B. Turf Areas**: Use imported topsoil mix containing 5% organic matter (typically around 25% compost).
Place 3 inches of imported topsoil mix on surface and till into 2 inches of soil.	Place 3 inches of imported topsoil mix on surface and till into 2 inches of soil.
Place 3 inches topsoil mix on surface.	Place 3 inches topsoil mix on surface.
Rake beds to smooth and remove surface rocks over 2 inches diameter.	Water or roll to compact soil to 85% of maximum.
Mulch planting beds with 2 inches of organic mulch.	Rake to level and remove surface rocks larger than 1-inch diameter.

9-14.1(15) Inspection and Verification

New

A. Pre-Grading Inspection: Prior to the commencement of site work, contact the Contracting Agency to provide an inspection to verify the delineation and protection of native soils and vegetation to remain undisturbed, and to verify the proposed location for topsoil and material stockpiling. Make corrections and adjustment as directed by the Inspector.

B. Interim Grading Inspection: Prior to the placement of soil amendments, contact the Contracting Agency to provide an inspection to verify that specified erosion control methods have been implemented, the location of stockpiled soil and materials, and that subgrades are consistent with the Soil Management Plan. Make corrections and adjustment as directed by the Inspector.

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C. Post-Installation Inspection: Prior to planting, contact the Contracting Agency to provide an inspection to verify that the placement of amendments and soil preparation is consistent with the Soil Management Plan. Provide delivery tickets for soil amendments to verify the quantity of material specified on the Soil Management Plan. Make corrections and adjustment as directed by the Inspector.

D. Mulch Placement Verification: At the completion of planting, contact the Contracting Agency to provide a review to verify that mulch has been installed as specified.

E. Secondary Verification for Failing Sites: If the Contracting Agency determines that the installation does not meet the conditions of the approved Soil Management Plan, additional testing by an independent certified soil consultant will be ordered by the Contracting Agency and paid for by the Contractor. Make corrections and adjustment as directed by the Contracting Agency.

9-14.1(16) Final Acceptance

New

A. Final acceptance by the Contracting Agency for soil preparation will be contingent on the approval of all inspections, and that the soil preparation is consistent with these specifications and with the approved Soil Management Plan.

9-14.4 Mulch and Amendments

9-14.4(8) C Bioretention Compost

New

Bioretention Compost shall be Fine Compost meeting the requirements of Section 9-14.4(8) and that also meets the following requirements.

1. Bioretention Compost shall be from ≥ 65% Type I and ≤ 35% Type III Feedstocks (WAC 173-350- 100)
2. The Carbon to Nitrogen ratio shall be between 25:1 and 35:1. The carbon to nitrogen ratio shall be calculated using the dry weight of “Organic Carbon” using TMECC 04.01A divided by the dry weight of “Total N” using TMECC 04.02D.

The Bioretention Compost shall be tested to confirm that it meets the following criteria:

Parameter	Method	Requirement
SPLP Copper	EPA 1312 then 200.8	<= 5 ug/L
SPLP Nitrate+nitrite	EPA 1312 then 353.2	<= 0.1 mg/L
SPLP orthophosphate	EPA 1312 then 365.2	<= 0.5 mg/lg/L

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For Bioretention Compost, at least 10 Working Days prior to placement, the Contractor shall submit a sample of each type of compost to be used on the project to the Engineer. Bioretention Compost not conforming to the above requirements or taken from a source other than those tested and accepted shall be immediately removed from the project and replaced at no cost to the Owner.

Acceptable Bioretention Compost product sources include:

1. Cedar Grove Composting, Maple Valley and Everett, Washington
2. Other approved equal.

9-14.4(8) D Bioretention Coconut Fiber

New

Bioretention coconut fiber shall be the fibrous material found between the hard, internal shell and the outer coat of a coconut. Bioretention coconut fiber shall be soil grade fiber, 6 mm to 30 mm, properly hydrated, and suitable for mixing with sand. Product shall be free from weed and seeds.

Bioretention Coconut Fiber shall be tested to confirm that it meets the following criteria:

Parameter	Method	Requirement
SPLP Copper	EPA 1312 then 200.8	<= 5 ug/L
SPLP Nitrate+nitrite	EPA 1312 then 353.2	<= 0.1 mg/L
SPLP orthophosphate	EPA 1312 then 365.2	<= 0.5 mg/lg/L

Acceptable Bioretention coconut fiber product sources include:

1. Cedar Grove Composting, Maple Valley and Everett, Washington
2. Other approved equal.

9-14.4(8) E Screened Wood Chip Mulch

New

Screened Wood Chip Mulch shall be Rainier Wood Recyclers' Brown No. 2 Wood Chip or accepted equivalent. Rainier Wood Recyclers: 27529 Covington Way SE Covington, WA 98042. Phone: 253-333-0333.

Screened Wood Chip Mulch shall be derived from native trees and shall not contain cedar, black walnut, and/or exotic species. Wood chips shall not be derived from urban dimensional wood such as construction or demolition wood or from putrescible waste. Screened Wood Chip Mulch shall be created with chippers; not ground with grinders such as hammermills so as to minimize friable or hairy chips.

Screened Wood Chip Mulch color shall be naturally dark brown and shall not be artificially colored. It may contain wood, wood fiber, bark, and branches, but may not contain visible amounts of soil. Inorganic dirt and rocks shall not exceed 3%. Wood chip mulch shall be mechanically screened to reduce/minimize fines.

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Screened Wood Chip Mulch shall be free of weeds and weed seeds Including but not limited to plants on the King County Noxious Weed list available at: www.kingcounty.gov/weeds, and shall be free of invasive plant portions capable of resprouting, including but not limited to horsetail, ivy, clematis, knotweed, etc. It may not contain more than 1/2% by weight of manufactured inert material (plastic, concrete, ceramics, metal, etc.).

Screened Wood Chip Mulch, when tested, shall meet the following loose volume gradation:

Sieve Size	Percent Passing
1 inch	95 – 100
5/8 inch	0 – 50
¼ inch	0 – 20

At the Engineer's request, prior to delivery the Contractor shall provide the following:

1. The source of the product and species of trees included in it;
2. A sieve analysis verifying the product meets the above size gradation requirement;
3. A 5-gallon sample of the product, for the Engineer's approval.

The Engineer may allow the following chipped woody materials, meeting the above size gradation, weed-free, and inert material requirements, as acceptable substitutes for Screened Wood Chip Mulch:

A. Chips derived from composting operation screening ("overs")
B. Chips derived from whole tree grinding ("hog fuel")

9-15.0 CITY OF REDMOND PARKS DEPARTMENT IRRIGATION PARTS LIST

Replace

This Section shall be deleted in its entirety and replaced with the following:

Cabinet Enclosure	Metered Enclosure - V.I.T. Products, Strongbox (SB-24SS/120V) (powder coat dark green) Non-metered Enclosure - V.I.T. Products, Strongbox (SB-24SS) (powder coat dark green)
Cabinet Foundation	Metered Enclosure – V.I.T. Products, Strongbox (QP-M) Non-metered Enclosure – V.I.T. Products, Strongbox (QP-24)
Automatic Controller	Rain Bird ESP SITE
Double Check Valve	Wilkins 950XLT
Battery-Operated Controller	Hunter XC-Hybrid or Toro DDC WP Series
Pressure Regulating Valve	Wilkins 600 Brass
DC Solenoid	Rainbird TBOSPSOL
Control Valve	Rain Bird EFB-CP
Master Valve	Weathermatic Bronze Bullet
Isolation Valve	Legend or Nibco Brass Ball Valve
Modem	CTEK Z4550

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Resilient Seat Gate Valve	Kennedy 4057 or 4561N or Waterous
Quick Coupling Valve	1” Rain Bird 44 RC
Quick Coupler Valve Key	44 K
Unions	Schedule 80 PVC
Irrigation Pipe	Schedule 40 PVC for laterals Schedule 40 PVC for mainline Schedule 80 PVC nipples for valve assemblies
Pipe Fittings (all)	Schedule 40 PVC
Triple Swing Joints	Rainbird 1800 heads – Rainbird SA 65050Q or SA 125050Q (1/2”) Rainbird 5000 heads – Rainbird SA 127575 (3/4”) Rainbird 6504 heads – Rainbird TSJ PRS (1”)
Sprinkler Heads	Rain Bird 1800 Series Spray Heads (SAM PRS Series) Rain Bird 5004 Plus, Part Circle, Sam PRS (5004+PCSamR) Rain Bird 5004 Plus, Full Circle, Sam PRS (5004+FCSamR) Rain Bird 6504 Falcon Rotors (FC+PC)
Valve control wires	Red (141-R) control Orange (141-O) spare
Wire splice connectors	3M DBY (small) 3M DBR (big)
Valve and Wire Splice boxes	Standard quick coupler and wire splice box - Carson 10” Round complete (910) Standard valve box – Carson Jumbo (1220) Standard double check valve box – Carson (1730)

9-15.05 City of Redmond Parks Department Irrigation Standard Notes

New

Valves

- All permanent valves shall be Brass Rainbird EFB-CP
- Adjust valves with flow control to balance system.
- Valve designation number (i.e.: ‘6’ for valve 6) shall be clearly noted on each valve such that it can be visibly read when valve box lid is opened.
- Irrigation valves shall be located away from areas of potential tree roots.
- Irrigation valves shall be located at the maximum elevation within the site to allow for adequate drainage.
- An isolation valve shall be located at the primary mainline feeding all temporary irrigation.
- All irrigation boxes shall be supported by bricks to prevent box from sinking and/or resting on pipe.
- The double check valve shall be contained individually within one box.
- A 1” quick coupler valve shall be located just downstream of the double check valve (in its own box) for winterization purposes.
- Brass Isolation (ball) valves shall be installed upstream of each control valve.
- Brass union shall be installed on both sides of double check valve
- Valves shall be installed no deeper than 8” below finish soil grade
- Contractor shall use Schedule 80 threaded nipples, fittings, and unions on all control valve assemblies.

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- Control and quick coupling valves shall be located adjacent to pathways and clustered where possible.
- Valves shall run in consecutive order from one side of the project to the other.
- All valve boxes shall be large enough to fit the entire valve assembly including the isolation valve and unions.
- All valve or in-ground boxes shall have positive drainage (pea gravel)
- Locate valve boxes outside of turf areas and hardscapes where possible

Heads

- Contractor shall only use Rainbird brand spray and rotor heads. (1800, 5000, and 6500 series).
- Adjust radii of rotors as required to obtain even coverage.
- Adjust spacing of heads as required to obtain head-to-head coverage.

Pipes

- Contractor shall use a plastic cement primer before gluing each joint and fitting.
- Contractor shall use a heavy bodied plastic pipe cement on all joints and fittings 2” and larger (IPS WELD-ON PVC 711 Grey or equivalent).
- Contractor shall use a medium bodied plastic pipe cement on joints and fittings under 2” (IPS WELD-ON 721 Blue or equivalent)
- The main and lateral lines shall be schedule 40 PVC pipe.
- Irrigation heads (rotors and pop-ups) and quick coupler valves shall be installed with triple swing joint assemblies.
- A Parks Department employee shall be a witness to a pressure test on the installed irrigation system (main line only).
- The use of galvanized pipe will not be accepted on any irrigation installation.
- Contractor shall bury (shade) all mainline and laterals in a sandy soil.
- Contractor shall use both Teflon tape and thread sealing compound on all threaded fittings on main line and valve assemblies.
- Pipe sleeves shall be provided for all irrigation passing under sidewalks, pathways, or roads.
- Sleeves which run under paths, roads, or sidewalks shall be clearly marked with saw cuts in hard surface.
- An Isolation valve shall be installed on all temporary main lines where the permanent and temporary main lines meet.

Wiring

- A 12-gauge bare copper locator wire shall be installed on all main lines.
- All valve control wires shall be bundled and ran alongside the main line and secured every 10 feet.
- Additional control wires (spares) shall be installed to each control valve (at least two spares per valve cluster).
- Connect control wires to owner’s automatic controller to be located in cabinet or control room. Label/tag each wire with zone number or as a spare.
- All wire splices shall be located in a junction or valve box with the proper waterproof splice connectors. Label/tag each wire with zone number or as a spare.

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Other

- Contractor shall make any and all required adjustments to the irrigation plan to assure complete and adequate coverage with minimal overspray.
- The system is winterized by use of compressed air injected at the 1" quick coupling valve at the cut-in assembly and at the 1" quick coupling valves located along the irrigation main line piping.
- Prior to planting, irrigation system shall be fully functional.
- Contractor shall provide irrigation as-builts when project is complete.
- Parks Department Irrigation Lead or Technician shall be present for final testing of irrigation system.
- Three grounding rods shall be used for grounding irrigation controller.
- A working modem and a 120V receptacle shall be installed in the irrigation control cabinet.

9-21 RAISED PAVEMENT MARKERS (RPM)

9-21.1 Raised Pavement Markers Type 1

Supplement

All Type 1 RPMs shall be 4" round model "ANR-W or ANR-Y" as manufactured by Alpine Products, Inc. Auburn, Washington.

9-21.2 Raised Pavement Markers Type 2

Supplement

All Type 2 RPMs shall be square Stimsonite model 88 or Stimsonite model C80 as manufactured by Ennis-Flint.

9-29 ILLUMINATION, SIGNALS, ELECTRICAL

9-29.1 Conduit, Innerduct, and Outerduct

9-29.2 Junction Boxes, Cable Vaults, and Pull Boxes

Supplement

All concrete junction box lids shall be inscribed with the legends below:

- boxes with street lighting conductors shall read "LT"
- boxes with fiber optics, or copper interconnect, or spare for future read "ITS"
- boxes with traffic signal conductors read "TS" unless "ITS" is also present.

For example, a box containing lighting, and ITS, and traffic signal conductors would be labeled both "LT" and "ITS".

Label style shall comply with Standard Plan J.40.30.

All junction boxes within a paved or pedestrian area shall be made of non-skid steel plate at least 5/16-inch thick. Surfaces shall be Harsco Industrial IKG MEBAC1 or approved equal.

All junction box lids and frames shall be hot-dip galvanized.

All junction box lids shall be locking.

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9-29.3 Fiber Optic Cable, Electrical Conductors, Cables

Supplement

A. Interconnect Cable
Fiber optic interconnect cable shall conform to requirements in Section 9-29.3(1)

B. Illumination Conductors
Illumination conductors shall be USE rated

C. Induction Loop Conductors
Loop wire conductors shall be #12AWG or #14AWG, stranded USE
Loop lead-in conductors shall be IMSA 50-2

9-29.3(1) Fiber Optic Cable

Supplement

The fiber optic cables shall be suitable for use in a general-purpose telecommunications backbone network including installation outdoors in underground conduit in cable trenches, in conduit, in duct banks, and in aerial installations. The fiber optic cable shall be manufactured by Lucent, Corning or approved equivalent.

A number of cable types and configurations may be supplied under these Special Provisions. The Optical Specifications shall apply to each fiber supplied within a cable, and the Cable Construction specifications shall apply to the entire cable. Unless otherwise specified herein, the type, count, and length of each cable shall be per the Plans.

9-29.3(1) A Single Mode Fiber Optic Cable

Supplement

The optical fibers shall be single-mode with dual operating wavelengths at 1310 nm and 1550 nm nominal. The optical fibers shall be non-dispersion shifted. The optical specifications in this subsection are for un-cabled optical fibers unless otherwise noted.

Mode Field Diameter (Nominal): The Mode Field Diameter shall be 8.3 to 10 microns. The range of the specified nominal shall be less than ± 6%. The Mode Field Diameter measurement shall be made in accordance with TIA-455-191. The measurement wavelength shall be 1310 ± 20 nm.

Attenuation: The attenuation coefficient of the cabled optical fibers shall be:

- Maximum 0.35 dB/km @ 1310 nm
- Maximum 0.25 dB/km @ 1550 nm

The attenuation coefficient specified by the manufacturer shall be the maximum individual fiber attenuation coefficient in the cable. Fiber attenuation measurements shall be made in the factory in accordance with EIA/TIA-455-78 for single-mode fibers.

Chromatic Dispersion: The zero-dispersion wavelength shall be between 1295 nm and 1322 nm. The nominal zero-dispersion wavelength should be 1310 nm. In addition, the maximum value of the dispersion slope shall be no greater than 0.095 ps/ (km-nm2). The Chromatic Dispersion shall be measured in accordance with EIA-455-175.

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Environmental: The cabled Optical fibers shall maintain mechanical and optical integrity through an operational temperature range of -67°F to +185°F (-55°C to +85°C). The change in attenuation at the operational temperatures limits for single-mode fibers shall not be greater than 0.05 dB/km at 1310 nm and 1550 nm.

Fiber Identification: Color-coding: Color-coding of individual fibers shall be in accordance with EIA-359A. The fiber color-coding shall be discernible throughout the design life of the cable. Color concentrates or inks used to color the optical fibers shall be heat stable and shall not be capable of permeating through the protective fiber coating causing transmission degradation of the optical fibers as per Bellcore TR-NWT-00002 Section 5.2.5.

9-29.3(1) C Cable Construction

New

The fiber optic cable shall be an all-dielectric, loose tube fiber optic cable consisting of the specified number of fibers. Optical fibers shall be placed inside loose buffer tubes. The buffer tubes shall be stranded around a central strength member, and each buffer tube shall be filled with a non-hygroscopic, non-nutritive to fungus, electrically non-conductive, homogeneous gel. The gel shall be free from dirt and foreign matter shall be readily removable with conventional non-toxic solvents. Fillers may be included in the cable core to lend symmetry to the cable cross-section where needed. The buffer tubes shall be enclosed in a cable sheath as specified in this section.

Cable Materials: The cable shall be constructed using all dielectric materials. No metallic shielding or conductors shall be used. The optical fiber coating and/or buffer shall consist of materials that are environmentally stable in order to reduce long-term effects of stress corrosion caused by moisture absorption. The coating shall be suitable for removal by industry standard mechanical stripping methods. No chemicals shall be required to strip the coating and/or buffer material.

Structural Member(s): Structural member(s) constructed of all dielectric materials shall be used to limit the stress on the optical fibers. In outdoor cables the strength member shall be in the center of the cable.

Buffer Tube Identification: Buffer tubes shall be color coded as per EIA-359A.

Cable Code and Length Marking: Cable Code and Length Marking shall comply with Bellcore TR-NWT-000020, Section 5.2.4. This shall include sequentially numbered length markings in feet imprinted on the jacket, and this length marking shall not be reset to zero along the cable length. In addition to length markings, each length of the cable must be permanently marked to include the following:

- Manufacturer Cable and I.D. Code
- Year of Manufacturer (cable)
- Number of Fibers
- Twisted Pairs, if applicable

Temperature Range: The installation temperature ranges shall be the following:

- Storage Temperature: -58°F to 60°F (-50°C to 60°C)
- Installation Temperature: -40°F to 122°F (-40°C to 50°C)

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- Operating Temperature: -58°F to 140°F (50°C to 60°C)
- Relative Humidity 85% - 90%: 44.6°F to 140°F (7°C to 60°C)
- Cable Life: The cable shall maintain its mechanical and optical performance for an in-service period exceeding forty (40) years.

Pulling Eye: When required, the Vendor shall recommend and install a cable-pulling eye most appropriate for their cable. The pulling eye shall be designed such that the tensile load is transferred directly from the pulling eye to the cable tensile strength member during installation. The pulling eye/cable interface shall be watertight and shall not apply any tension to the fibers. The outside diameter of the pulling eye shall not exceed the cable diameter by more than 1/5 inch (5 mm). Cables without pulling eyes shall have the ends sealed to prevent the ingress of moisture.

Cable End Access: Each length of cable shall be wound on a separate cable reel. Each cable shall be reeled in such a way that both ends of the cable are readily accessible for testing, without any need for unreeling. The inner end of the cable shall be properly secured to prevent whipping when the end of the reel is reached. A minimum of 9 feet 10 inches (3 m) of the inner end of the cable shall be accessible for optical testing. The inner end must be securely fastened or protected against shipping or installation damage.

Warranty and Reliability: The cable manufacturer shall maintain suitable records for a period of at least five years of all optical tests required. The manufacturer shall guarantee to the purchaser that the Fiber Optic Cable will be furnished free from defects in design, material and workmanship, and will conform to and perform in accordance with this specification when leaving the manufacturer’s plant. It shall be the cable manufacturer’s responsibility to conduct the required testing to substantiate this guarantee and ensure that design parameters for a forty (40) year useful life were used, assuming normal conditions of installation and operation.

The cable shall carry an optical, electrical, and mechanical performance warranty of five (5) years from the date of the cable shipment from the manufacturer’s plant.

After a five (5) year warranty period, the installed cables shall exhibit the same optical, electrical, and mechanical characteristics as date of purchase.

9-29.3(1) D Fiber Optic Cable Supply

New

Shipping Requirements: Fiber optic cable shall be furnished in a manner suited to installation requirements developed by the Contractor. All cable shall be shipped on reels adequately protected from damage in shipment by heavy wrapping or wood lagging.

Fiber optic cable shall be closely and tightly wound around each layer on reels. Both ends of the cable shall be sealed to prevent the entrance of moisture and securely fastened so that they will not become loose while in transit.

Packaging Requirements: Each reel shall contain on the outside flange, plainly eligible and water resistant the following information:

1. City purchase order number
2. Manufacturer’s identification (name or trademark)
3. Cable information (length, type)

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4. Total weight
5. Date of cable manufacture (month, year)
6. Quantity and type of fiber
7. A copy of the fiber optic test results as described below shall be provided with each reel

Factory Tests:

1. Prior to shipment, Factory-controlled tests shall be performed to verify compliance of the cable with the City's specifications.
2. Each cable reel shall be shipped with test results indicating the length of the cable reel and the attenuation at 1310 nm and 1550 nm for each fiber. A copy of these test results shall also be provided to the City.
3. Any test that reveals the materials or equipment does not meet the stated specifications shall constitute failure.

Delivery Inspection: The Contractor shall inspect fiber optic cables at the time of delivery to the Site to ensure that no damage was done during shipping and that the specified cable was received. Every reel shall be inspected by the Contractor for physical damage such as nails driven into reels to secure shipping blocks, lagging, or reel covering missing and cable and seals missing or damaged. A copy of these inspection reports shall be submitted to the City when requested. The Contractor shall replace all damaged or rejected cable promptly.

9-29.3(2) A3. Equipment Grounding and Bonding Conductors

Revision

Equipment grounding and bonding jumper conductors shall be green insulated, stranded copper with cross-linked polyethylene insulation rated THWN and 600 volts, with the exception that the equipment grounding and bonding jumper conductors installed between a junction box or cable vault's frame and its lid shall be tinned, braided copper.

9-29.6 Light and Signal Standards

9-29.6(1) Steel Light and Signal Standards

Supplement

Steel light and signal standards shall conform to the WSDOT Pre-Approved plans with the following provisions:

1. All pole shafts and arms for signal and illumination standards shall be round and tapered or approved equal. Pole shafts shall be one-piece construction. No butt welds will be allowed except to the base plate.
2. Luminaire poles and Type 3 signal standards shall incorporate a Type 1 (J style) davit arm with a 5-foot 9-inch radius bend.
3. All signal poles shall have base plate bolt covers, provided by the pole fabricator.
4. All signal mast arms shall have end cap covers, provided by the pole fabricator.

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9-29.6(1) A Decorative Steel and Concrete Street Light Standards

Decorative street light poles shall conform to the following:

1. Square pre-stressed concrete poles shall be the Centrecon product line manufactured by Ameron and shall conform to City of Redmond Standard Drawing No. 420.
2. Octagonal pre-stressed concrete poles shall be the Centrecon product line manufactured by Ameron and shall conform to City of Redmond Standard Drawing No. 430.
3. Victorian style concrete poles shall conform to City of Redmond Standard Drawing No. 430B.
4. Victorian style steel poles shall conform to City of Redmond Standard Drawing No. 471.
5. Fluted decorative steel poles shall conform to City of Redmond Standard Drawing No. 470.

9-29.7 Luminaire Fusing and Electrical Connections at Light Standard Bases

Supplement

Light standards shall be equipped with 2 in-line fuse holders with the fuses mounted inside the pole and readily accessible from the handhole. Fuse holders shall be SEC Model 1791 SF with FNM 5 or approved equal. In-line fuse shall be 10-amp, slow burn.

9-29.7(3) Splicing Electrical Connections at Junction Box

New

Illumination splices in junction box shall use the following re-enterable splice kits:

- Splice kits shall be SEC Model 1791-DP
- Splice box shall be SEC Model 0791-0.

9-29.10 Luminaires

Supplement

LED luminaires shall be provided with markers for positive identification of light source type and wattage and lumen output rounded to nearest hundred lumens. Markers shall have black block letters on a white background. The marker shall list the consumed power (at rated voltage and 25*C) and the characters “LED”. All luminaire fixtures shall have a control ready 7-wire photocontrol receptacle with GE ELWN0A8UBAAXXAD external node.

9-29.10(1) Cobra Head Luminaires

Replace

LED Cobra Heads Luminaires shall be manufactured by Leotek and conform to the following part numbers:

- GCM2-(XX)H-MV-NW-3R-GY-530-PCR7-CR-WL
- GCM2-(XX)H-MV-NW-3R-GY-700-PCR7-CR-WL

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- GCL1-(XX)H-MV-NW-3R-GY-530-PCR7-CR-WL
- GCL1-(XX)H-MV-NW-3R-GY-700-PCR7-CR-WL.

9-29.10(2) Decorative Luminaires

Supplement

Decorative luminaires shall conform to the following:

1. Rectangular “shoebox” fixtures shall be CREE LEDway LED. The unit shall conform to the following part numbers:

    - STR-LWY-3M-HT-(XX)-E-UL-BZ-525-DIM-R-UTL-40K-7P
    - STR-LWY-3M-HT-(XX)-E-UL-BZ-700-DIM-R-UTL-40K-7P.

    See City of Redmond Standard Drawing No. 420.

2. Post top mount fixtures for the steel Victorian decorative poles shall be as specified on City of Redmond Standard Drawing No. 471. Lamps shall be LED and fixture shall be painted RAL 8556A “Peking Blue”.

3. Hanging decorative luminaires shall be as specified on City of Redmond Drawing No.470. Lamps shall be LED and fixture shall be painted RAL 8556A “Peking Blue”.

4. Post top mount fixtures for the concrete Victorian decorative poles shall be as specified on City of Redmond Standard Detail No.430B. Lamps shall be LED, and fixture shall be powder coated black.

9-29.13(3) Traffic Signal Controllers

Supplement

The Contractor shall furnish an Econolite Cobalt ATC 1000 controller with telemetry module.

9-29.13(6) Emergency Preemption

Supplement

All emergency vehicle preemption equipment and materials shall be the Opticom™ emergency vehicle preemption system.

The emergency preemption detectors shall be the 721 Opticom™ detectors unless specified otherwise in the plans. The detectors shall be capable of detecting an optical signal generated by an Opticom™ brand emitter assembly. The detectors shall detect the optical signals from the emitter, amplify the signal, and transmit it to the phase selector.

The detector lead-in cable shall be Opticom™ Model 138 shielded detector cable.

9-29.13(10) C NEMA Controller Cabinets

Revision

The Contractor shall furnish a NEMA TS2 Type 1 size P controller cabinet assembly with generator bypass door, Western Systems Part Number 2500010031 (or subsequent revision approved by the City).

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Cabinet Components

Major cabinet components shall include:

- Malfunction Management Unit: Reno part number MMU-1600GE
- Power supply: EDI part number PS250
- Bus interface units: EDI part number BIU700, quantity 5
- Loop detector amplifiers: EDI part number ORACLE4eH, quantity 8.
- Preemption discriminator card: GTT Opticom 764 rack-mounted multimode phase selector.
- Preemption interface panel: GTT Opticom 768 interface panel. This shall be purchased through and installed by the cabinet manufacturer.
- Polara Navigator accessible pedestrian signal control unit, part number iCCU-S2, and harness, shall be purchased through and installed by the cabinet manufacturer.

9-29.16 Vehicular Signal Heads

Supplement

Vehicle signal heads shall be manufactured by McCain Traffic Supply and shall be equipped with tunnel-type visors and shall have a flat back mounting. All exterior and interior surfaces of the signal head housing and doors, and all exterior surfaces of signal visors shall have an electrostatically powder-coated finish of Traffic Signal Green. Interior surfaces of visors shall be painted flat black. The vehicle signal heads shall be installed with LED indications for all sections. These shall be Dialight LED:

Red ball – 433-1210-003XL
Amber ball – 433-3230-901XL
Green ball (clear lens) – 433-2270-001XL
Red arrow – 432-1314-001XOD
Amber arrow – 431-3334-901XOD
Green arrow (clear lens) – 432-2374-001XOD
Green/Amber arrow – 430-6370-001

Vehicle signal heads shall have 12-inch lenses unless otherwise shown on plans.

All vehicular signal heads shall be equipped with 12-inch aluminum tunnel visors.

All vehicle signal heads shall have a 1/4-inch drain hole in the base.

9-29.18 Vehicle Detectors

9-29.18(1) Induction Loop Detectors

Supplement

The following materials are required for detector loop installation:

- No. 12 AWG or No. 14 AWG stranded copper wire, USE.
- Loop lead-in wire shall be IMSA Loop Cable Specification No. 50 2, No. 14. Single pairs shall be used. The number of single pairs required shall conform to the “Loop Detector Spacing” Drawing No. 454A.

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- Loop sealant shall be MSI, Crafco Loop Detector Sealant, Part No. 34271. Loop sealant shall be packaged in containers clearly marked “Loop Detector Sealant.”

9-29.18(1) A Detector Amplifiers

New

The Contractor shall furnish and install 4 channel EDI Oracle 4eH Induction Loop Amplifiers.

9-29.19 Pedestrian Push Buttons

Supplement

Pedestrian push buttons shall be Polara Engineering Bulldog III (version 3) momentary style buttons, black in color, part number R-BDL3-B-4H. Pedestrian push button mounts shall be Polara Engineering, 5-inch by 7-inch frame, black in color, part number PBF 5X7-B. Pedestrian push button plaques shall be Polara Engineering part number 800-87.

Accessible pedestrian signal stations shall be Polara Navigator, part number iNS25AN0-B Ped Station. Where two buttons are installed within 10 feet of one another, they shall use speech messages, part number iNS25AN1-B. Accessible pedestrian signal control unit shall be Polara Navigator part number iCCU-S2. It shall be supplied with 2-wire cable (part number BTN-PLC-Cable, normally provided with the control unit); a 4-foot “Y” splitter cable (part number iN2-SDLC-YCABLE); and Polara Navigator interconnect board (part number iN2-ICB).

9-29.20 Pedestrian Signals

Supplement

Pedestrian signal displays employed on this Project shall be uniform appearance countdown style, either:

1. Dialight part number 430-6479-001X, or
2. GE Lumination part number GT1, or
3. Approved equal.

The maximum overall dimensions of the signal shall be 19 inches wide, 18 3/4 inches high, and 19 inches deep, including “Z” crate visor and hinges. The signal shall be furnished complete with transformers installed. In order to facilitate installation and maintenance, the signal shall be designed so that all components are readily accessible from the front by merely opening the signal door.

The case shall be a 1-piece corrosion-resistant aluminum alloy die casting. Integrally cast hinge lug pairs, 2 at the top and 2 at the bottom of each case, shall be provided for operation of a swing-down door. Prior to final assembly, the case, door frame, and “Z” crate visor (aluminum portion only) shall be thoroughly cleaned and chromate conversion coating applied inside and out per Military Specifications MIL-C-5541. A synthetic enamel conforming to Military Specifications TTE-529 shall then be electrostatically applied. Color and gloss shall be Traffic Green. The finish shall be oven cured for a minimum of 20 minutes at 350 degrees F. All terminal compartments shall be either ferrous metal or bronze.

9-29.22 Rectangular Rapid Flash Beacon (RRFB) System

New

Rectangular Rapid Flashing Beacon (RRFB) system shall consist of RRFB LED light bars, controller cabinet, controller panel, push button assemblies, and associated warning signs, all mounted on poles (configuration per the Plans).

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Controller Cabinet

The cabinet shall be manufactured of 0.125-inch sheet aluminum and shall be a Type 3X NEMA enclosure. Nominal cabinet dimensions shall be 13.63" H x 15.5" W x 14.75" D. The cabinet shall be a one (1) compartment type with a neoprene gasket seal for a weather seal. The cabinet shall have wire screened insect-proof louvers on each side for ventilation. The louvers shall be designed to not allow any rain to enter the cabinet. On the bottom of the cabinet there shall be two screened insect-proof drain holes. The door shall be a single unit with a continuous piano hinge riveted to the door and the cabinet. The door shall incorporate a neoprene gasket which, when closed, forms a snug weather-tight seal. The door lock shall be a standard police lock, reinforced with a steel plate. Each cabinet shall be equipped with the necessary rigid mounts appropriately sized for the pole as dimensioned on the plans. All necessary hardware for the proper mounting shall be included.

Control Panel

The control panel containing the electronics (circuit breaker, surge arrestor, flasher, countdown timer, and a 120 VAC to 12 VDC power supply) shall be mounted in the cabinet using bolts with wing nuts for quick and easy removal. The back panel and flashing beacons shall be connected through a main wiring harness via a circular pin connector (CPC). All modular components shall be connected in such a manner that they are easily removed for replacement or maintenance. Two control panels will be supplied, one in the upper compartment and one in the lower compartment. Each control panel will control the flashing beacons for one set of lanes.

The circuit breaker must be a one pole, 20A, 120 VAC with reversible line or load lugs for line or surface mounting wiring. The flasher shall be solid state, two circuit device which controls the flashing sequence of the beacon. The flasher will have a selectable flash rate of 35 to 70 flashes per minute and will flash a duty cycle of 50 percent on and 50 percent off. The flasher shall be a separate unit easily removable for maintenance. The flasher will be capable of operating in a temperature range of -40 degrees C and +85 degrees C. The surge arrestor will be capable of protecting up to 120 VAC, 60A service, will have no follow current, respond in 5 nanoseconds, and will allow automatic recovery. It must be flame retardant epoxy encapsulated. The peak surge current will be 13kA/mode/phase total. The surge arrestor will be approximately 0.5" H x 1.5" W x 2.0" L. It will operate from -40 degrees C to +85 degrees C. The system shall employ a countdown timer that allows the end user to adjust the length of time that the RRFBs flash upon activation. The range of time shall be adjustable from 1 second to a maximum of 1 minute in 1-second intervals. The timer shall operate such that any time the pedestrian pushes the button the timer resets to its preset time to allow the pedestrian the full amount of time to cross the street. The countdown timer will operate from -20 degrees C to +60 degrees C.

RRFB LED Light Bar

The RRFB shall comply with the latest FHWA guidelines, and the housing shall be wraparound, have a brushed aluminum finish and shall have rectangular shape, high intensity LED alternating patterns flashing beacons with number of LEDs and configuration per the Plans. All RRFB light bars shall be manufactured by Electrotechnics Corporation or approved equal. Mounting shall be per manufacturer's recommendation- coordinate work with the Engineer in the field. The RRFBs will wig wag with a flash pattern of two rapid flashes on one beacon and then four short rapid flashes and one longer rapid flash on the other beacon as specified in the latest interpretation letter from FHWA dated June 13, 2012. The beacons shall flash at a rate between 70 and 80 flashes per minute. The LED light on the end facing the pedestrian crosswalk shall be a Whelen Class 1 light.

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The LEDs used in the light bar shall meet the SAE J595 requirement for peak luminous (candelas) for Class 1. The vendor shall submit third-party lab certification that the LEDs have been tested and certified for Class 1 intensity. The RRFB light bar will be assembled and wired as a unit and shall include two flasher timers: one for pedestrian push button and one for future detection. It will consist of a mounting bracket, a bottom shell that attaches to the mounting bracket, and a top shell that attaches to the bottom shell. It shall be mounted on the pole with U-bolts.

The system shall be supplied with pedestrian push button part number BDSP-014-B.

9-29.23 Speed Radar

New

Speed radar system shall be Speed Check Radar 14205010 as manufactured by Information Display Company. Connection from all devices in junction box shall be via an SEC Pin Kit (SEC 1791-SP).

9-29.24 Service Cabinets

Supplement

The service cabinet shall be a Skyline Electric Drawing No. 47995 R5 conforming to City of Redmond Standard Drawing No. 461 and the following requirements. A copy of the wiring diagram shall be provided in a plastic holder mounted conveniently inside the service cabinet. Nameplates shall be provided for each control component and shall be embossed phenolic with white letters on black background.

The service cabinet wiring shall be arranged so that any piece of apparatus may be removed without disconnecting any wiring except the lead to that piece of apparatus. All wiring shall be appropriately marked with a permanent, indelibly marked, clip sleeve wire marker. Control wire shall be 7 strand No. 14 AWG THHN and all wiring shall conform to NEMA Class II C.

There shall be space within the cabinet for the future addition of 2-time clocks and 3 additional contactors.

Breaker sizes shall be as shown on Breaker Schedule on the plans. If no Breaker Schedule is shown on the plans, breakers shall be per City of Redmond Standard Drawing No. 461.

9-29.24(1) Metered Service Disconnect

New

The service disconnect cabinet shall be of Type QO “Load Center”, Catalog No. Q02L40RB, Series G01 or approved equal and conforming to City of Redmond Standard Drawing No. 458.

9-29.25 Amplifier, Transformer, and Terminal Cabinets

Supplement

A. Pole Mounted Terminal Cabinet

Pole mounted terminal cabinets shall conform to NEMA 3R requirements. Each cabinet shall have a minimum of three 12-position terminal blocks

The cabinet shall be constructed of welded 14-gauge (minimum) sheet aluminum and shall be of the following dimensions: 8 inches by 12 inches by 16 inches. The cabinets shall be gray in color.

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The door shall be equipped with a lock that shall be capable of accepting a Best BM Series core.

9-29.26 Battery Backup System

New

A. Alpha BBS Part Numbers

This specification establishes the minimum requirements for a complete emergency battery back-up system for use at traffic signals utilizing Light Emitting Diodes (LED) signals and pedestrian heads. The Battery Back-up System (BBS) shall include, but not be limited to the following:

- UPS with Inverter, Charger, Tap Switching Transformer and Internal Power Transfer Switch.
- Automatic / Manual Bypass Transfer Switch unit.
- Batteries
- Cabinet
- Mounting hardware
- Wiring

The BBS shall provide reliable emergency power to a traffic signal in the event of a power failure or interruption.

B. ALPHA FXM2000 UPS

Part Number: Western #: 8025010020 | Alpha# 017-232-31

The BBS shall provide the following operational modes when operating on battery power:

- Full operation of all traffic signal devices
- Flash operation
- Combination of full and flash operation

C. ALPHA enclosure (s6)

Part Number: Western #: 8025020302| Alpha# SE48-2216

The Alpha Enclosure shall include the following equipment:

- Best Lock
- Universal Automatic Transfer Switch
- Receptacle Plate Assembly
- Battery Cable Kit
- Alpha Guard
- Battery Heater Mats

D. ALPHAcell batteries

Part Number: Western #: 8025040060 | Alpha# 181-233-10

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The battery shall be comprised of extreme temperature, float cycle, GEL VRLA (Valve Regulated Lead Acid). Individual batteries shall meet the following specifications:

- Voltage Rating: 12V
- Amp-hour rating: 109 AH, at the 20-hour rate, to 1.75 Volts per cell, minimum battery rating. Larger AH batteries are acceptable providing they do not exceed the group size listed below. (Case 31)
- Group size: Case 31
- Batteries shall be easily replaced and commercially available off the shelf
- Batteries shall provide 100% runtime capacity out-of-box. Each battery must meet its specification without the requirement of cycling upon initial installation and after the initial 24-hour top off charge.
- Batteries used for the BBS shall consist of 4 batteries configured for a 48 VDC battery buss system.

E. ALPHA riser (8" – Aluminum)

Part Number: Western #: 8025020400 | Alpha# 740-787-22

F. Remote Battery Management System

Part Number: Western #: 8520051000 | Alpha# 0370260-001

G. Natural Aluminum Finish

9-29.27 Detectable Pull Tape

New

The Contractor shall furnish and install a flat polyester woven pre-lubed tape that contains a 22-gauge wire.

The tape will be marked with sequential footage markings and be continuous.

The tape shall meet or exceed a breaking strength of 900 lb., with a width of 1/2-inch.

9-29.28 Communications Vault

New

The Contractor shall provide pre-cast utility vaults meeting ASTM C 478 with twenty-eight (28) day 5500 psi minimum compressive strength concrete and designed for H-20 loading unless otherwise indicated on the Plans.

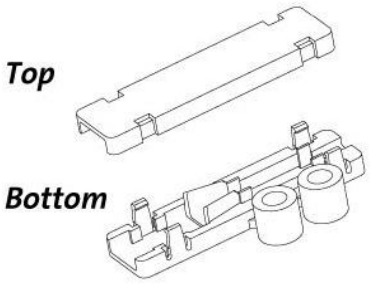
As specified on the Plans, the communications vault, "C", shall be a type 25TA manufactured by Utility Vault Co. or approved equivalent, or a WSDOT Pull Box per WSDOT Standard Plan J.90.10-00. The communications vaults are to be provided with a racking hardware package for cable storage as indicated on the plans and details. The vault cover shall have a slide-lock device, non-skid surface and a ground strap. Refer to the vault details on the Plans and WSDOT Standard Plan J.90.20-00.

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9-29.29 Splicing and Termination

9-29.29(1) Fiber Optic Buffer Tube Fan-Out Kit

New



Furcation Unit



Fan-Out Assembly

The Contractor shall furnish and install Buffer Tube Fan-Out Kits as shown on the Plans and in the details. The Buffer Tube Fan-Out Kit shall meet the following requirements:

1. The assembly shall include a 900 mm fan-out assembly and a top and bottom furcation unit.
2. The assembly shall be color coded to match the fiber color scheme.
3. The assembly shall have an environmental rating by the manufacturer for use in field cabinets.
4. The tubing supplied within the assembly shall have a minimum length of 25 inches.
5. The assembly shall be sized for either 6 or 12 single-mode fibers, depending on the fiber optic cable that is to be terminated.

9-29.29(2) Fiber Optic SC Connectors

New

The Contractor shall supply Simplex Single-mode SC Fiber Optic Connectors that utilize epoxy. The Fiber Optic Connectors shall meet the following standard and specifications and be tested to Telcordia GR-326, Issue 3:

- Insertion Loss (SM): < 0.30 dB
- Insertion Loss (MM): < 0.50 dB
- Reflectance (UPC): < -40 dB
- Reflectance (APC): < -65 dB
- Fiber Height: ± 50 nm
- Radius of Curvature (UPC): 7 - 25 mm
- Radius of Curvature (APC): 5 - 12 mm
- Apex Offset: < 50 µm

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- Designed for terminating single mode fiber with 125 µm cladding
- Factory-measured attenuation less than 0.5 dB
- Connector attenuation will not change more than 0.2 dB following 1000 matings

9-29.29(3) Fiber Optic Termination Panel – 12 Port

New

The Contractor shall furnish and install a Fiber Optic Termination Panel in the locations shown on the Plans in the traffic signal controller cabinet. The termination panels located in the traffic signal controller cabinets shall consist of a single panel housing for storage, protection and termination of fiber optic cables and shall be manufactured by Corning Cable Systems model number LANScape SPH-01P. The panel shall meet the following requirements:

- The cabinet shall be of metal construction with dimensions no larger than 6.3”H x 5.5” W x2.0”D.
- The cabinet shall be suitable for wall or shelf mounting and shall be provided with all necessary hardware required for mounting.
- The cabinet shall include a lockable access door.
- The cabinet shall have cable entrances on the top and bottom of the cabinet. All cable entrances shall have a gasket to prevent the ingress of foreign material into the cabinet.
- The cabinet shall include internal cable management for the protection of the furcated fibers.
- The termination panel shall utilize connector panels to facilitate the connection of the connectorized Buffer Tube Fan-Out Kit and fiber optic patch cords used to connect to the equipment.
- The panel housing shall accommodate and include one CCH connector panel that accommodates up to 12 fibers. The connector panel shall be populated with six SC connectors. All connectors shall be supplied with protective covers.
- For locations where a 24-port panel is required, 2-12 port panels shall be installed.

9-29.29(4) Fiber Optic Splice Enclosure

New

The Contractor shall supply fiber splice enclosures as indicated on the Plans. The enclosure shall be Tyco Electronics part number FOSC 450 or equivalent and shall be suitable for both vault and aerial applications. The enclosure will meet the following requirements:

- The splice enclosure shall be suitable for outdoor applications with a temperature range of -10°C to 60°C.
- The splice enclosure shall provide sufficient space to allow entry of fiber optic cable without exceeding the cable minimum bending radius.
- The enclosure shall protect the splices from moisture and mechanical damage and shall be resistant to corrosion.

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- The enclosure shall be waterproof and re-enterable.
- The enclosure shall permit selective splicing to allow one or more fibers to be cut and spliced without disrupting other fibers.
- The enclosure shall have strain relief for the cable to prevent accidental tension from disturbing the splices.
- Each splice tray will be able to store 36 splices securely. Each splice shall be individually mounted and mechanically protected on the splice tray. Vinyl markers shall be supplied to identify each fiber spliced within the enclosure.
- The Contractor shall furnish and install the mounting hardware for aerial and vault applications where indicated on the plans. The Contractor shall field verify the appropriate hardware for each application. Mounting hardware may include vertical mounting brackets for attachment to poles, adjustable aerial hanger brackets or vault hangers.

9-29.37 CCTV

9-29.37(1) CCTV Cabling

New

Video and Data Cable

The cable shall be an outdoor rated, shielded CAT6 cable or approved equivalent.

9-30 WATER DISTRIBUTION MATERIALS

9-30.1(1) Ductile Iron Pipe

Revision

Modify the last statement of subparagraph one as follows:

"...All other ductile iron pipe shall be standard thickness Class 52, ~~minimum pressure class 350~~…"

Supplement

Add the following subparagraphs:

4. Ductile iron pipe shall be American, McWane Ductile, or US Pipe, manufactured in the United States or Canada. No other manufacturers or countries of origin will be allowed.
5. Ductile iron pipe with threaded flanges shall meet the requirements of AWWA C-115 and all threaded flanges shall be ductile iron.

9-30.1(4) Steel Pipe

9-30.1(4) B Steel Pipe (4-inches and under)

Supplement

Add the following to the first paragraph:

Steel pipe 4-inches and smaller shall be schedule 40.

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9-30.2 Fittings

9-30.2(1) Ductile Iron Pipe

Revision

Add the following to the paragraph:

Ductile iron fittings conforming to AWWA C-153 shall be class 350. Flange-type fittings shall meet the requirements of AWWA C-115 and shall be ductile iron. Flanges shall be faced and drilled to 125-pound ANSI template. Bolts shall be steel as specified in the appendix of AWWA C-115. 'Uniflanges' are prohibited. Ductile iron fittings shall be American, Clow, Star, and Tyler-Union manufactured in the United States or Canada. No other manufacturers or countries of origin will be allowed.

9-30.2(6) Restrained Joints

Revision

Delete this section in its entirety and substitute with the following:

Restrained joints for mechanical joints shall be US Pipe Mechanical Joint Gripper Gland, Romac Grip Ring, Uniflange Series 1400, Tyler MJ Field Lok or Mega Lugs, or approved equivalent. Restrained joints for push-on type joints shall be US Pipe field-lok gasket and American Pipe Fastgrip gasket. No other restraint systems shall be used. All restraint systems shall be manufactured in the United States or Canada.

9-30.3 Valves

Supplement

Add the following to the paragraph:

Each valve bonnet shall be covered by 2-inch thick "ethafoam" donut ring sized for the valve box or Carson VGuard Valve Box Adaptor appropriately sized to fit the valve bonnet and valve box bottom section.

9-30.3(1) Gate Valves (2 to 12 inches)

Revision

Delete the first paragraph and substitute with the following:

Gate valves, 2-inches through 12-inches, shall be of the resilient wedge type, and shall conform to the requirements of AWWA C-509 or C-515. All interior various parts, including the interior of the gate or wedge shall be coated with fusion bonded epoxy with a minimum thickness of 8 ml. Said coating shall be non-toxic, impart no taste to water and shall conform to AWWA C-550.

Gate valves, smaller than 2-inches for buried service, shall be iron bodied, non-rising stem with bronze double wedge disc rated for service at 300 PSIG non-shock WOG. Valves shall have joints compatible with the pipe to which they are connected.

Gate valves, smaller than 2-inches for exposed service shall, be bronze-bodied double wedge disc gate valves. Valves shall have joints compatible with the pipe to which they are connected. Valves shall have a handwheel operator.

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9-30.3(3) Butterfly Valves (valves 12 inches and larger)

Revision

Modify the first paragraph as follows ". . . AWWA C504 Class 250B."

9-30.3(4) Valve Boxes

Supplement

Add the following to the paragraph:

The cover shall be a non-locking drop lid cover with a 2-inch skirt. Valve box assemblies shall be two-piece slip type, 8555 series, made in the United States by East Jordan Iron Works Inc.

Cover - catalog no. 6800

Top Section 16", Bottom Section 24" - 85552737

Extensions shall be cast iron soil pipe. Align valve box internal lugs in the direction of the water main. Valve box assemblies' countries of origin shall be United States and Canada. No other countries of origin shall be allowed.

9-30.3(5) Valve Marker Posts

Revision

Modify the second paragraph as follows:

The exposed portion of the marker post shall be coated with two coats of concrete paint Far West Paint Company #260 (Canary Yellow), Parker Paint Marathon 1050, color #29-6696 with 1030 Neutral Base or approved equal. Use of an appropriate surface primer is required. Posts shall be located within the right-of-way or utility easement.

9-30.3(6) Valve Stem Extensions

Revision

Modify the second sentence as follows:

"Valves with an operating nut more than 36 inches..."

9-30.3(8) Tapping Sleeve

Revision

Rename this section. Delete the paragraph in its entirety and substitute the following:

Tapping sleeves shall be Romac 304 stainless steel tapping sleeve with stainless steel or ductile iron flange.

9-30.4 Miscellaneous

9-30.4(1) Meter Boxes - Concrete

New

Concrete meter boxes for air vacs and blowoffs shall be Fogtite No. 2 with steel cover.

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9-30.4(4) Large Meter/PRV Vaults

New

Vaults shall be Old Castle Precast designed for H-20 loading capacity or approved equal. The access door shall be Bilco, LW Products, or approved equal and shall be aluminum channel frame design with factory applied non-skid surface meeting ADA requirements. The door shall have stainless steel hardware, recessed hasp for padlock with hinged lid flush with surface. The channel drain shall be piped through brass and PVC piping to drain. The ladder shall be bolt-on style aluminum designed in accordance with WISHA. A flush floor mount sleeve fixed base, for use with a Unique Concepts, Ltd. variable offset safety mast, shall be cast into each concrete vault cover slab/top section at the location shown on the Plans. The stainless steel fixed base (Model number 12828) and stainless cap (Model number 10827) shall be manufactured by Unique Concepts, Ltd. No substitutions will be accepted.

The vault cover slab/top shall be properly designed and constructed to accommodate the mast mounting load requirements, as provided by Unique Concepts, Ltd.

9-30.4(5) Casing Spacers

New

Spacers for positioning water and sewer pipelines within casings shall be APS Model SSI or approved equal. The band shall be 14 gauge and the risers shall be 10-gauge T-304 stainless steel. Runners shall be 2” wide UHMW Polymer plastic. The liner shall be .090” thick polyvinyl chloride. The carrier pipe shall be centered within the casing with all runners of the spacer touching the inside wall of the casing. The carrier pipe within the casing shall be restrained using the materials specified in 9-30.2(6). The quantity of runners and the dimensions between spacers shall be as specified by the manufacturer or as shown on the approved construction drawings, whichever is more stringent. End seals are required to seal casing ends and shall be APS Model AC or approved equal.

9-30.4(6) Pressure Reducing Valve

New

Valves 4-inch and larger shall be Clayton series 92-01 pressure reducing and sustaining valve. Valves shall be equipped with the following:

Main Valve Body and Cover: Ductile Iron ASTM A-536
Main Valve Trim (Disc Guide, Seat & Cover Bearing): Stainless Steel
Disc: Buna-N Synthetic Rubber
Diaphragm: Nylon Reinforced Buna-N Rubber
Stem, Nut and Spring: Stainless Steel
Pilots and Solenoids: CRD & CRL
Pilot Control: Bronze ASTM B62
Pilot Control Tubing and Fittings: Stainless Steel Type 303
Pilot System: Shutoff Cocks on the Pilot Control System, plugs in other valve body taps
Flow Clean Strainer
Valve Position Indicator
Speed Controls: Opening and closing
Epoxy Coating: 4 mil fusion bonded both inside and out

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End Details Flanged: Ductile iron ANSI B16.42 150A

Valves, 3-inch and smaller, shall be Clayton 90-01 pressure reducing valve and shall be equipped with the same accessories as a 4-inch and larger valves, with the following exception, End Details Screwed: 250 & 300 ANSI B2.1. Adjustment ranges shall be determined for each valve and shall be designated on the plans. Valves shall be CLA-Val Company. No other manufacturers will be allowed.

9-30.4(7) Pressure Relief Valve

New

Pressure relief valves shall be Clayton Series 50-01 pressure relief valve. Valves shall be equipped with the following:

Main Valve Body and Cover: Ductile Iron ASTM A-536
Main Valve Trim (Disc Guide, Seat and Cover Bearing): Stainless Steel
Disc: Buna-N Synthetic Rubber
Diaphragm: Nylon Reinforced Buna-N Rubber
Stem, Nut and Spring: Stainless Steel
Pilots and solenoids: CRD
Pilot Control: Bronze ASTM B62
Pilot Control Tubing and Fittings: Stainless Steel Type 303
Pilot System: Shutoff Cocks on the Pilot Control System, plugs in other valve body taps
Valve Position Indicator
Epoxy Coating: 4 mil fusion bonded both inside and out
End Details Flanged: Ductile iron ANSI B16.42 150A

Adjustment ranges shall be determined for each valve and shall be designated on the plans. Valves shall be CLA-Val Company. No other manufacturers will be allowed.

9-30.4(8) Pressure Gauge Assembly

New

Pressure gauge shall be 3½-inch Pollard Water, glycerin filled, model P67083, 0-160 PSI range. Pressure gauge assembly shall include a brass ¼-inch shut-off cock and brass needle valve. All assembly pipe shall be brass. Pressure gage assemblies shall be mounted on tapping bosses on fittings or with pipe saddles. Tapping size shall be 1/2 inch minimum and tap shall be equipped with a ball valve.

9-30.4(9) "H" Type Strainer

New

"H" type strainers shall be CLA-Val Model X43H, 150 ANSI.

9-30.4(10) Anchor Bolts

New

Anchor bolts shall be in accordance with ASTM A307. All anchor bolts, nuts and washers shall be stainless steel in all locations. Anchor bolts shall be Hilti Kwik bolt anchor or equal.

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9-30.4(11) Expansion Bolts

New

Bolts, nuts and washers shall be 303 or 304 stainless steel; wedges shall be double plated spring steel.

9-30.4(12) Pipe Supports and Brackets

New

Pipe supports, and brackets shall be equal to Fee and Mason. Adjustable pipe supports shall be equal to #291. Pipe brackets shall be equal to #155, heavy welded steel bracket with #1590 anchor chair. 3/4-inch tubing brackets shall be equal to #327B, one-hole clamp. Drain pipe supports shall be uni-strut. All supports, and brackets shall be galvanized.

9-30.4(13) Exposed Polyvinyl Chloride Pipe (PVC Pipe Smaller Than 4")

New

PVC pipe which is not buried shall be schedule 80 and shall be in accordance with ASTM D1785. Joints shall be solvent weld socket or threaded. Solvent cement shall be in accordance with ASTM D2564.

9-30.4(14) Painted Surfaces

New

All exposed piping, fittings, valves and appurtenance surfaces shall be painted except non-ferrous, corrosion resistant ferrous alloys, and non-metallic materials. The painting system shall be Tnemec Series 1029 Enduratone, applied in 2 coats directly to the asphalt coating at 2-4 mils DFT per coat. No other paint brands shall be used. No bleed through of the pipe bituminous coating shall be permitted. Prepare pipe surface as recommended by the paint manufacturer. Paint color shall be Tnemec KC Blue (21 BL) for piping in a vault. Paint color for PRV discharge piping outside of the vault shall be Tnemec Hunter Green (08 SF).

9-30.4(15) Brass Piping

New

Brass piping shall conform to ASTM B43.

9-30.5 Hydrants

Supplement

Hydrants shall be manufactured by American Flow Control (Waterous Pacer), Clow Corporation (F2500 or Medallion), Dresser Manufacturing (M & H 1295), Mueller Company (A-423), American (AVK #2780) and East Jordan Iron Works (Water Master 5CD250 with dust cap). Hydrants shall be painted with two coats of an alkyd enamel or acrylic polymer (Tnemec). Color shall be Tnemec Enduratone Series 1029 Canary Yellow (14 YW), PPG HPC Industrial Alkyd 4308 Safety Yellow (D18758) supplied by Miller Paint, or Cloverdale self-priming maintenance and marine enamel gloss Safety Yellow, supplied by Rodda Paint. Paint surface preparation, application, and paint thickness shall be as recommended by paint manufacturer.

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9-30.5(2) Hydrant Dimensions

Supplement

The pumper nozzle shall be 4½-inch size with national standard thread and shall be equipped with a 5-inch cam lock Storz adapter fitting. The Storz fitting shall be installed after pressure testing of the system.

9-30.5(4) Hydrant Restraints

Revision

Hydrant restraints shall be restrained joint pipe meeting the requirements of section 9-30.2(6).

9-30.5(6) Guard Posts

Revision

Guard posts for hydrants shall be provided as shown on City of Redmond Standard Details. Guard posts shall be pressure treated timber posts treated with copper azole (CA) in accordance with section 9-09.3(1) of the Standard Specifications.

9-30.6 Water Service Connections (2-inches and smaller)

9-30.6(1) Saddles

Revision

Saddle bodies shall be ductile iron meeting the requirement of ASTM A-536. All saddles shall have double straps which are stainless steel. All saddles shall have iron pipe standard tapping with iron pipe threads. All saddles shall be protected with corrosion resistant paint or nylon coating, the standard of the manufacturer. Manufacturer shall be Romac, Smith-Blair, or approved equal.

9-30.6(3) Service Pipes

9-30.6(3) B Polyethylene Tubing

Revision

Delete the last 2 sentences and substitute with the following:

Tubing shall be SIDR 7 (iron pipe size).

9-30.6(4) Service Fittings

Supplement

Add the following to the paragraph:

Fitting shall be Ford Pack Joint design.

9-30.6(5) Meter Setters

Supplement

Add the following to the paragraph:

Meter setters shall be Ford Company, Mueller Company, or AY McDonald. Meter setters shall be horizontal inlet and outlet type, except 1½-inch and 2-inch meter setters which may be vertical inlet and outlet type. Meter setters for a 5/8-inch x 3/4-inch and 1-inch services shall

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be ball valve inlet type. Meter stops shall have swivel type nuts for installation of meter and union end connections. Meter setters for 1½-inch and 2-inch meters shall be of the ball valve inlet type. The by-pass ball valve shall have lock wings. All meter setters shall be manufactured using no lead brass. The meter setter model numbers for the Ford, Mueller, and AY McDonald Companies are as follows:

Meter Size	Ford	Mueller	AY McDonald
5/8” x 3/4”	VBH72-12W-11-33-NL	B-2404-2N x12”	720-212WCDD33
1”	VBH74-12W-11-44-NL	B-2404-2N x12”	720-412WCDD44
1½”	VBH76-12B-11-66-NL or VBH86-12B-11-66-NL	B-2427-2N x12”	720B612WDFF665 or 730B612WDFF665
2”	VBH77-12B-11-77-NL or VBH87-12B-11-77-NL	B-2427-2N x12”	720B712WDFF775 or 730B712WDFF775

9-30.6(7) Meter Boxes - Standard

Supplement

Delete the last sentence of paragraph one and add the following paragraph to this section:

Wherever possible, meter boxes shall be placed in landscape areas. Meter boxes in landscape areas shall be polyethylene meter boxes with a solid lid by Carson Industries, Inc. In urban streetscapes where landscape areas are not available or where approved by the City, meter boxes in traffic areas or sidewalks shall be concrete meter boxes by Fogtite, Inc. with an integrated single leaf aluminum hatch by LW Products Company, Inc. (no exceptions).

The meter box model numbers for the various single meter sizes are as follows:

Meter Size	Carson Model #	Fogtite Model #
5/8” x 3/4”	1324 (15” Deep)	Redmond 2 X 3
1”	1324 (15” Deep)	Redmond 2 X 3
1 ½”	1730 (18” Deep)	Redmond 2 X 3
2”	1730 (18” Deep)	Redmond 2 X 3

Provide additional expansion joints in concrete sidewalks where meter boxes are in the sidewalk as directed by the Engineer.

9-30.6(8) Tracer Wire

New

Tracer wire shall be number 12-gauge insulated solid copper wire. Use blue tracer wire for water systems and green tracer wire for sewer systems.

9-30.6(9) Meters

New

Water meters shall be new and of the latest design of the manufacturer. Meters shall conform to AWWA Standards C-700 (latest version). Meters shall be Sensus Touch Read Pit Lid (TRPL) type meters with radio read accessories or approved equal. Where directed, the City will provide and install only meters 2-inches and smaller at the City's standard rates. Acquisition and installation of meters larger than 2-inches shall be coordinated through the Engineer. Meters larger than 2-inches shall be Sensus Omni C2 with integral strainer and 316 stainless steel bolts meeting the latest version of AWWA Standards C702 Class II. Compound Meter registers for 3-inch meters

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shall be read in 100 cubic feet increments. Registers for 4-inch meters or larger shall be read in 1000 cubic feet increments.

Meter assemblies including all pipe and fittings shall be installed as per the City of Redmond Standard Details or as directed by the Engineer.

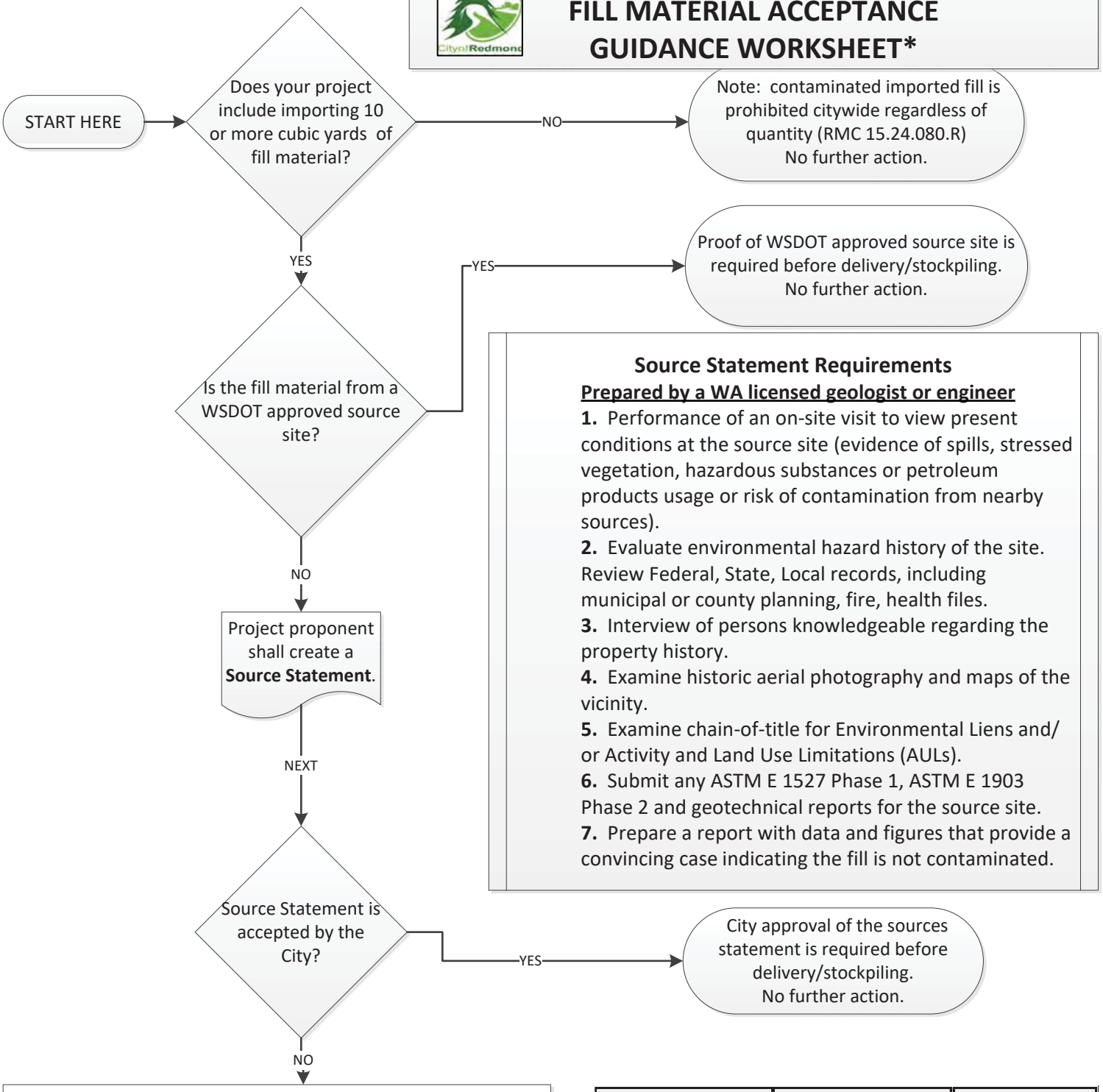
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APPENDIX 1

FILL MATERIAL ACCEPTANCE GUIDANCE WORKSHEET

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APPENDIX 1: CITY OF REDMOND FILL MATERIAL ACCEPTANCE GUIDANCE WORKSHEET*



Source Statement Requirements

Prepared by a WA licensed geologist or engineer

1. Performance of an on-site visit to view present conditions at the source site (evidence of spills, stressed vegetation, hazardous substances or petroleum products usage or risk of contamination from nearby sources).
2. Evaluate environmental hazard history of the site. Review Federal, State, Local records, including municipal or county planning, fire, health files.
3. Interview of persons knowledgeable regarding the property history.
4. Examine historic aerial photography and maps of the vicinity.
5. Examine chain-of-title for Environmental Liens and/ or Activity and Land Use Limitations (AULs).
6. Submit any ASTM E 1527 Phase 1, ASTM E 1903 Phase 2 and geotechnical reports for the source site.
7. Prepare a report with data and figures that provide a convincing case indicating the fill is not contaminated.

If the project proponent still wishes to use the source site, the following needs to occur:

- ✓ The project proponent will develop for City approval a sampling and analysis plan, to characterize the source material. The City will approve only sampling plans that will produce representative sampling and confirmation that the source material is not contaminated (see MTCA guidance).
- ✓ Sample analysis will include the parameters listed to the right.
- ✓ The City will determine based on sample results and project proponent sample analysis if the source material can be imported into the City.

Analyte	Method	Reporting Limit
Gasoline	NWTPH-Gx	1/2 the cleanup level
Diesel and Oil	NWTPH-Dx	"
Volatile Organic Compounds (full list)	EPA 8260B	"
SemiVolatile Orgainc Compounds	EPA 8270D	"
Total Metals (13 priority pollutant metals list)	EPA 6010B or EPA 6020	"
Mercury	EPA 7471A	"
PCB's	EPA 8082	"
Total Organic Carbon (TOC)	EPA 9060	"

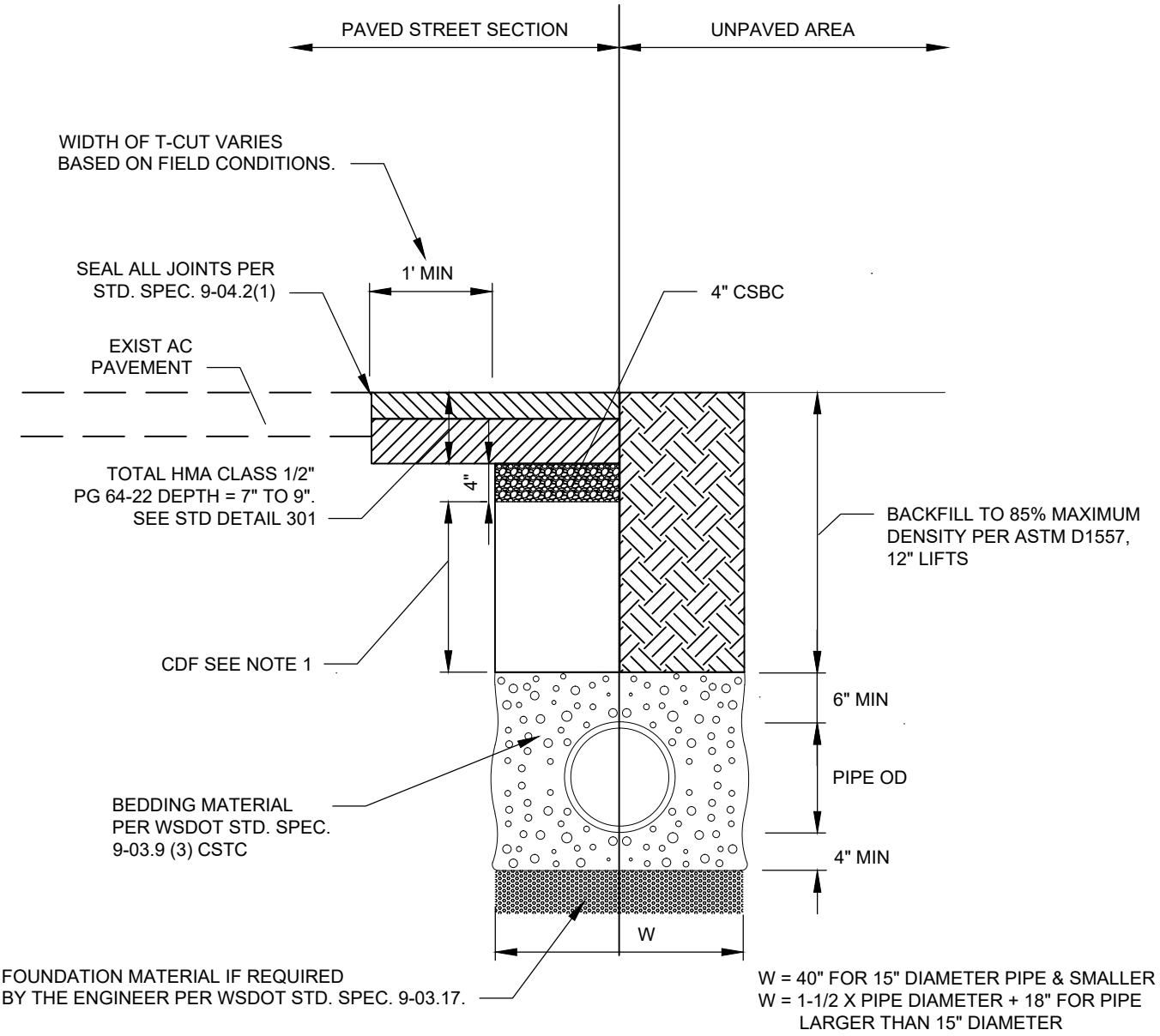
* Guidance for compliance with RMC 15.24.080(r) and 15.24.095, refer to full code for all local requirements. Version 1, drafted 6/2011

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SECTION 2

CONSTRUCTION ALONG/ACROSS CITY ROW

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CROSS SECTION

NTS

NOTES:

1. OTHER MATERIAL PROPOSED FOR BACKFILL SHALL BE SUBMITTED TO THE CITY FOR APPROVAL PRIOR TO USE. APPROVED BACKFILL SHALL BE COMPACTED TO 95% MAXIMUM DENSITY PER ASTM D1557 IN 6" LIFTS. LANDSCAPE AREAS SHALL BE BACKFILLED TO 85% MAXIMUM DENSITY PER ASTM D1557 IN 12" LIFTS.
2. TRENCH WIDTH IN PAVED ROADWAYS ARE NOT TO EXCEED 6 FEET. IF CONDITIONS REQUIRE A WIDER TRENCH, A SPECIAL DESIGN MUST BE SUBMITTED AND APPROVED BY THE CITY.
3. EXCESS SAW CUTTING DEBRIS SHALL BE REMOVED WITH A VACUUM DEVICE AND DISPOSED OF PROPERLY.
4. GRAVEL SHOULDERS DISTURBED BY EXCAVATION SHALL BE RESHAPED TO ORIGINAL CONDITION AND SURFACED WITH A MINIMUM THREE INCH THICKNESS OF CRUSHED SURFACING TOP COURSE PER 9-03.9(3) OF THE STANDARD SPECIFICATIONS. REQUIRED COMPACTION SHALL BE 95% OF MAXIMUM DENSITY AS DETERMINED BY MODIFIED PROCTOR (ASTM D1557).
5. STEEL PLATE USE IN THE ROADWAY MUST BE APPROVED BY THE CITY. SEE SPECIFICATION SECTION 1-07.23(1)

APPROVED BY:JON C. SPANGLER
CONSTRUCTION ENGINEERING MANAGER

REVISION DATE: MARCH 01, 2019

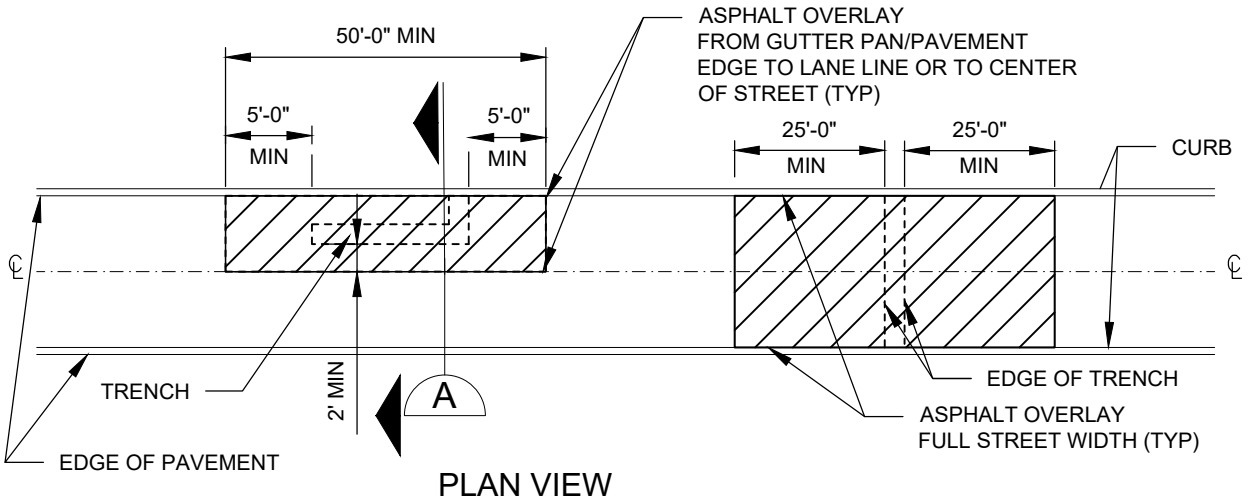
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STANDARD DETAILS

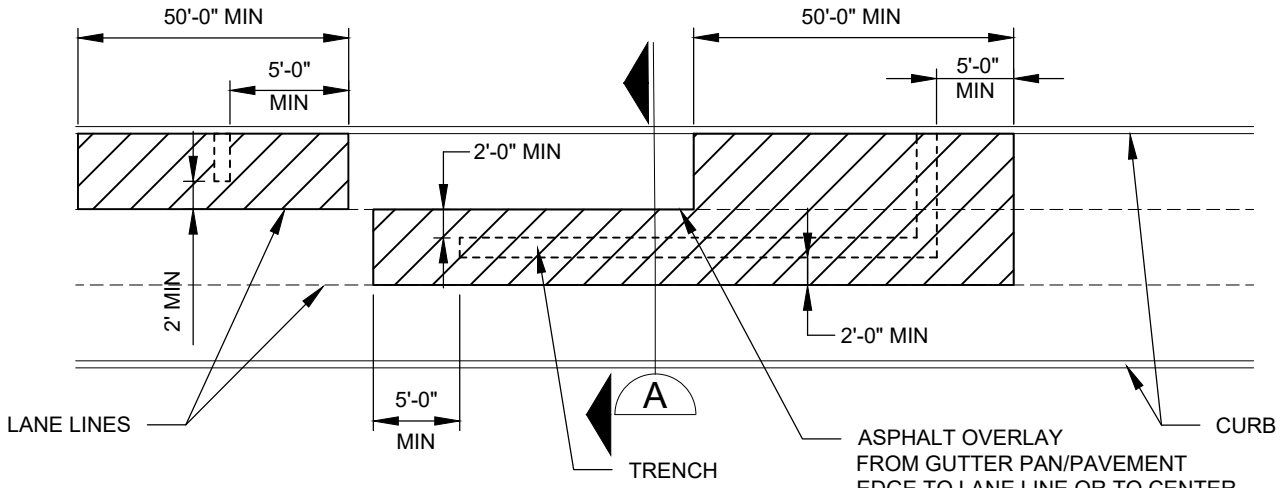
TYPICAL TRENCH

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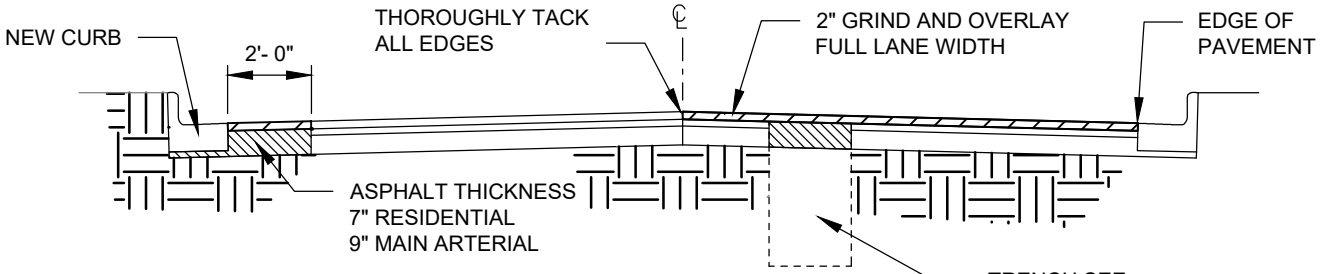
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PLAN VIEW
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SECTION A-A
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NOTES:

1. THIS STANDARD APPLIES TO ALL CUTS.
2. OVERLAY AREA MAY BE MODIFIED BY CITY ON OLDER PAVEMENT DEPENDING ON CONDITIONS OR SCHEDULED CONSTRUCTION/MAINTENANCE.
3. LOWER ALL UTILITY CASTING PRIOR TO OVERLAY. AFTER OVERLAY ADJUST TO FINISH GRADE AND RESTORE CHANNELIZATION AND LOOP DETECTORS.

Paul S. Cho

APPROVED BY: PAUL S. CHO
TRAFFIC OPERATIONS SAFETY AND ENGINEERING MANAGER

REVISION DATE: MARCH 01, 2020

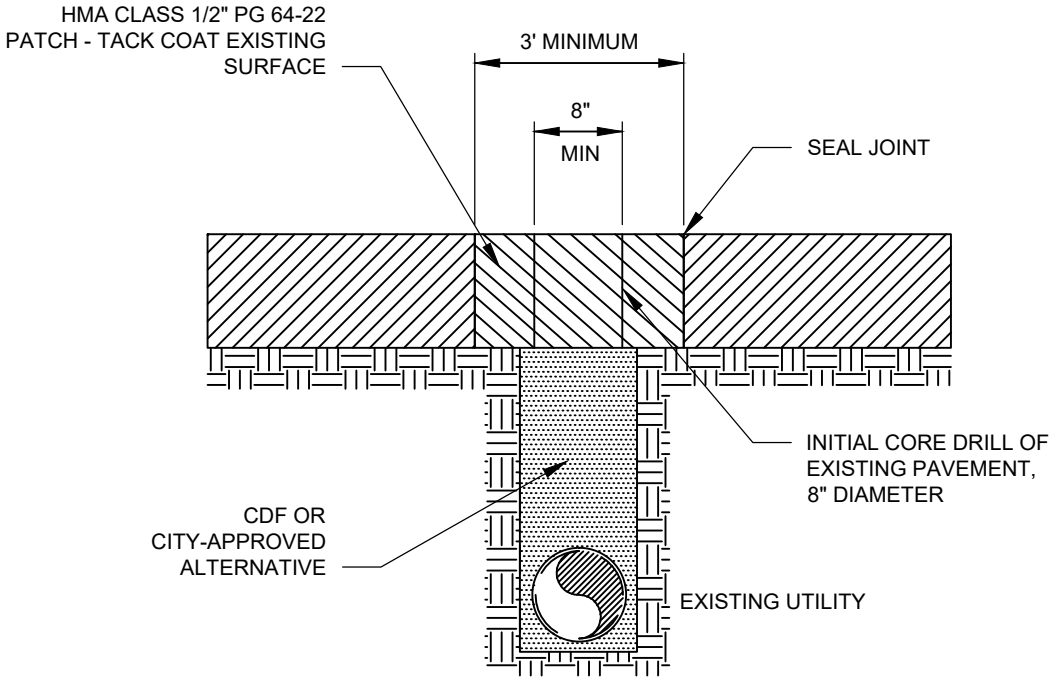
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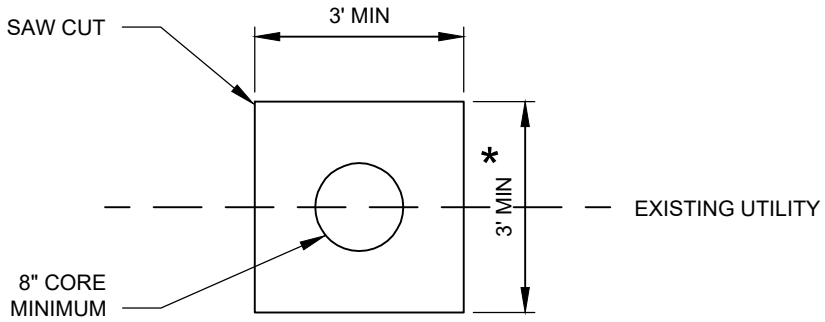
STANDARD DETAILS

ASPHALT OVERLAY FOR ROADWAY TRENCH REPAIR

FILE NAME: SD202.DWG | DETAIL NUMBER: **202**

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* EXTEND TO EDGE OF GUTTER PAN OR NEAREST LANE LINE AS DIRECTED BY CITY INSPECTOR.

NOTES:

1. THE EXISTING PAVEMENT SHALL BE CUT FULL DEPTH WITH A MINIMUM EIGHT INCH DIAMETER CORE DRILL. THE SUB-BASE MATERIAL SHALL BE REMOVED USING A VACUUM EXCAVATOR, KEEPING THE EXCAVATION AS MINIMAL AS POSSIBLE.
2. BACKFILL THE EXCAVATION WITH CONTROLLED DENSITY FILL (CDF) OR CITY-APPROVED ALTERNATIVE.
3. REPAIR THE PAVEMENT SECTION WITH HMA CLASS 1/2" PG 64-22 AND SEAL THE JOINT. ASPHALT DEPTHS SHOULD BE 7" ON LOCAL ACCESS STREETS, 9" ON ARTERIALS OR MATCH EXISTING, WHICHEVER IS GREATER.
4. FOR MORE THAN 3 CORES WITHIN 50 FEET EDGE TO EDGE OF EACH OTHER IN ANY DIRECTION, OR 12 OR MORE CORES WITHIN A BLOCK, PAVEMENT REPAIR WILL BE CONSIDERED A TRENCH AND SUBJECT TO THE REPAIR DETAIL IN SD202.

Paul S. Cho

APPROVED BY: PAUL S. CHO
TRAFFIC OPERATIONS SAFETY AND ENGINEERING MANAGER

REVISION DATE: MARCH 01, 2020

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STANDARD DETAILS

PAVEMENT RESTORATION FOR WINDOW CUTS

FILE NAME: SD203.DWG | DETAIL NUMBER: **203**

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SECTION 3

ROADWAY CONSTRUCTION

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TYPICAL ROADWAY SECTIONS

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NOTES:

1. PAVEMENT DEPTHS FROM APPENDIX 2, REDMOND ZONING CODE.
2. 4" OF 1-1/4" MINUS CRUSHED SURFACING BASE COURSE UNDER ROADWAYS, DRIVEWAYS AND DRIVEWAY APPROACHES, AND USE MINIMUM 2" OF 1-1/4" MINUS CRUSHED SURFACING BASE COURSE UNDER SIDEWALKS AND ADA CURB RAMPS PER WSDOT STANDARD SPEC 9-03.9(3).
3. SUBGRADE SHALL BE COMPACTED TO 95% DENSITY AS DETERMINED BY MODIFIED PROCTOR ASTM D 1557. A SOILS REPORT PREPARED BY A REGISTERED PROFESSION ENGINEER SHALL CERTIFY THAT THE ABOVE SECTION IS ACCEPTABLE.
4. CONCRETE PAVEMENT SHALL MEET WSDOT STANDARD SPEC 5-05. FINISH SURFACE BY TEXTURING WITH COMB PERPENDICULAR TO CENTER LINE OF PAVEMENT PER WSDOT STANDARD SPEC 5-05.3(11).
5. FRANCHISE AND DRY UTILITIES SHOULD BE LOCATED IN EASEMENTS OUTSIDE RIGHT-OF-WAY OR AS APPROVED BY CITY ENGINEER.

APPROVED BY: DONALD CAIRNS
TRANSPORTATION PLANNING AND ENGINEERING MANAGER

REVISION DATE: MARCH 01, 2020

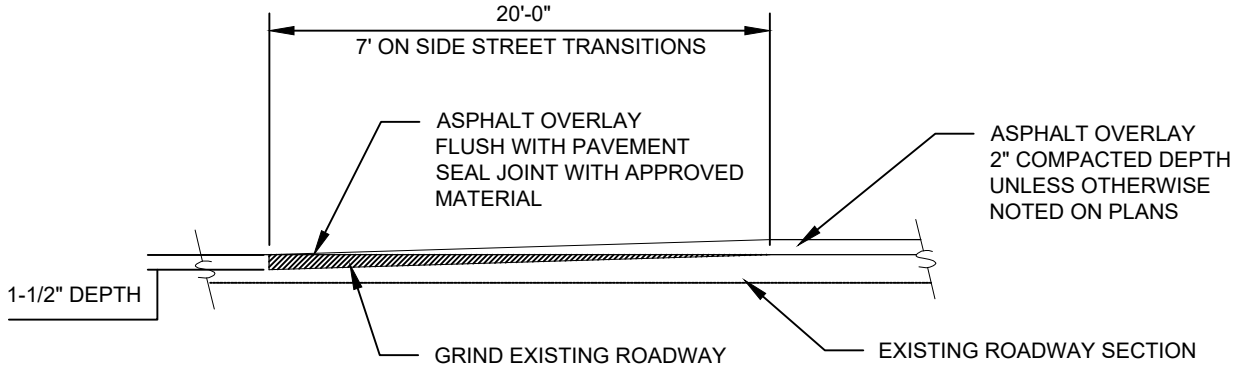
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STANDARD DETAILS

TYPICAL ROADWAY SECTIONS

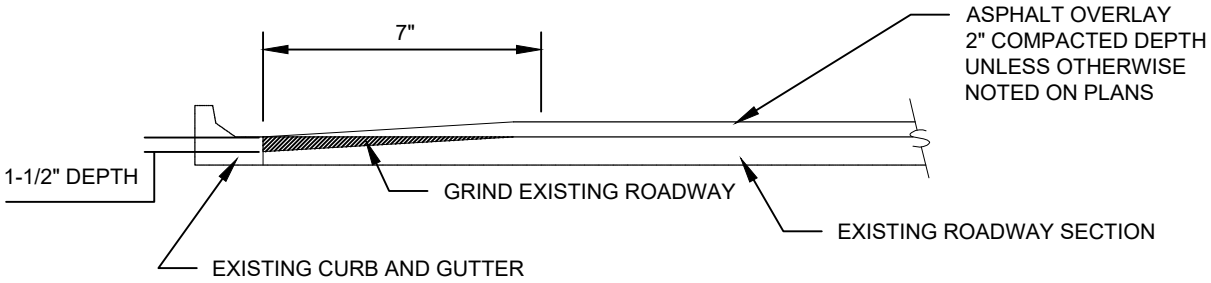
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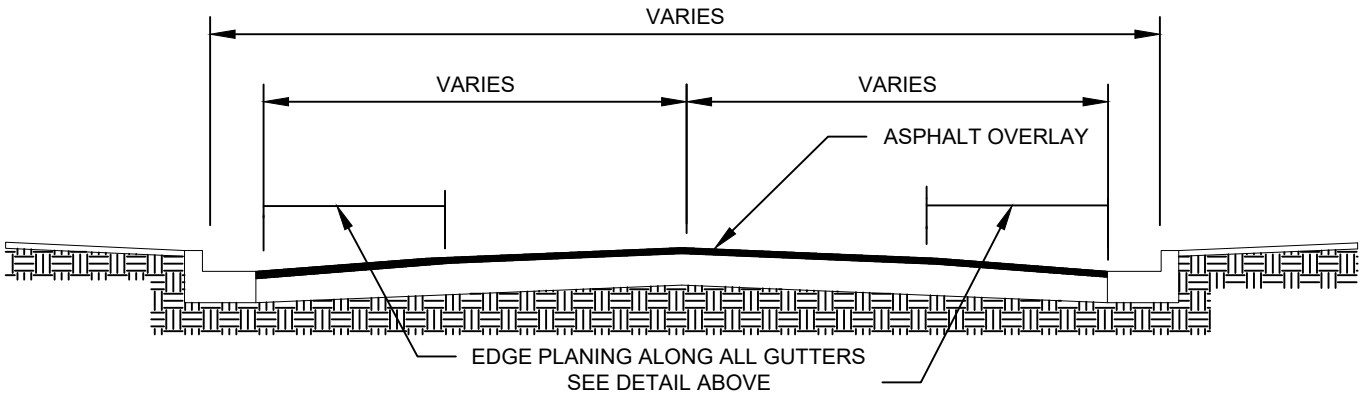
BUTT JOINT DETAIL

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EDGE PLANING DETAIL

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TYPICAL OVERLAY DETAIL

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Paul S. Cho

APPROVED BY: PAUL S. CHO
TRAFFIC OPERATIONS SAFETY AND ENGINEERING MANAGER

REVISION DATE: MARCH 01, 2020

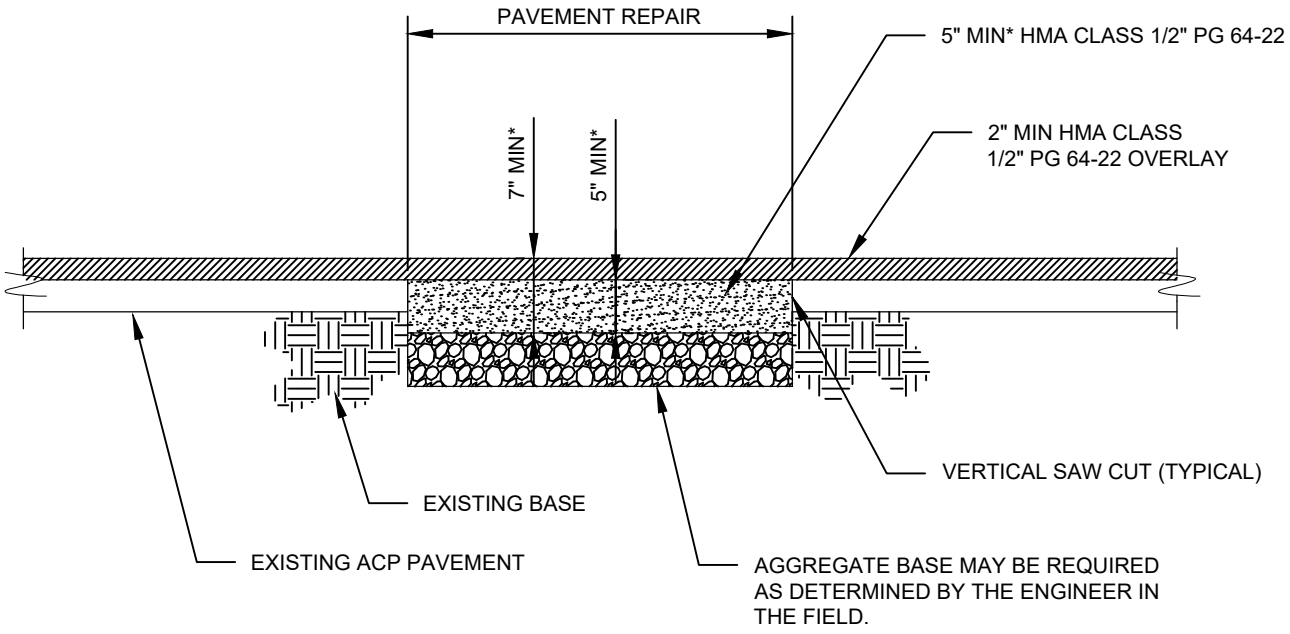
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PAVEMENT PLANING DETAILS

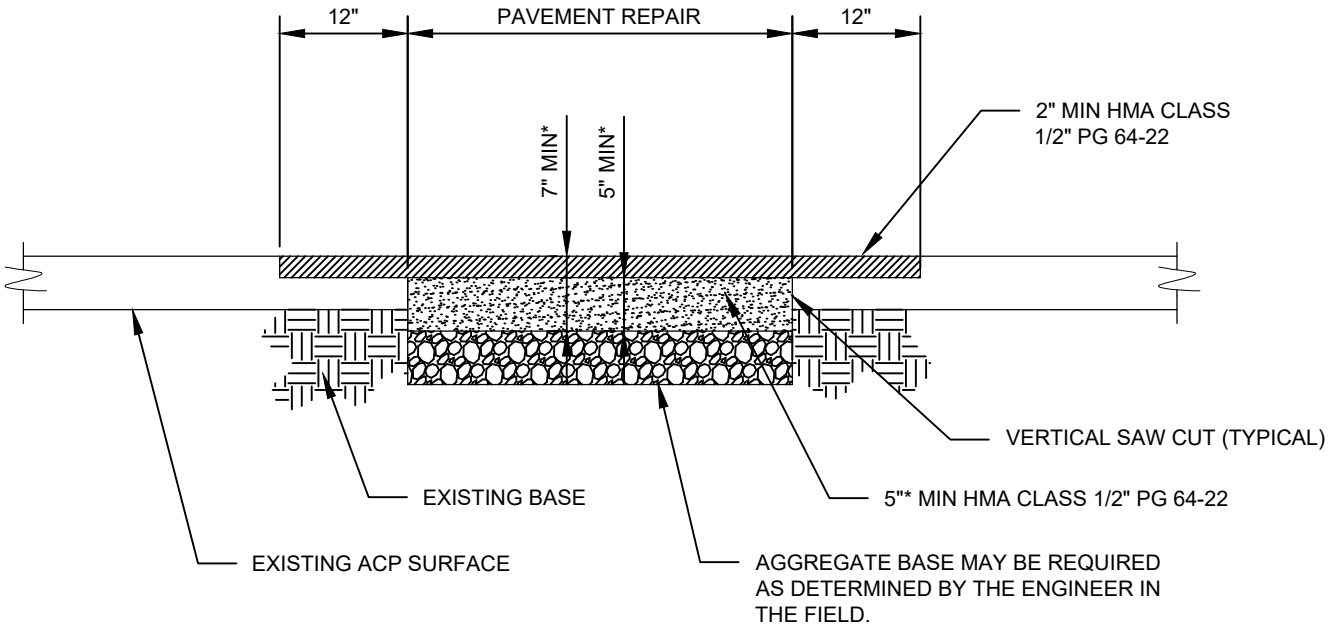
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TYPICAL PAVEMENT REPAIR DETAIL WITH OVERLAY

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TYPICAL PAVEMENT REPAIR DETAIL

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NOTE:

* SEE TYPICAL ROADWAY SECTIONS SD 301 FOR PAVEMENT DEPTHS.

Paul S. Cho

APPROVED BY: PAUL S. CHO
TRAFFIC OPERATIONS SAFETY AND ENGINEERING MANAGER

REVISION DATE: MARCH 01, 2020

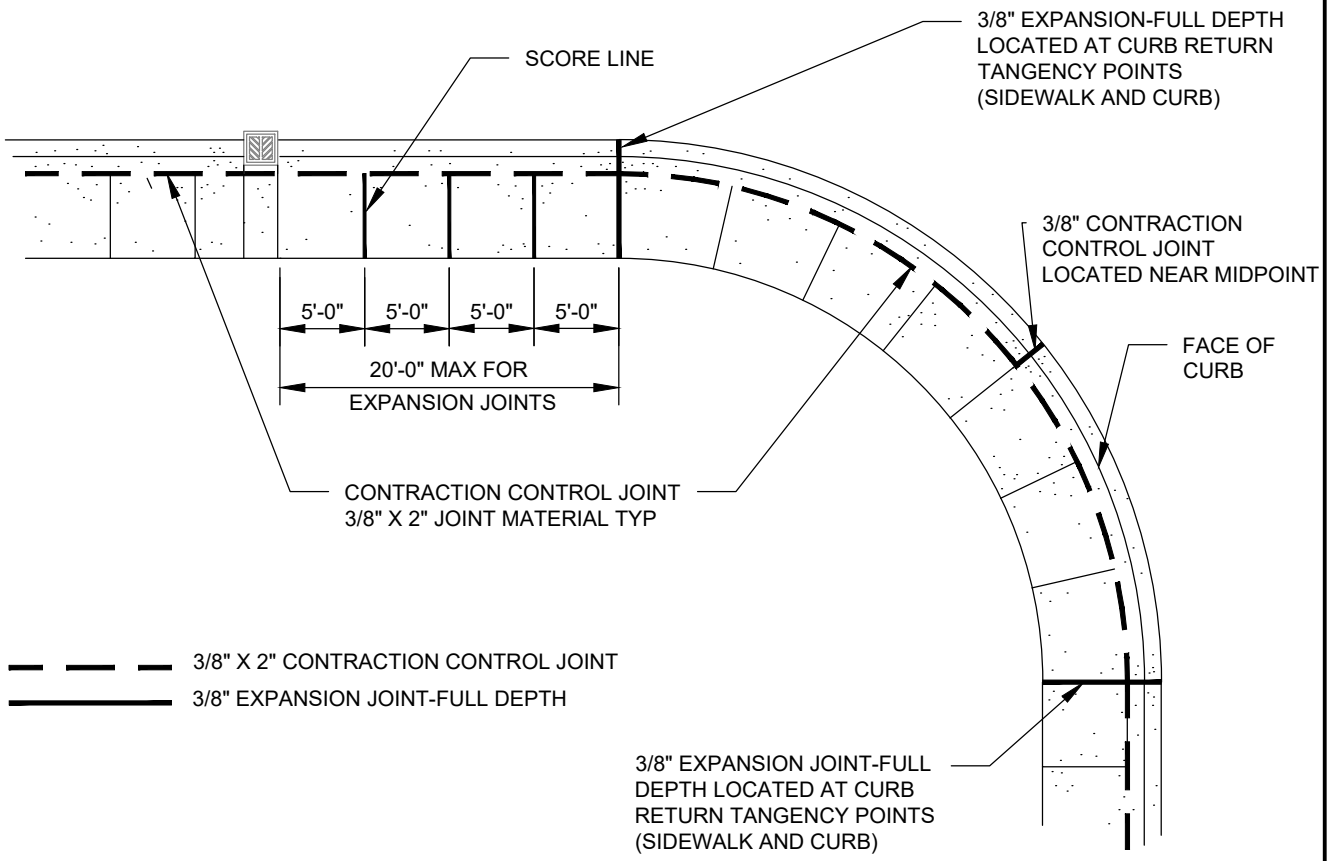
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STANDARD DETAILS

PAVEMENT REPAIR DETAILS

FILE NAME: SD302A.DWG | DETAIL NUMBER: **302A**

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PLAN VIEW
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NOTES:

1. SCORE LINE SHALL BE 1/4 INCH DEEP V-GROVE.
2. JOINTS SHALL MATCH THE CURB.
3. SIDEWALK SHALL BE CONSTRUCTED IN ACCORDANCE WITH SECTION 8-14 OF THE STANDARD SPECIFICATIONS AND AS SHOWN ON THE STANDARD DETAILS
4. SIDEWALK SHALL BE 6 INCH MINIMUM THICKNESS WHERE ADJACENT TO ROLLED CURB SECTION, OTHERWISE MINIMUM THICKNESS SHALL BE 4 INCH.
5. THE CONCRETE MIX FOR SIDEWALKS SHALL BE AIR ENTRAINED CONCRETE CLASS 3000 IN ACCORDANCE WITH THE REQUIREMENTS OF SECTION 6-02.
6. PLACING AND FINISHING OF SIDEWALKS SHALL BE PER SECTION 8-14 OF THE STANDARD SPECIFICATION. THE SURFACES ARE TO BE STRUCK OFF, TROWELED, LIGHTLY BRUSHED IN TRANSVERSE DIRECTION, THEN JOINED AND EDGED. THE FINISH REQUIREMENTS INCLUDE:
   A. JOINTS SHALL BE TOOLED WITH 1/4 INCH RADIUS EDGER.
   B. SIDEWALK EDGES TOOLED WITH A 1/2 INCH EDGER.
   C. WHEN REPLACING SECTIONS OF EXISTING SIDEWALK OR WHEN NEW SIDEWALK ADJOINS EXISTING, NEW CONCRETE SHALL BE FINISHED TO MATCH THE EXISTING CONCRETE OR AS DIRECTED BY THE CITY ENGINEER. COLORING AGENT SHALL BE USED IN NEW CONCRETE TO MATCH EXISTING.
   D. WHEN CASTINGS ARE LOCATED IN THE SIDEWALK, JOINTS SHALL BE INSTALLED TO CONTROL CRACKING. REBAR SHALL BE INSTALLED AS DIRECTED BY THE CITY TO STRENGTHEN SIDEWALK TO PREVENT CRACKING AT CORNERS OF CASTINGS AND OTHER BLOCKOUTS.

Donell Cairns

APPROVED BY: DONALD CAIRNS
TRANSPORTATION PLANNING AND ENGINEERING MANAGER

REVISION DATE: MARCH 01, 2018

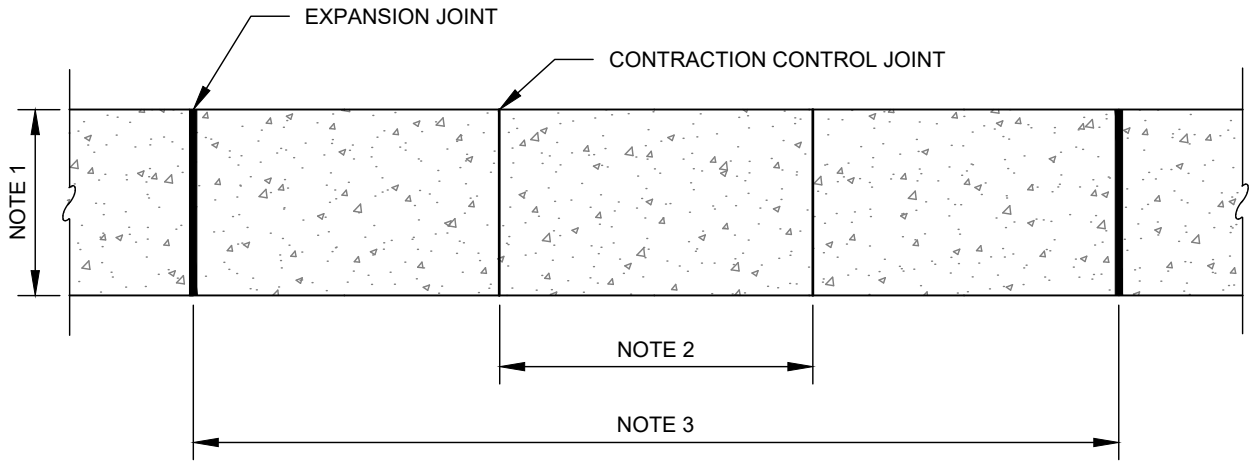
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STANDARD DETAILS

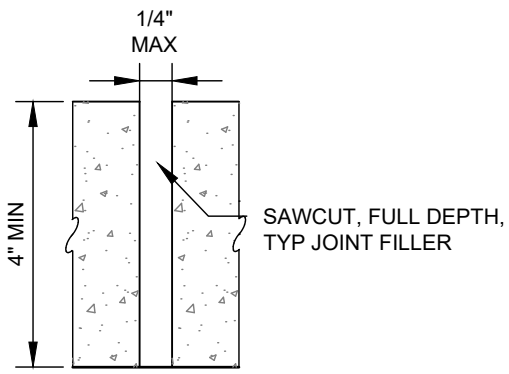
CURB AND SIDEWALK JOINTS

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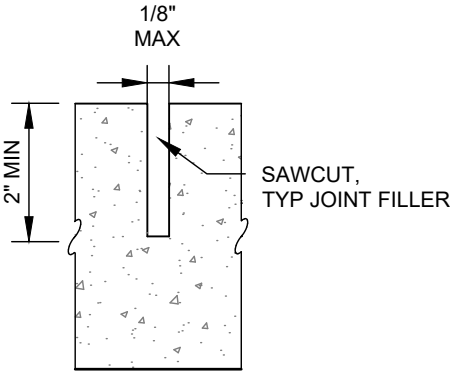
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PLAN VIEW
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EXPANSION JOINT SECTION
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CONTRACTION CONTROL JOINT SECTION
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NOTES:

1. SHARED USE PATH WIDTH SHALL BE IN ACCORDANCE WITH DESIGN MANUAL M-22-01.09 CHAPTER 1515 AS DIRECTED BY CITY ENGINEER. MINIMUM VERTICAL CLEARANCE OF PATH SHALL BE 12 FEET.
2. CONTRACTION JOINTS SHALL BE AT 5-FOOT INTERVALS OR INTERVALS EQUAL TO SHARED USE PATH WIDTH AS DIRECTED BY CITY ENGINEER.
3. EXPANSION JOINTS SHALL BE INSTALLED AT 100-FOOT MAXIMUM INTERVALS AS DIRECTED BY CITY ENGINEER. EXPANSION JOINTS SHALL ALSO BE INSTALLED AT CURB RAMPS AND FIXED STRUCTURES AS PER STANDARD SPECIFICATIONS SECTION 8-14.
4. LONGITUDINAL JOINTS ARE NOT ALLOWED.
5. IF SHARED USE PATH IS ADJACENT TO CURB, JOINTS SHALL MATCH THE CURB.
6. SHARED USE PATH SHALL BE CONSTRUCTED IN ACCORDANCE WITH SECTION 8-14 OF STANDARD SPECIFICATIONS, EXCEPT THAT ALL JOINTS SHALL BE SAWCUT.

Donald Cairns

APPROVED BY: DONALD CAIRNS
TRANSPORTATION PLANNING AND ENGINEERING MANAGER

REVISION DATE: OCTOBER 13, 2020

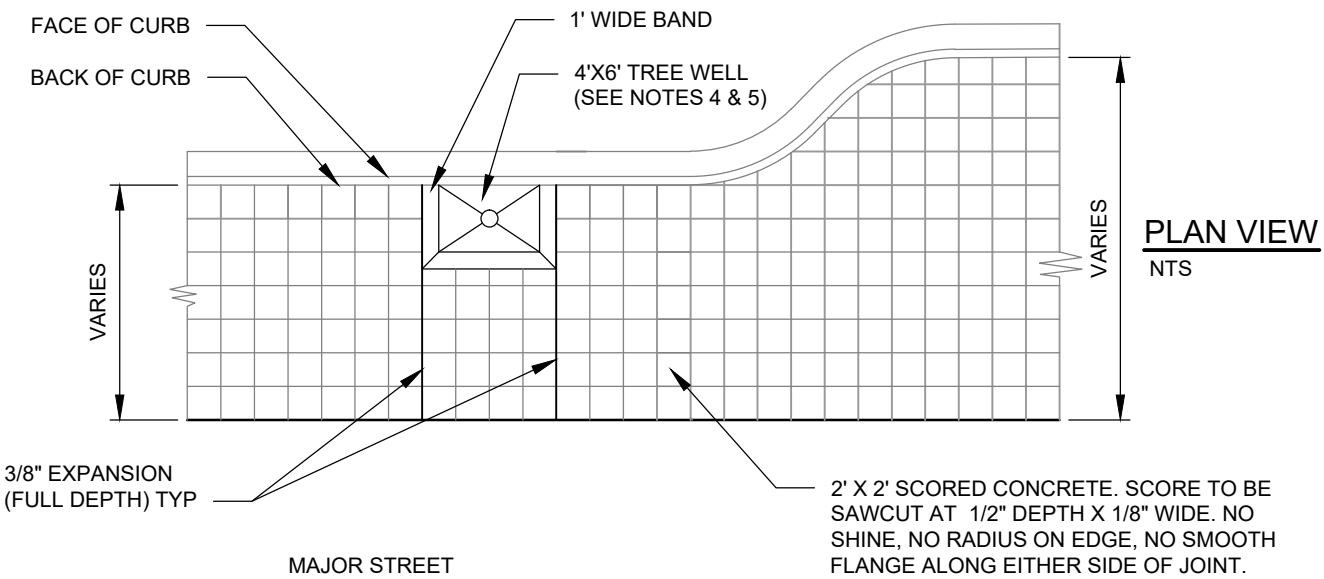
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STANDARD DETAILS

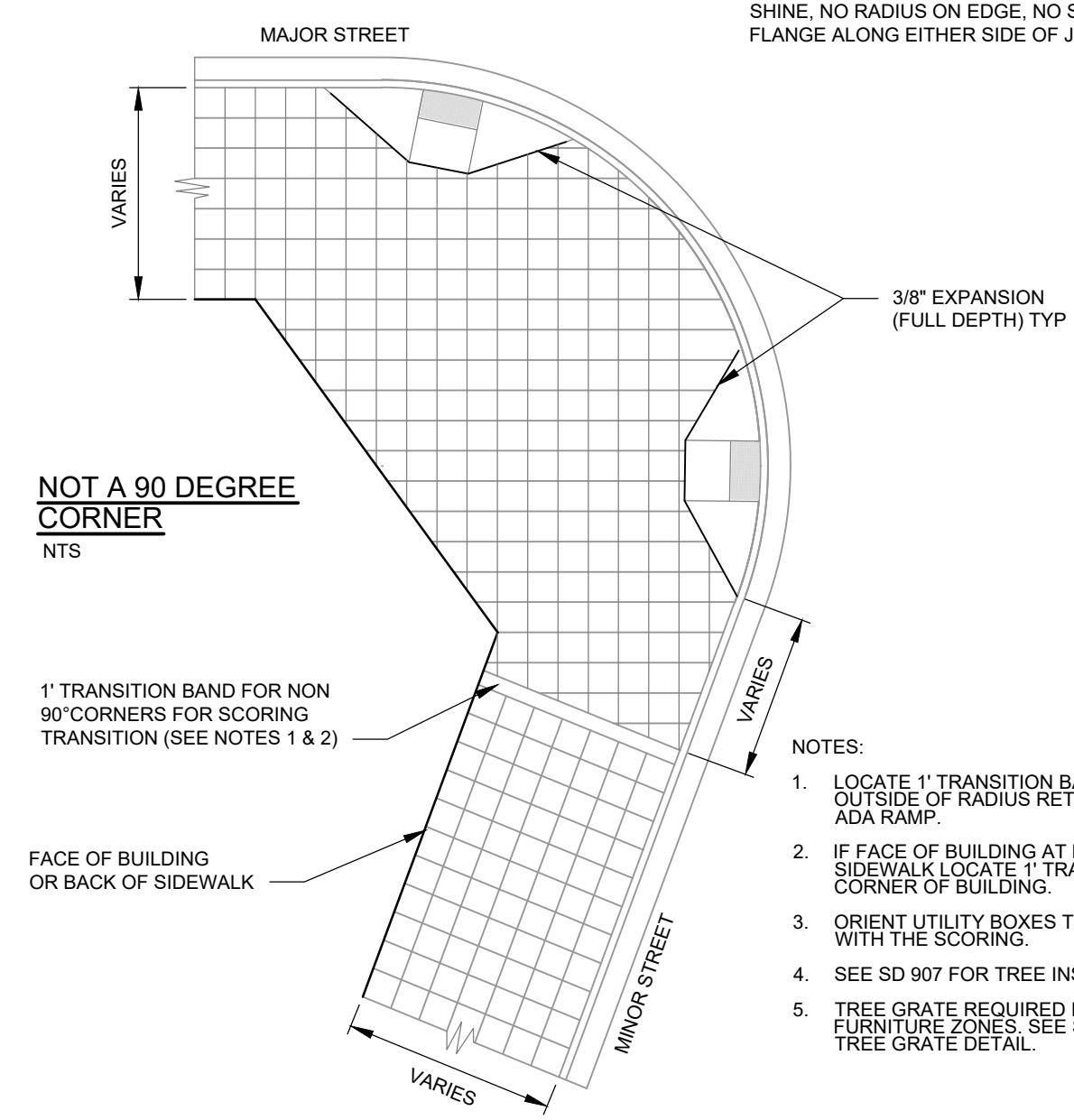
CONCRETE SHARED USE PATH

FILE NAME: SD303A.DWG | DETAIL NUMBER: **303A**

DocuSign Envelope ID: F681597A-CCE8-405B-ACDB-A8564C559739



PLAN VIEW
NTS



NOT A 90 DEGREE CORNER
NTS

NOTES:

1. LOCATE 1' TRANSITION BAND OUTSIDE OF RADIUS RETURN AND ADA RAMP.
2. IF FACE OF BUILDING AT BACK OF SIDEWALK LOCATE 1' TRANSITION AT CORNER OF BUILDING.
3. ORIENT UTILITY BOXES TO ALIGN WITH THE SCORING.
4. SEE SD 907 FOR TREE INSTALLATION.
5. TREE GRATE REQUIRED IN FURNITURE ZONES. SEE SD 473 FOR TREE GRATE DETAIL.

Donell Cairns

APPROVED BY: DONALD CAIRNS
TRANSPORTATION PLANNING AND ENGINEERING MANAGER

REVISION DATE: MARCH 01, 2020

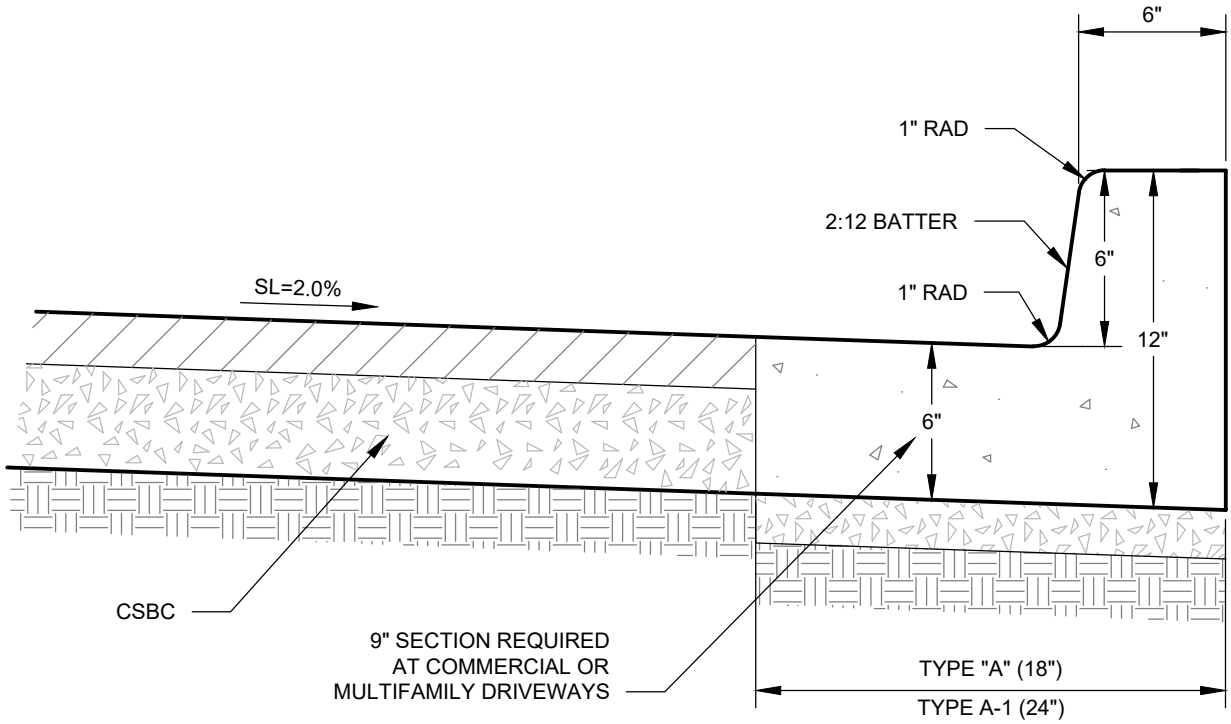
CityofRedmond
WASHINGTON

STANDARD DETAILS

DOWNTOWN AND OVERLAKE PEDESTRIAN SIDEWALK

FILE NAME: SD303B.DWG | DETAIL NUMBER: **303B**

DocuSign Envelope ID: F681597A-CCE8-405B-ACDB-A8564C559739



TYPE A AND A-1 CURB AND GUTTER SECTION

NTS

NOTES:

1. CONCRETE SHALL BE AIR ENTRAINED CLASS 3000 PER WSDOT STANDARD SPECIFICATIONS 6-02 CLASS 4000 REQUIRED ALONG DRIVEWAY ENTRANCE.
2. TYPE "A" AND ROLLED CURB AND GUTTER SECTIONS MAY BE PERMITTED FOR NEW PRIVATE STREETS.
3. TYPE "A" OR ROLLED CURB AND GUTTER MAY BE PERMITTED ON PUBLIC STREETS ONLY TO MATCH EXISTING.
4. CURB AND GUTTER SHALL BE CONSTRUCTED IN ACCORDANCE WITH SECTION 8-04 OF THE STANDARD SPECIFICATIONS.
5. AFTER THE CONCRETE HAS SET SUFFICIENTLY, THE ROADWAY FACE OF THE CURB FORMS SHALL BE REMOVED AND THE TOP AND FACE OF THE CURB SHALL RECEIVE A LIGHT BRUSH FINISH, AND THE TOP OF THE GUTTER SHALL RECEIVE A BROOM FINISH.
6. FOR CRUSHED SURFACING BASE COURSE UNDER CONCRETE, SEE SD 301.

Paul S. Cho

APPROVED BY: PAUL S. CHO
TRAFFIC OPERATIONS SAFETY AND ENGINEERING MANAGER

REVISION DATE: MARCH 01, 2020

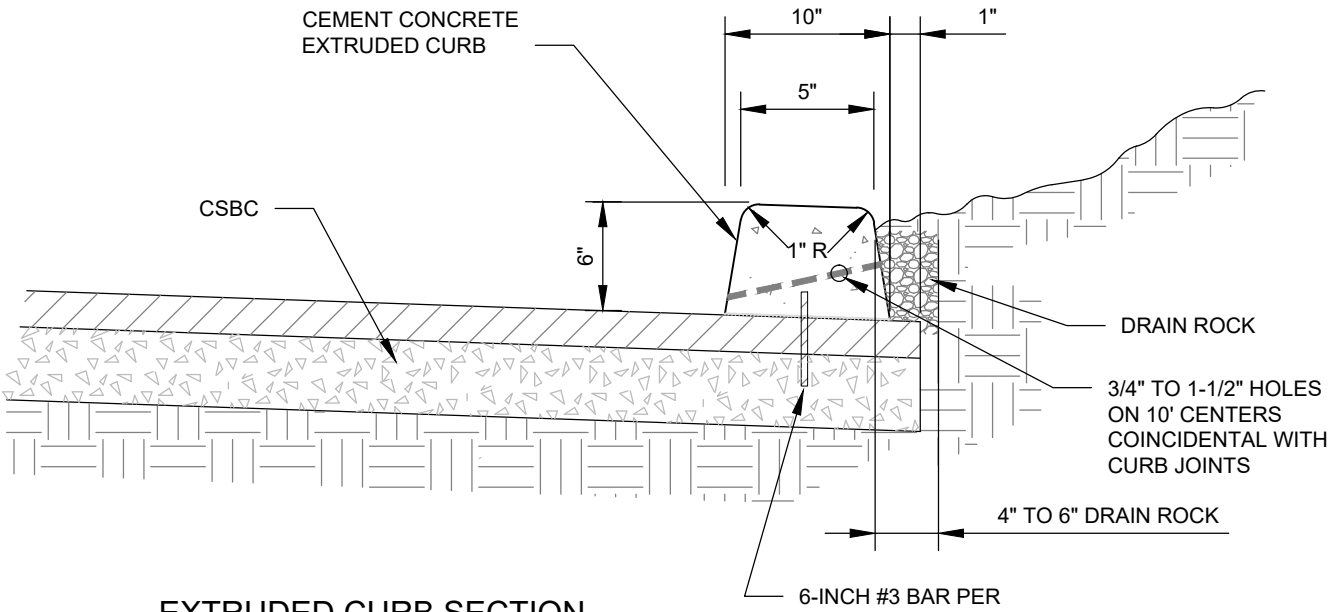
CityofRedmond
WASHINGTON

STANDARD DETAILS

TYPICAL CURB AND GUTTER DETAILS

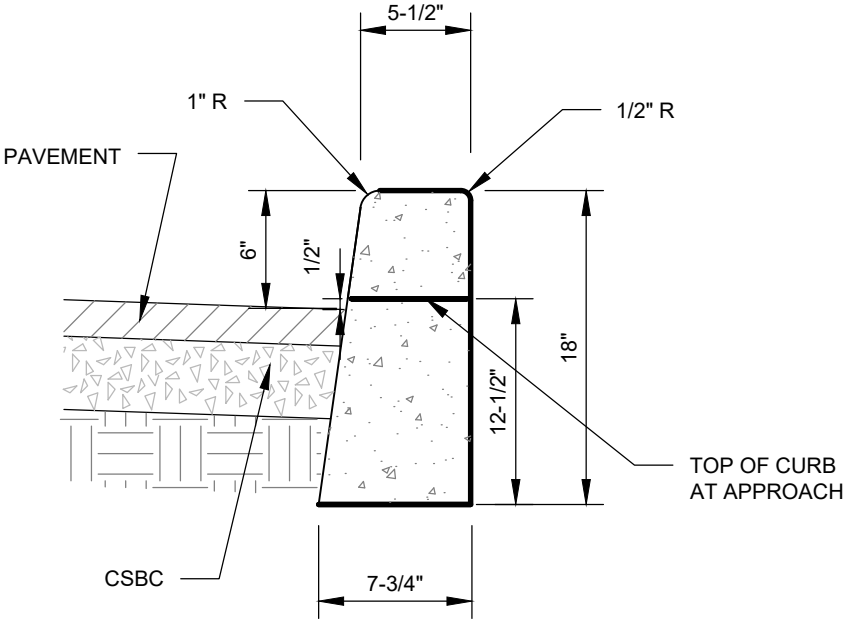
FILE NAME: SD304.DWG | DETAIL NUMBER: **304**

DocuSign Envelope ID: F681597A-CCE8-405B-ACDB-A8564C559739



EXTRUDED CURB SECTION

NTS



BARRIER CURB

NTS

NOTES:

1. CURBS SHALL BE CONSTRUCTED IN ACCORDANCE WITH SECTION 8-04 OF THE STANDARD SPECIFICATIONS.
2. THE CONCRETE MIX FOR CURB SHALL BE AIR ENTRAINED CONCRETE CLASS 3000 IN ACCORDANCE WITH REQUIREMENTS OF SECTION 6-02 OF THE STANDARD SPECIFICATIONS. USE CLASS 4000 ALONG DRIVEWAYS.
3. AFTER THE CONCRETE HAS SET SUFFICIENTLY, THE ROADWAY FACE OF THE CURB FORMS SHALL BE REMOVED AND THE TOP AND FACE OF THE CURB SHALL RECEIVE A LIGHT BRUSH FINISH.
4. FOR CRUSHED SURFACING BASE COURSE CONCRETE, SEE SD 301.

Paul S. Cho

APPROVED BY: PAUL S. CHO
TRAFFIC OPERATIONS SAFETY AND ENGINEERING MANAGER

REVISION DATE: MARCH 01, 2020

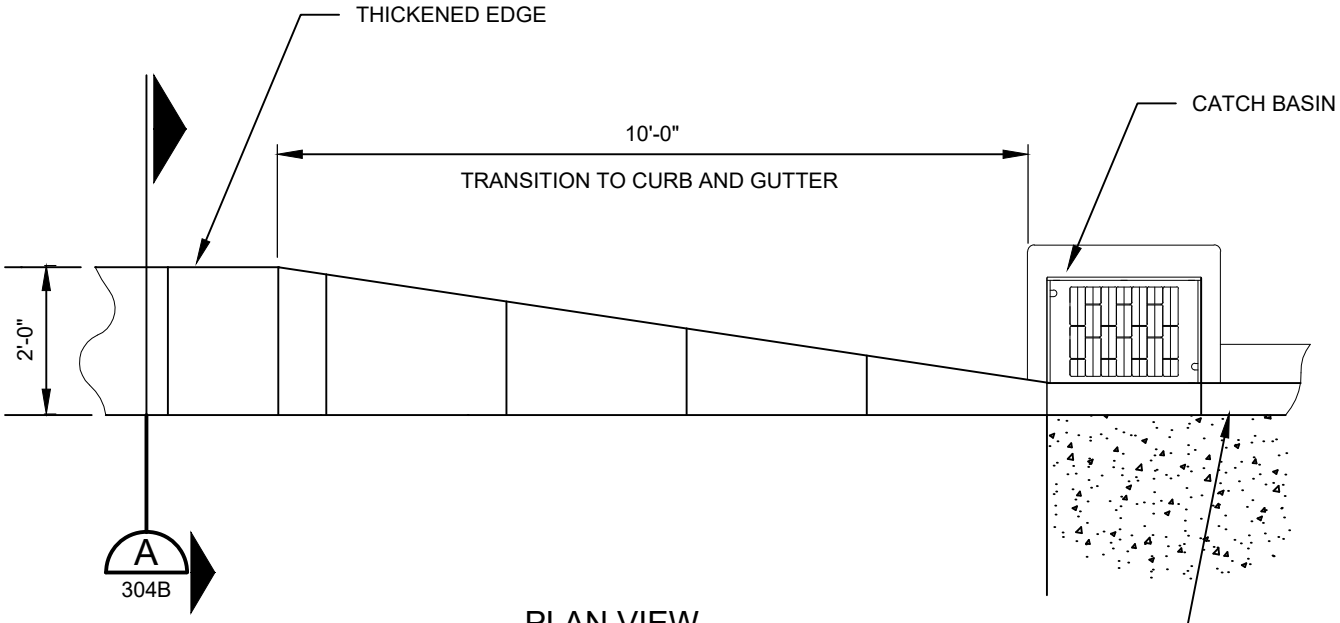
CityofRedmond
WASHINGTON

STANDARD DETAILS

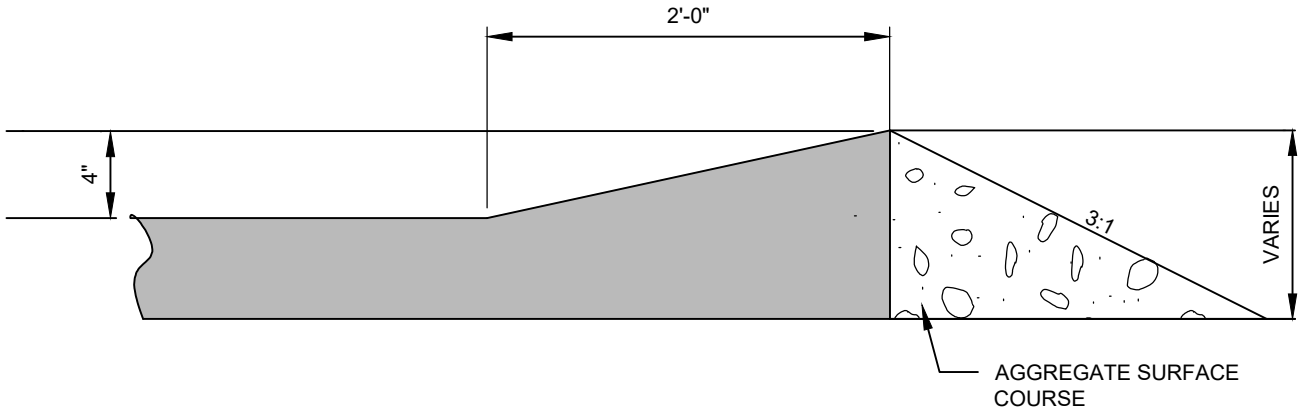
EXTRUDED AND BARRIER CURB SECTIONS

FILE NAME: SD304A.DWG | DETAIL NUMBER: **304A**

DocuSign Envelope ID: F681597A-CCE8-405B-ACDB-A8564C559739



PLAN VIEW
NTS



SECTION A-A
NTS

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TRAFFIC OPERATIONS SAFETY AND ENGINEERING MANAGER

REVISION DATE: MARCH 01, 2020

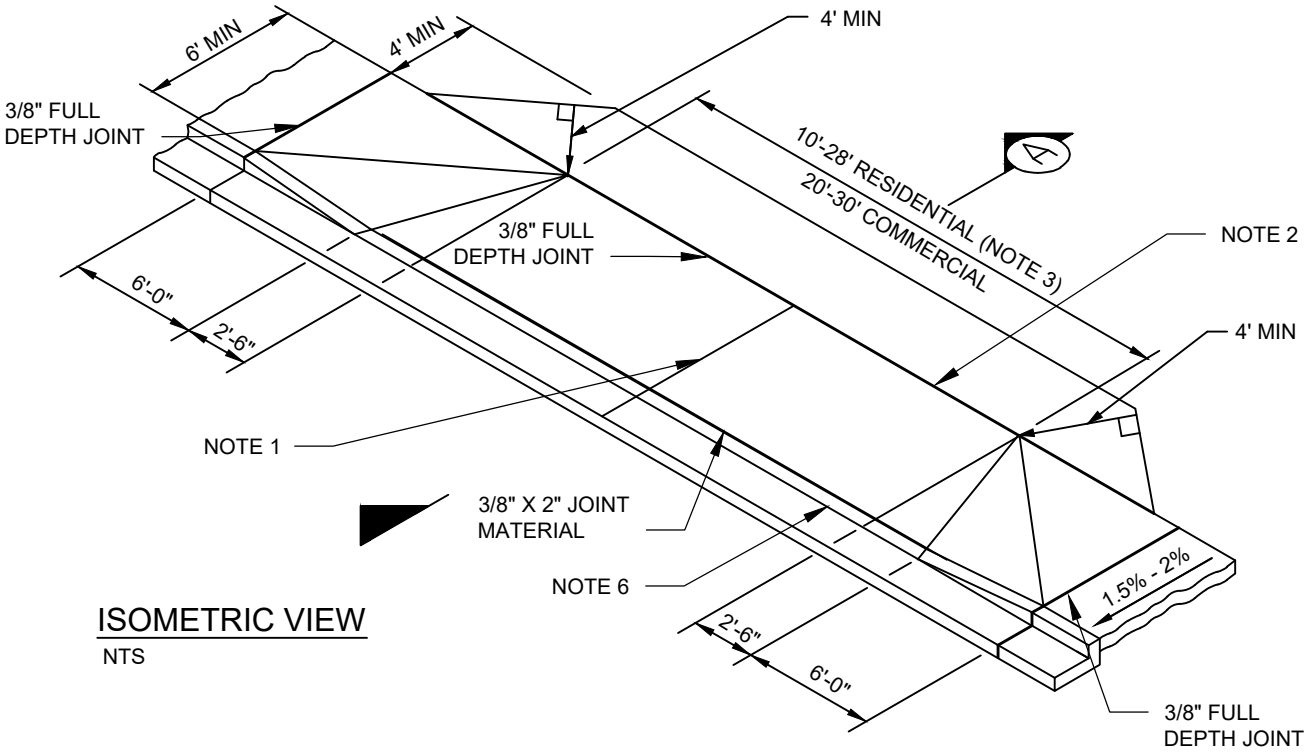
CityofRedmond WASHINGTON

STANDARD DETAILS

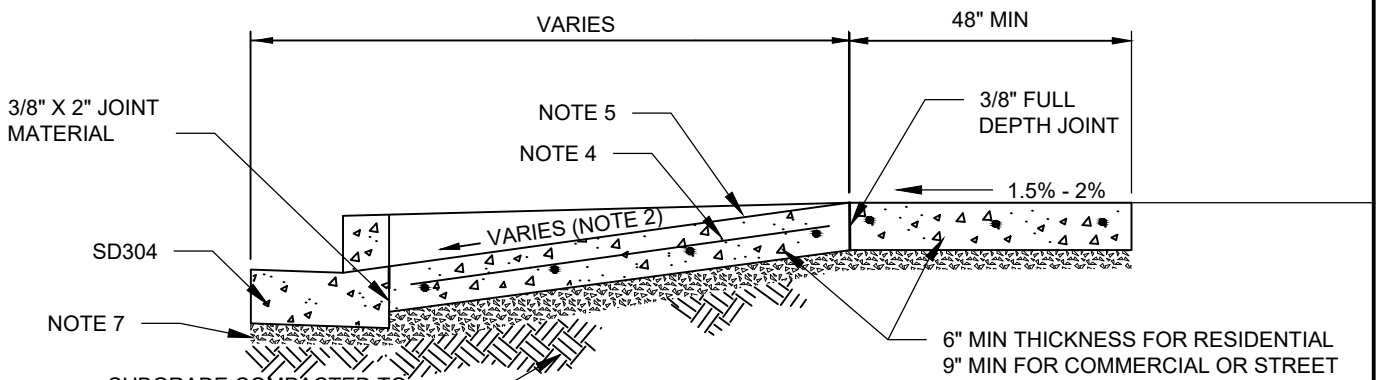
ASPHALT THICKENED EDGE

FILE NAME: SD304B.DWG | DETAIL NUMBER: **304B**

DocuSign Envelope ID: F681597A-CCE8-405B-ACDB-A8564C559739



ISOMETRIC VIEW
NTS



SECTION A
NTS

NOTES:

1. 3/8 INCH X 2 INCH JOINT MATERIAL ON CENTERLINE WHEN DRIVEWAY IS WIDER THAN 16 FEET.
2. IF DRIVEWAY SLOPE EXCEEDS 2%, A 48 INCH WALKWAY IS REQUIRED BEHIND THE DRIVEWAY AND FLARE.
3. SEE RZC APPENDIX 2 SECTION D.3 AND TABLE 11 FOR DETAILS.
4. DRIVEWAYS SHALL BE CONSTRUCTED IN ACCORDANCE WITH SECTION 5-05 AND 8-06 OF THE STANDARD SPECIFICATIONS. WIRE MESH SHALL BE INSTALLED AT MID-SECTION ON COMMERCIAL DRIVEWAYS. WIRE MESH SHALL BE 4 INCH X 4 INCH, NUMBER 4 GAUGE PER SECTION 9-07.7 OF THE STANDARD SPECIFICATIONS (AASHTO M55).
5. THE CONCRETE MIX FOR DRIVEWAYS SHALL BE AIR ENTRAINED CONCRETE CLASS 4000 IN ACCORDANCE WITH THE REQUIREMENTS OF SECTION 6-02 OF THE STANDARD SPECIFICATIONS. THE CONCRETE FINISH REQUIREMENTS INCLUDE:
   A. JOINTS SHALL BE TOOLED WITH 1/4 INCH RADIUS EDGER
   B. DRIVEWAY EDGES TOOLED WITH A 1/2 INCH RADIUS EDGER
   C. AFTER DRIVEWAY IS GIVEN A LONGITUDINAL (TRANSVERSE TO VEHICLE FLOW) BRUSH FINISH, THE EDGES OF THE DRIVEWAY AND ALL JOINTS SHALL BE LIGHTLY EDGED AGAIN WITH A 4 INCH WIDE EDGING TOOL TO GIVE A FINISHED APPEARANCE.
6. PROVIDE EDGE AS REQUIRED TO ENSURE GUTTER FLOW OF STORMWATER ACROSS DRIVEWAY.
7. FOR CRUSHED SURFACING BASE COURSE UNDER CONCRETE, SEE SD 301.

Donell Cairns

APPROVED BY: DONALD CAIRNS
TRANSPORTATION PLANNING AND ENGINEERING MANAGER

REVISION DATE: MARCH 01, 2020

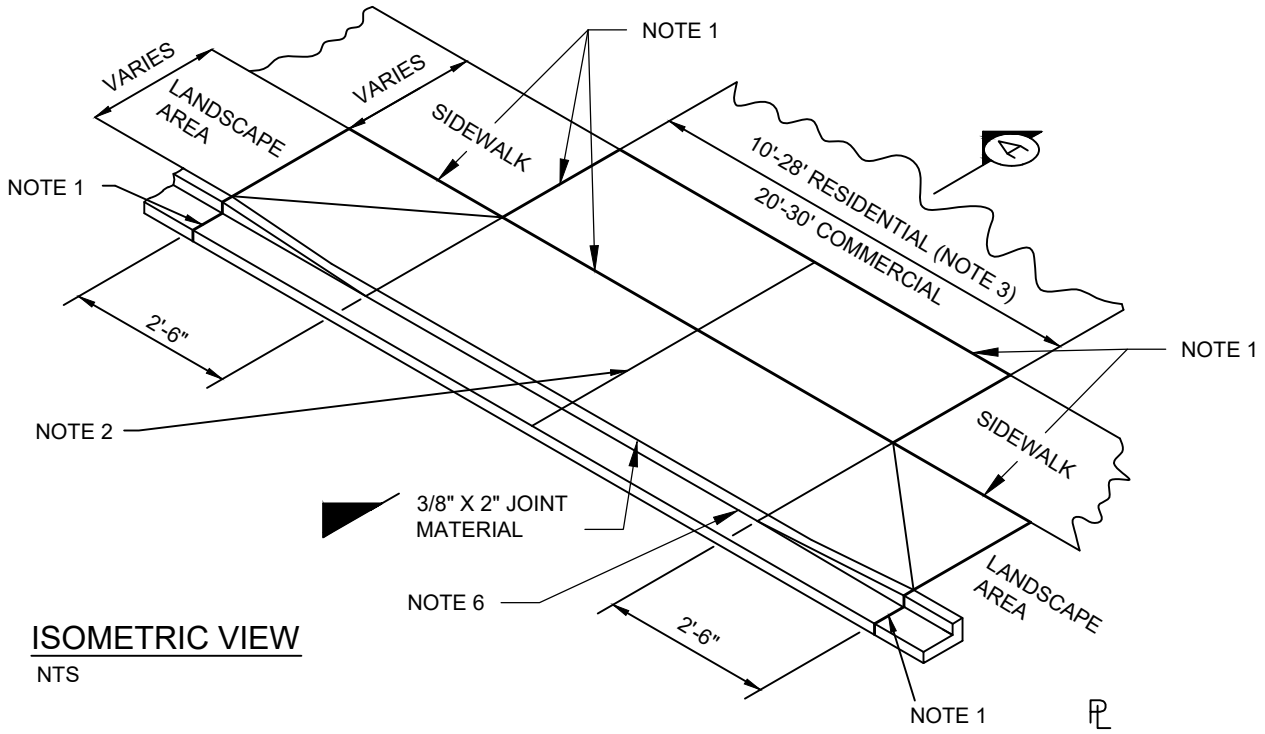
CityofRedmond
WASHINGTON

STANDARD DETAILS

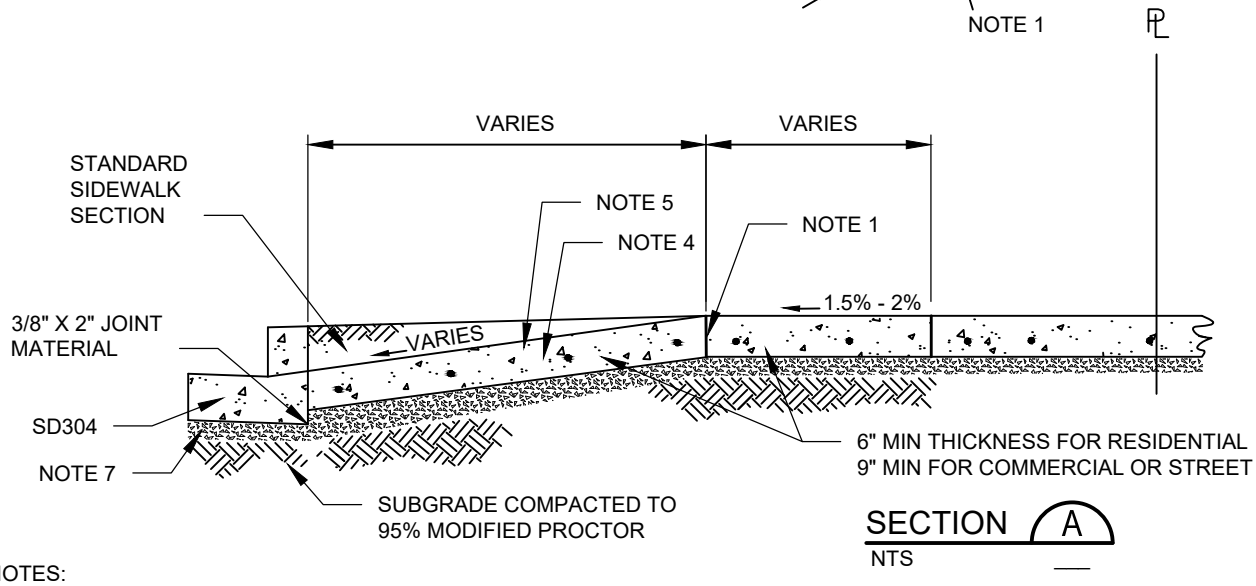
TYPE "1" DRIVEWAY

FILE NAME: SD305.DWG | DETAIL NUMBER: **305**

DocuSign Envelope ID: F681597A-CCE8-405B-ACDB-A8564C559739



ISOMETRIC VIEW
NTS



SECTION A
NTS

NOTES:

1. 3/8 INCH FULL DEPTH JOINT.
2. 3/8 INCH X 2 INCH JOINT MATERIAL ON CENTERLINE WHEN DRIVEWAY IS WIDER THAN 16 FEET.
3. SEE RZC APPENDIX 2 SECTION D.3 AND TABLE 11 FOR DETAILS.
4. DRIVEWAYS SHALL BE CONSTRUCTED IN ACCORDANCE WITH SECTION 5-05 AND 8-06 OF THE STANDARD SPECIFICATIONS. WIRE MESH SHALL BE INSTALLED ON COMMERCIAL DRIVEWAYS. WIRE MESH SHALL BE 4 INCH X 4 INCH, NUMBER 4 GAUGE PER SECTION 9-07 OF THE STANDARD SPECIFICATIONS (AASHTO M55).
5. THE CONCRETE MIX FOR DRIVEWAYS SHALL BE AIR ENTRAINED CONCRETE CLASS 4000 IN ACCORDANCE WITH THE REQUIREMENTS OF SECTION 6-02 OF THE STANDARD SPECIFICATIONS. THE CONCRETE FINISH REQUIREMENTS INCLUDE:
   A. JOINTS SHALL BE TOOLED WITH 1/4 INCH RADIUS EDGER
   B. DRIVEWAY EDGES TOOLED WITH A 1/2 INCH RADIUS EDGER
   C. AFTER DRIVEWAY IS GIVEN A LONGITUDINAL (TRANSVERSE TO VEHICLE FLOW) BRUSH FINISH, THE EDGES OF THE DRIVEWAY AND ALL JOINTS SHALL BE LIGHTLY EDGED AGAIN WITH A 4 INCH WIDE EDGING TOOL TO GIVE A FINISHED APPEARANCE.
6. PROVIDE EDGE AS REQUIRED TO ENSURE GUTTER FLOW OF STORMWATER ACROSS DRIVEWAY.
7. FOR CRUSHED SURFACING BASE COURSE UNDER CONCRETE, SEE SD 301.

Donell Cairns

APPROVED BY: DONALD CAIRNS
TRANSPORTATION PLANNING AND ENGINEERING MANAGER

REVISION DATE: MARCH 01, 2020

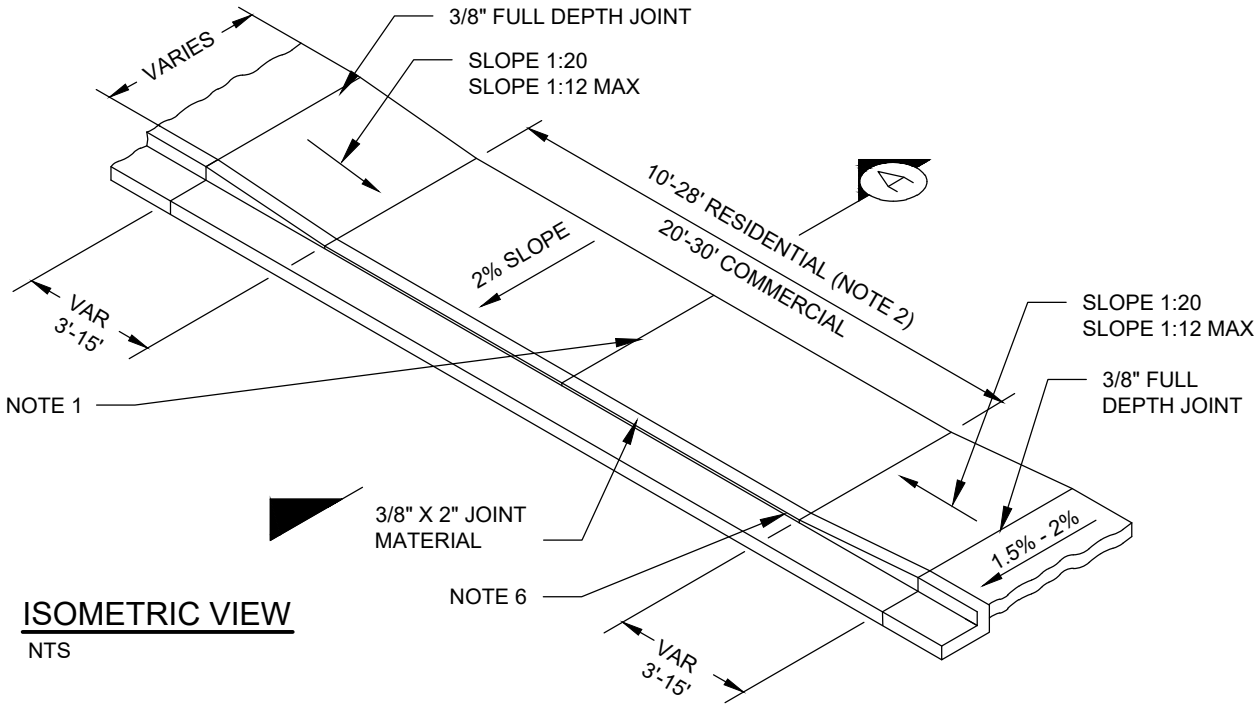
CityofRedmond WASHINGTON

STANDARD DETAILS

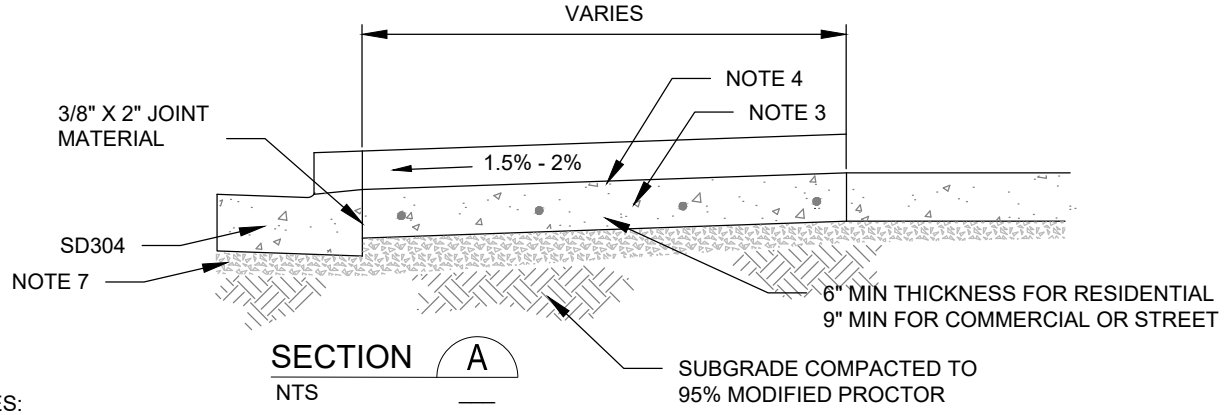
TYPE "1A" DRIVEWAY W/ ADJACENT LANDSCAPE AREA

FILE NAME: SD305A.DWG | DETAIL NUMBER: **305A**

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ISOMETRIC VIEW
NTS



SECTION A
NTS

NOTES:

1. 3/8 INCH X 2 INCH JOINT MATERIAL ON CENTERLINE WHEN DRIVEWAY IS WIDER THAN 16 FEET.
2. SEE RZC APPENDIX 2 SECTION D.3 AND TABLE 11 FOR DETAILS.
3. DRIVEWAYS SHALL BE CONSTRUCTED IN ACCORDANCE WITH SECTION 5-05 AND 8-06 OF THE STANDARD SPECIFICATIONS. WIRE MESH SHALL BE INSTALLED ON COMMERCIAL DRIVEWAYS. WIRE MESH SHALL BE 4 INCH X 4 INCH, NUMBER 4 GAUGE PER SECTION 9-07.7 OF THE STANDARD SPECIFICATIONS (AASHTO M55).
4. THE CONCRETE MIX FOR DRIVEWAYS SHALL BE AIR ENTRAINED CONCRETE CLASS 4000 IN ACCORDANCE WITH THE REQUIREMENTS OF SECTION 6-02 OF THE STANDARD SPECIFICATIONS. THE CONCRETE FINISH REQUIREMENTS INCLUDE:
   A. JOINTS SHALL BE TOOLED WITH 1/4 INCH RADIUS EDGER
   B. DRIVEWAY EDGES TOOLED WITH A 1/2 INCH RADIUS EDGER
   C. AFTER DRIVEWAY IS GIVEN A LONGITUDINAL (TRANSVERSE TO VEHICLE FLOW) BRUSH FINISH, THE EDGES OF THE DRIVEWAY AND ALL JOINTS SHALL BE LIGHTLY EDGED AGAIN WITH A 4 INCH WIDE EDGING TOOL TO GIVE A FINISHED APPEARANCE.
5. TYPE "2" DRIVEWAY TO BE USED WHERE ADJOINING PROPERTY IS LOWER THAN SIDEWALK GRADE AND SHALL BE APPROVED BY THE CITY.
6. PROVIDE EDGE AS REQUIRED TO ENSURE GUTTER FLOW OF STORMWATER ACROSS DRIVEWAY
7. FOR CRUSHED SURFACING BASE COURSE UNDER CONCRETE, SEE SD 301.

Donell Cairns

APPROVED BY: DONALD CAIRNS
TRANSPORTATION PLANNING AND ENGINEERING MANAGER

REVISION DATE: MARCH 01, 2020

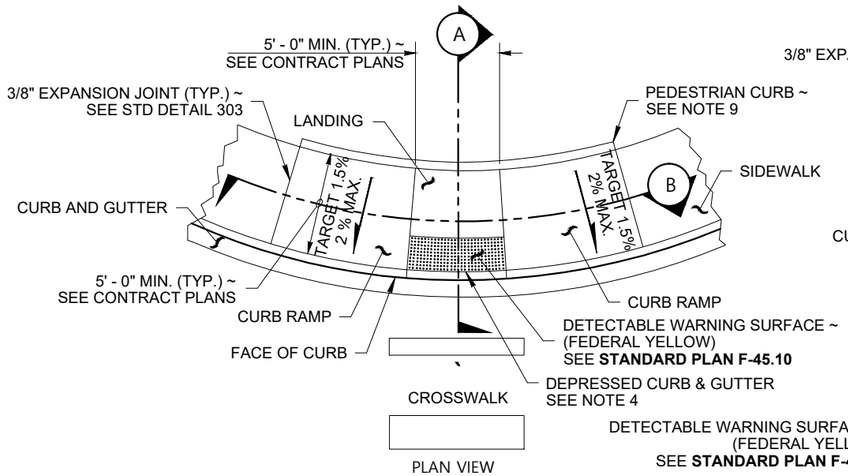
CityofRedmond WASHINGTON

STANDARD DETAILS

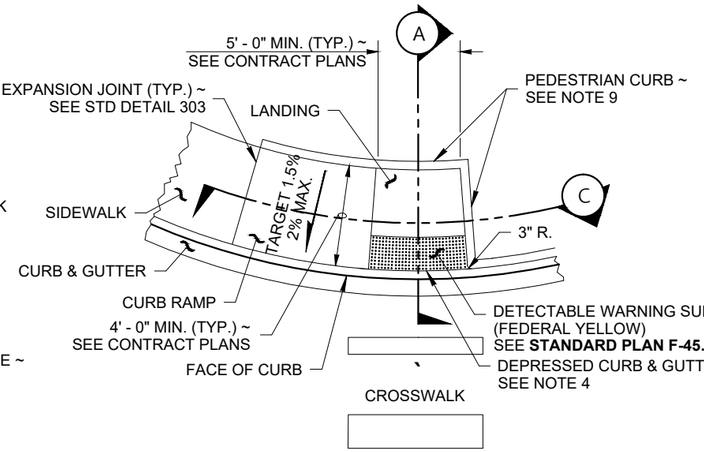
TYPE "2" DRIVEWAY

FILE NAME: SD306.DWG | DETAIL NUMBER: **306**

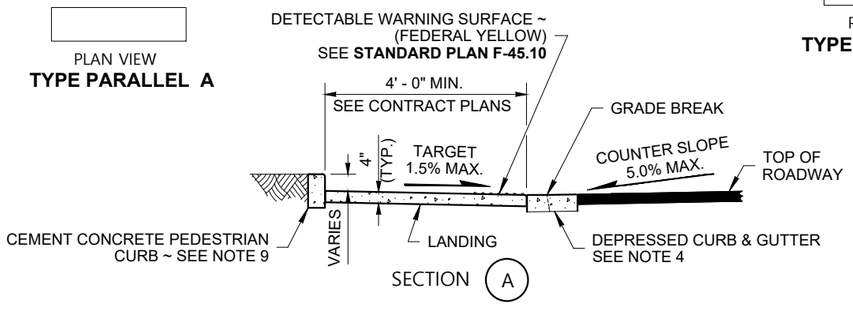
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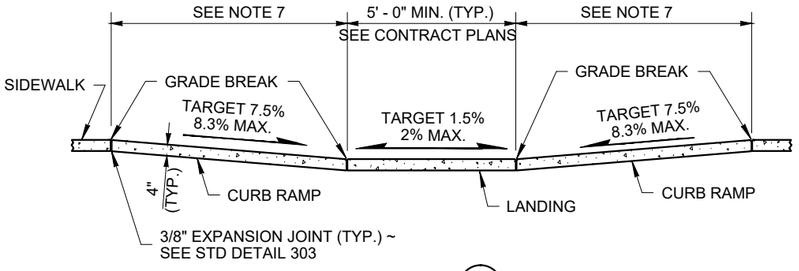


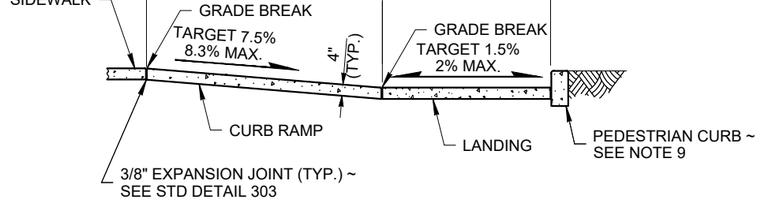
TYPE PARALLEL A

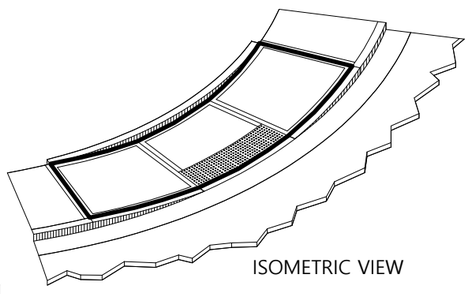


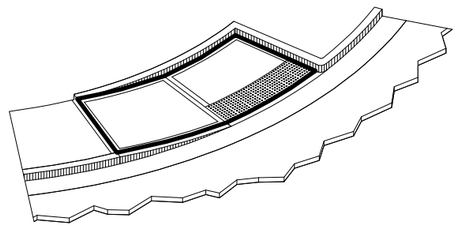
TYPE PARALLEL B











NOTES

1. Provide a separate Curb Ramp for each marked or unmarked crosswalk. Curb Ramp location shall be placed within the width of the associated crosswalk, or as shown in the Contract Plans.
2. Where "GRADE BREAK" is called out, the entire length of the grade break between the two adjacent surface planes shall be flush.
3. Do not place Gratings, Junction Boxes, Access Covers, or other appurtenances in front of the Curb Ramp or on any part of the Curb Ramp or Landing.
4. See Contract Plans for the curb design specified. See SD 304 and 304A for Curb, Curb and Gutter, and Pedestrian Curb details. For depressed curb and gutter detail, see WSDOT Standard Plan F-10.12.
5. See **Standard Plan F-30.10** for Cement Concrete Sidewalk Details. See Contract Plans for width and placement of sidewalk.
6. (Intentionally left BLANK)
7. Ramp slope must be Target 7.5 percent (8.3 percent Max) or ramp length must exceed 15 feet.
8. Curb Ramp, Landing, and Flares shall receive broom finish. See **Standard Specifications 8-14.**
9. Pedestrian Curb may be omitted if the ground surface at the back of the Curb Ramp and/or Landing will be at the same elevation as the Curb Ramp or Landing and there will be no material to retain.
10. For crushed surfacing base course under concrete, see SD 301.

LEGEND

SLOPE IN EITHER DIRECTION

MODIFIED
STANDARD PLAN F-40.12-02
WSDOT 6/20/13
SHEET 1 OF 1 SHEET

APPROVED BY: PAUL S. CHO
TRAFFIC OPERATIONS SAFETY AND ENGINEERING MANAGER

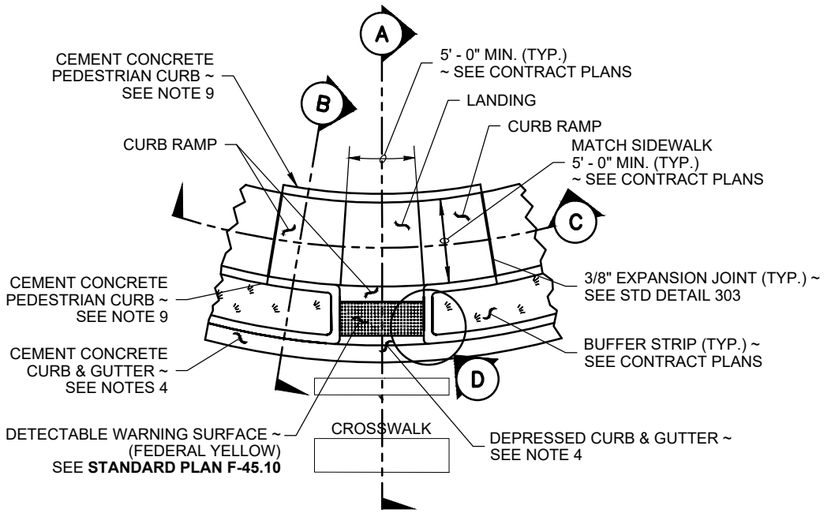
REVISION DATE: MARCH 01, 2020

CityofRedmond
WASHINGTON

STANDARD DETAILS

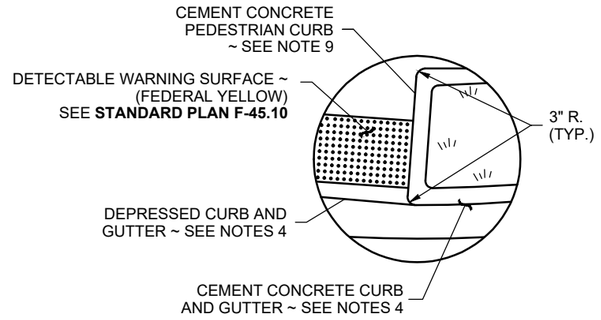
PARALLEL CURB RAMP

FILE NAME: SD307.DWG | DETAIL NUMBER: **307**



PLAN VIEW

TYPE COMBINATION WITH BUFFER



DETAIL D

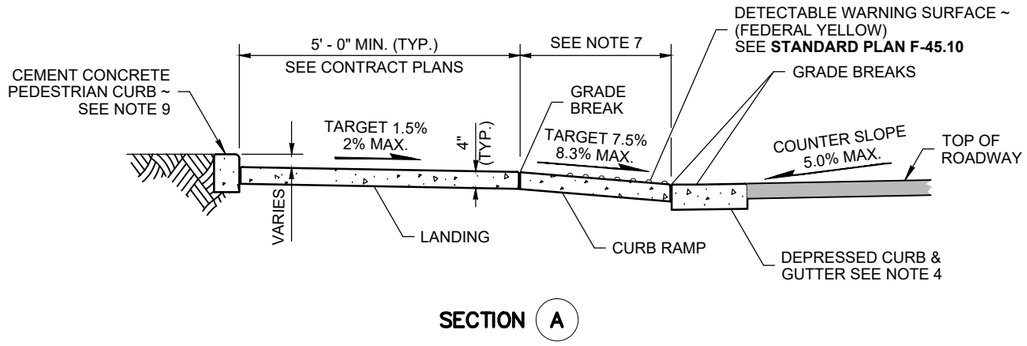
CURB RADIUS DETAIL

NOTES

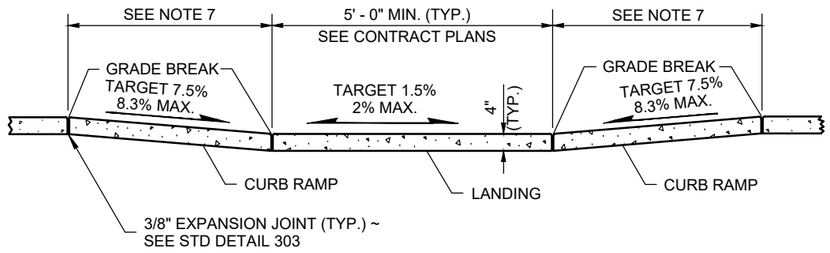
1. Provide a separate Curb Ramp for each marked or unmarked crosswalk. Curb Ramp location shall be placed within the width of the associated crosswalk or as shown in the Contract Plans.
2. Where "GRADE BREAK" is called out, the entire length of the grade break between the two adjacent surface planes shall be flush.
3. Do not place Gratings, Junction Boxes, Access Covers, or other appurtenances in front of the Curb Ramp or on any part of the Curb Ramp or Landing.
4. See Contract Plans for the curb design specified. See STD Detail 304 and 304A for Curb, Curb and Gutter, and Pedestrian Curb details. For Depressed Curb and Gutter Details, see WSDOT Standard Plan F-10.12.
5. See STD Detail 303 for Cement Concrete Sidewalk Details. See Contract Plans for width and placement of sidewalk.
6. (Intentionally left BLANK)
7. Ramp slope must be Target 7.5 percent (8.3 percent Max) or ramp length must exceed 15 feet.
8. Curb Ramp, Landing and Flares shall receive broom finish. See **Standard Specifications 8-14.**
9. Pedestrian Curb may be omitted if the ground surface at the back of the Curb Ramp and/or Landing will be at the same elevation as the Curb Ramp or Landing and there will not be material to retain.
10. For crushed surfacing base course under concrete, see SD 301.

LEGEND

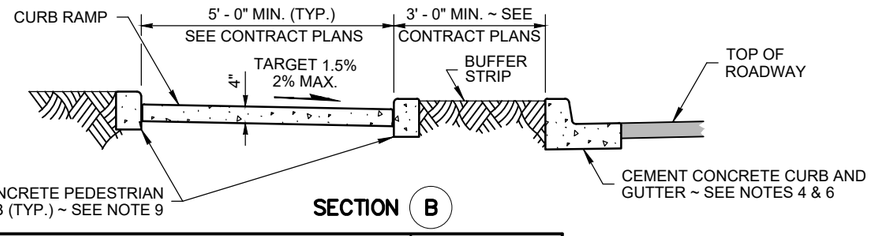
SLOPE IN EITHER DIRECTION



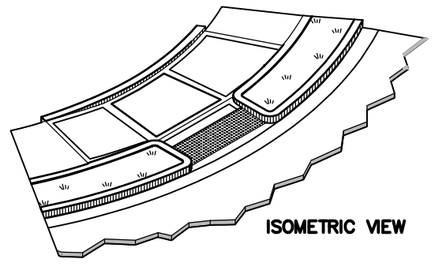
SECTION A



SECTION C



SECTION B



ISOMETRIC VIEW

MODIFIED STANDARD PLAN F-40.14-02

WSDOT 6/20/13

SHEET 1 OF 1 SHEET

Paul S. Cho

APPROVED BY: PAUL S. CHO
TRAFFIC OPERATIONS SAFETY AND ENGINEERING MANAGER

REVISION DATE: MARCH 01, 2020

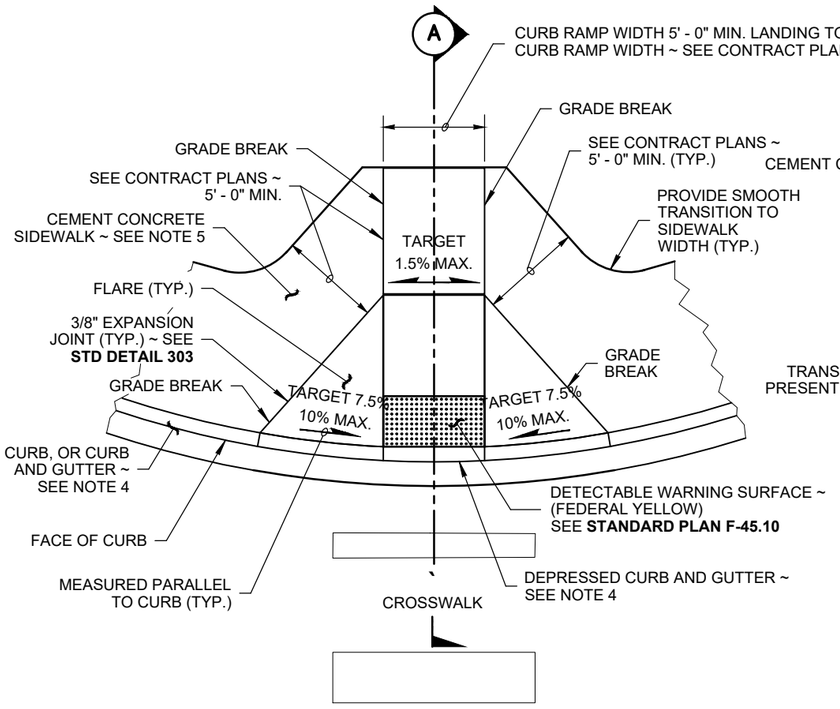
CityofRedmond WASHINGTON

STANDARD DETAILS

COMBINATION CURB RAMP

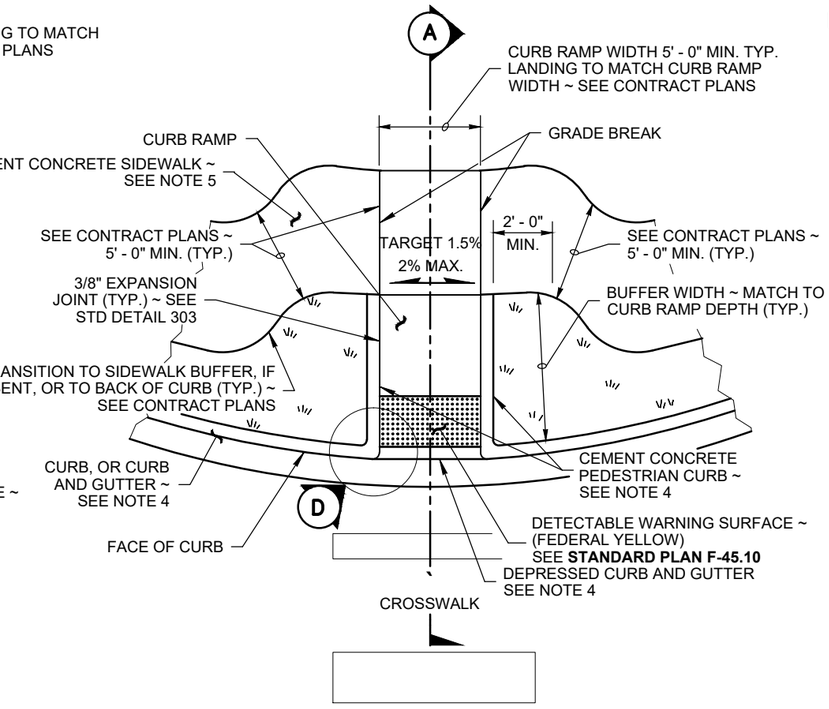
FILE NAME: SD308.DWG | DETAIL NUMBER: **308**

DocuSign Envelope ID: F681597A-CCE8-405B-ACDB-A8564C559739



PLAN VIEW

TYPE PERPENDICULAR A



PLAN VIEW

TYPE PERPENDICULAR B

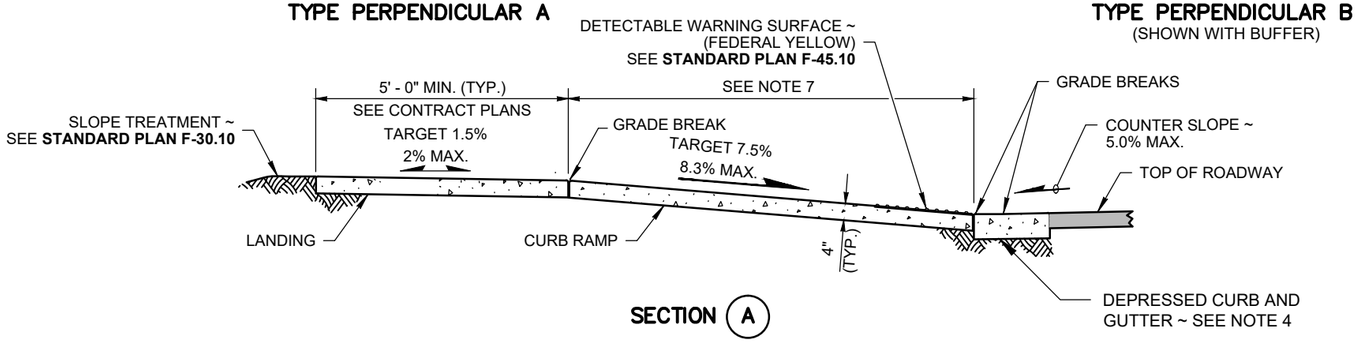
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NOTES

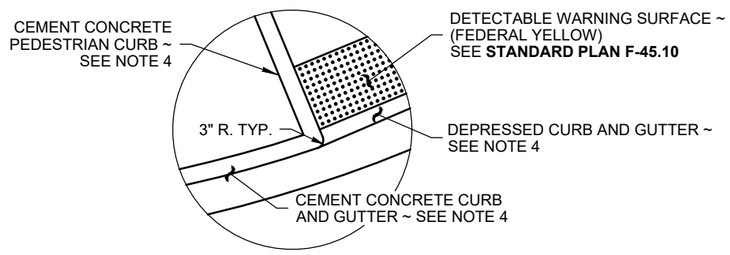
1. Provide a separate Curb Ramp for each marked or unmarked crosswalk. Curb Ramp location shall be placed within the width of the associated crosswalk or as shown in the Contract Plans.
2. Where "GRADE BREAK" is called out, the entire length of the grade break between the two adjacent surface planes shall be flush.
3. Do not place Gratings, Junction Boxes, Access Covers, or other appurtenances in front of the Curb Ramp or on any part of the Curb Ramp or Landing.
4. See the Contract Plans for the curb design specified. See SD 304 and 304A for Curb, Curb and Gutter, and Pedestrian Curb details. For Depressed Curb and Gutter Details, see WSDOT Standard Plan F-10.12.
5. See STD Detail 303 for Cement Concrete Sidewalk details. See Contract Plans for width and placement of sidewalk.
6. (Intentionally left BLANK)
7. Ramp slope must be Target 7.5 percent (8.3 percent Max) or ramp length must exceed 15 feet.
8. Curb Ramp, Landing, and Flares shall receive broom finish. See **Standard Specifications 8-14.**
9. **For crushed surfacing base course under concrete, see SD 301.**

LEGEND

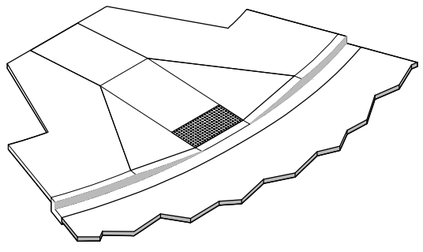
SLOPE IN EITHER DIRECTION



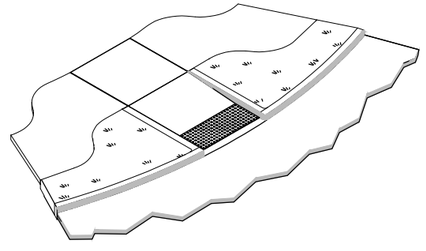
SECTION (A)



CURB RADIUS DETAIL (D)



ISOMETRIC VIEW



ISOMETRIC VIEW

MODIFIED
STANDARD PLAN F-40.15
WSDOT 6/20/13
SHEET 1 OF 1 SHEET

Paul S. Cho

APPROVED BY: PAUL S. CHO
TRAFFIC OPERATIONS SAFETY AND ENGINEERING MANAGER

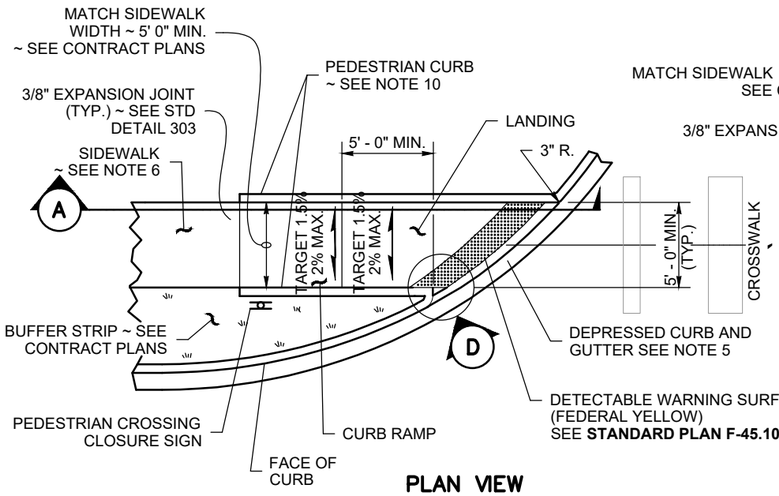
REVISION DATE: MARCH 01, 2020

CityofRedmond WASHINGTON

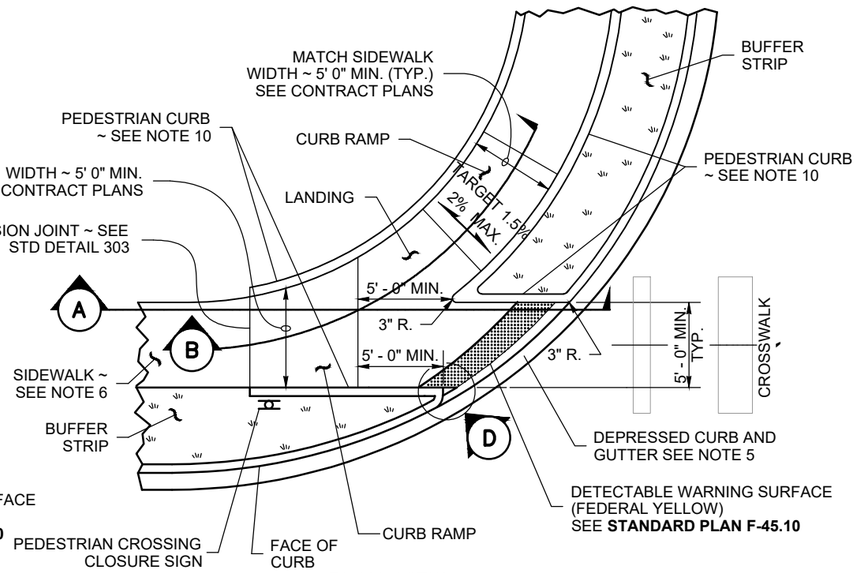
STANDARD DETAILS

PERPENDICULAR CURB RAMP

FILE NAME: SD309.DWG | DETAIL NUMBER: **309**



PLAN VIEW
TYPE SINGLE DIRECTION A



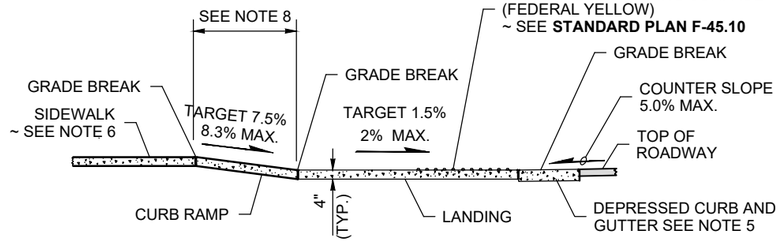
PLAN VIEW
TYPE SINGLE DIRECTION B

NOTES

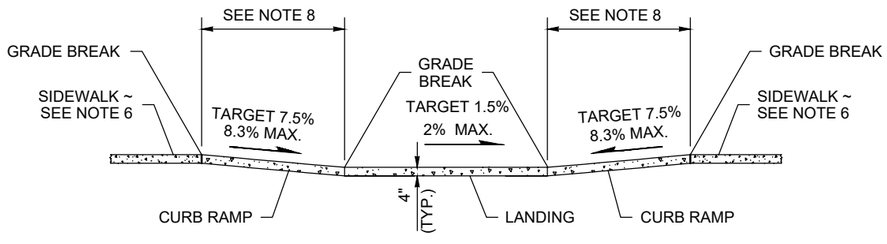
1. This plan is to be used where pedestrian crossing in one direction is not permitted.
2. Curb ramp location shall be placed within the width of the associated crosswalk, or as shown in the Contract Plans.
3. Where "GRADE BREAK" is called out, the entire length of the grade break between the two adjacent surface planes shall be flush.
4. Do not place gratings, junction boxes, access covers or other appurtenances in front of the curb ramp or on any part of the curb ramp or landing.
5. See the Contract Documents for the curb design specified. See STD Detail 304 and 304A for Curb, Curb and Gutter, and Pedestrian Curb details. For Depressed Curb and Gutter Details, see WSDOT Standard Plan F-10.12.
6. See STD Detail 303 for Cement Concrete Sidewalk Details. See contract plans for width and placement of sidewalk.
7. (Intentionally left BLANK)
8. Ramp slope must be Target 7.5 percent (8.3 percent Max)) or ramp length must exceed 15 feet.
9. Curb ramps and landings shall receive broom finish. See **Standard Specifications 8-14.**
10. Pedestrian Curb may be omitted if the ground surface at the back of the Curb Ramp and/or landing will be at the same elevation as the Curb Ramp or Landing and there will be no material to retain.
11. For crushed surfacing base course under concrete, see SD 301.

LEGEND

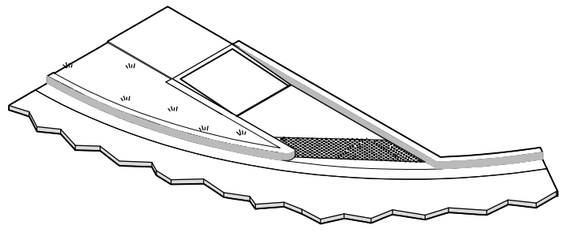
SLOPE IN EITHER DIRECTION



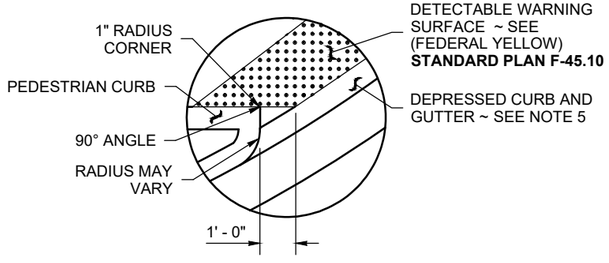
SECTION (A)



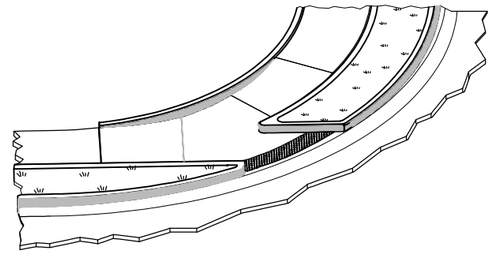
SECTION (B)



ISOMETRIC VIEW



DETAIL (D)



ISOMETRIC VIEW

MODIFIED
STANDARD PLAN F-40.16-02
WSDOT 6/20/13
SHEET 1 OF 1 SHEET

APPROVED BY: PAUL S. CHO
TRAFFIC OPERATIONS SAFETY AND ENGINEERING MANAGER
REVISION DATE: MARCH 01, 2020

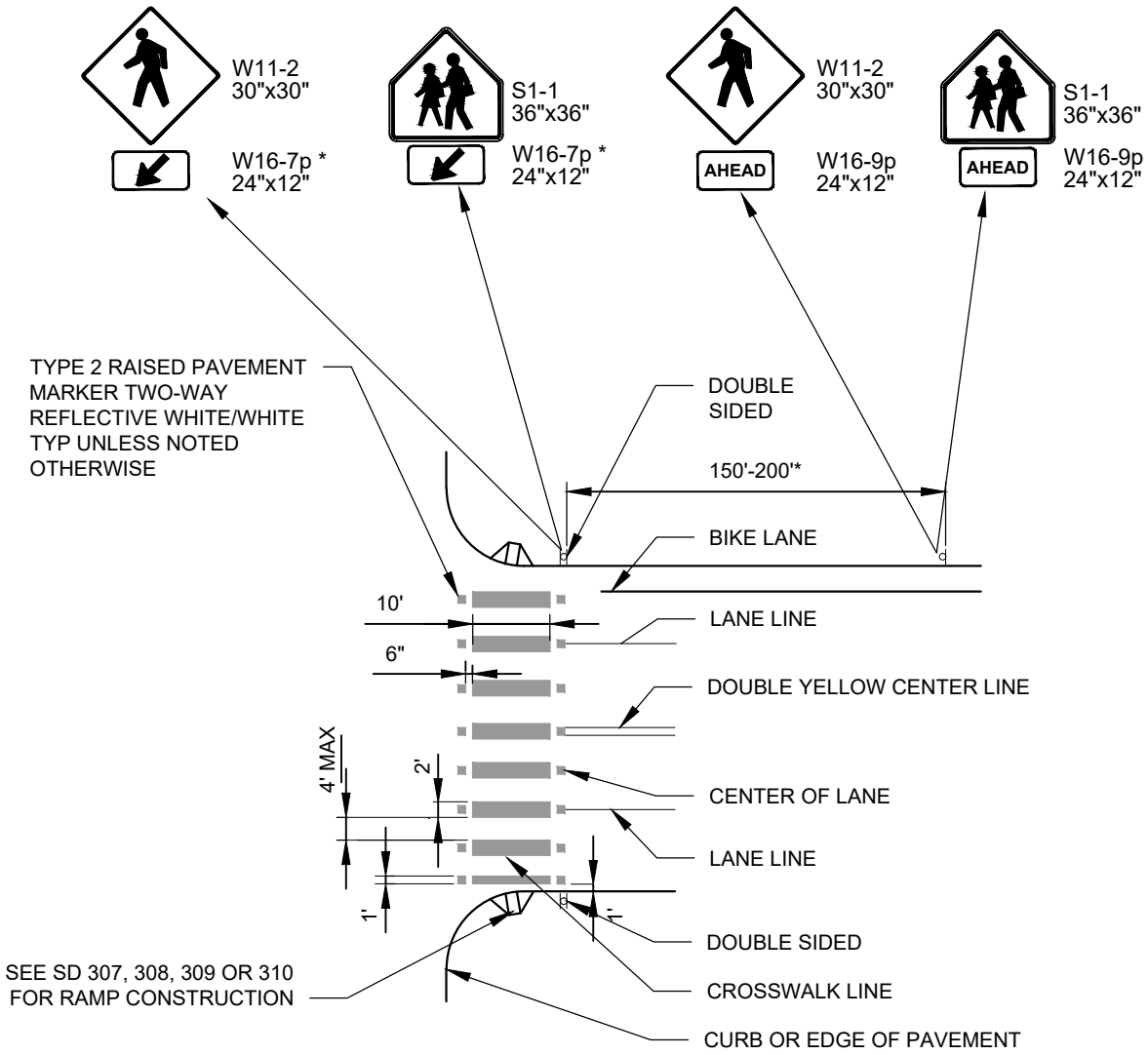
CityofRedmond WASHINGTON

STANDARD DETAILS

SINGLE DIRECTION CURB RAMP

FILE NAME: SD310.DWG | DETAIL NUMBER: **310**

DocuSign Envelope ID: F681597A-CCE8-405B-ACDB-A8564C559739



*TYPICAL

UNPROTECTED CROSSWALK OR UNSIGNALIZED SCHOOL CROSSWALK

NTS

NOTES:

1. USE WHITE THERMOPLASTIC UNLESS DIRECTED OTHERWISE BY THE ENGINEER.
2. SIGNS HAVE FLUORESCENT YELLOW GREEN BACKGROUND WITH BLACK LEGEND AND BORDER. SIGN MATERIAL: 3M DIAMOND GRADE DG3.
3. UNPROTECTED NON-SCHOOL CROSSWALK: USE W11-2 WITH W16-7P AND W11-2 WITH W16-9P.
4. UNPROTECTED SCHOOL CROSSWALK USE S1-1 WITH W16-7P AND S1-1 WITH W16-9P.
5. PROTECTED CROSSWALK OMIT S1-1 WITH W16-7P AND S1-1 WITH W16-9P.

Paul S. Cho

APPROVED BY: PAUL S. CHO
TRAFFIC OPERATIONS SAFETY AND ENGINEERING MANAGER

REVISION DATE: MARCH 01, 2020

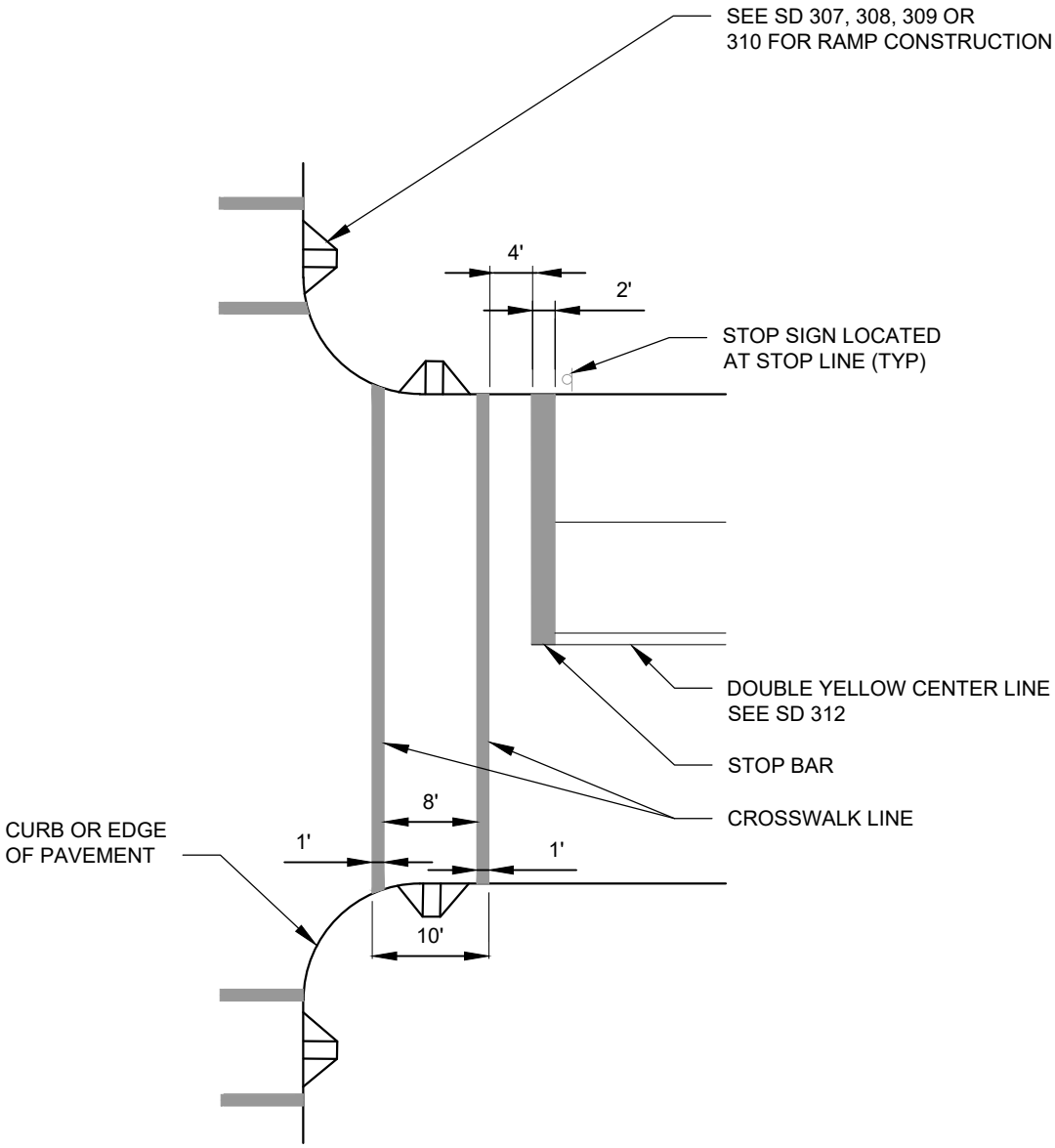
CityofRedmond WASHINGTON

STANDARD DETAILS

CROSSWALK MARKINGS & SIGNS WITHOUT SIGNAL OR STOP CONTROL

FILE NAME: SD311.DWG | DETAIL NUMBER: **311**

DocuSign Envelope ID: F681597A-CCE8-405B-ACDB-A8564C559739



PLAN VIEW

NTS

NOTES:

1. USE WHITE THERMOPLASTIC UNLESS OTHERWISE DIRECTED BY THE ENGINEER.
2. INSTALLATION OF OFFSET STOP BAR SHALL BE ENGINEER-APPROVED.
3. USE ONLY WITH APPROVAL BY THE CITY TRAFFIC ENGINEER.

Paul S. Cho

APPROVED BY: PAUL S. CHO
TRAFFIC OPERATIONS SAFETY AND ENGINEERING MANAGER

REVISION DATE: MARCH 01, 2020

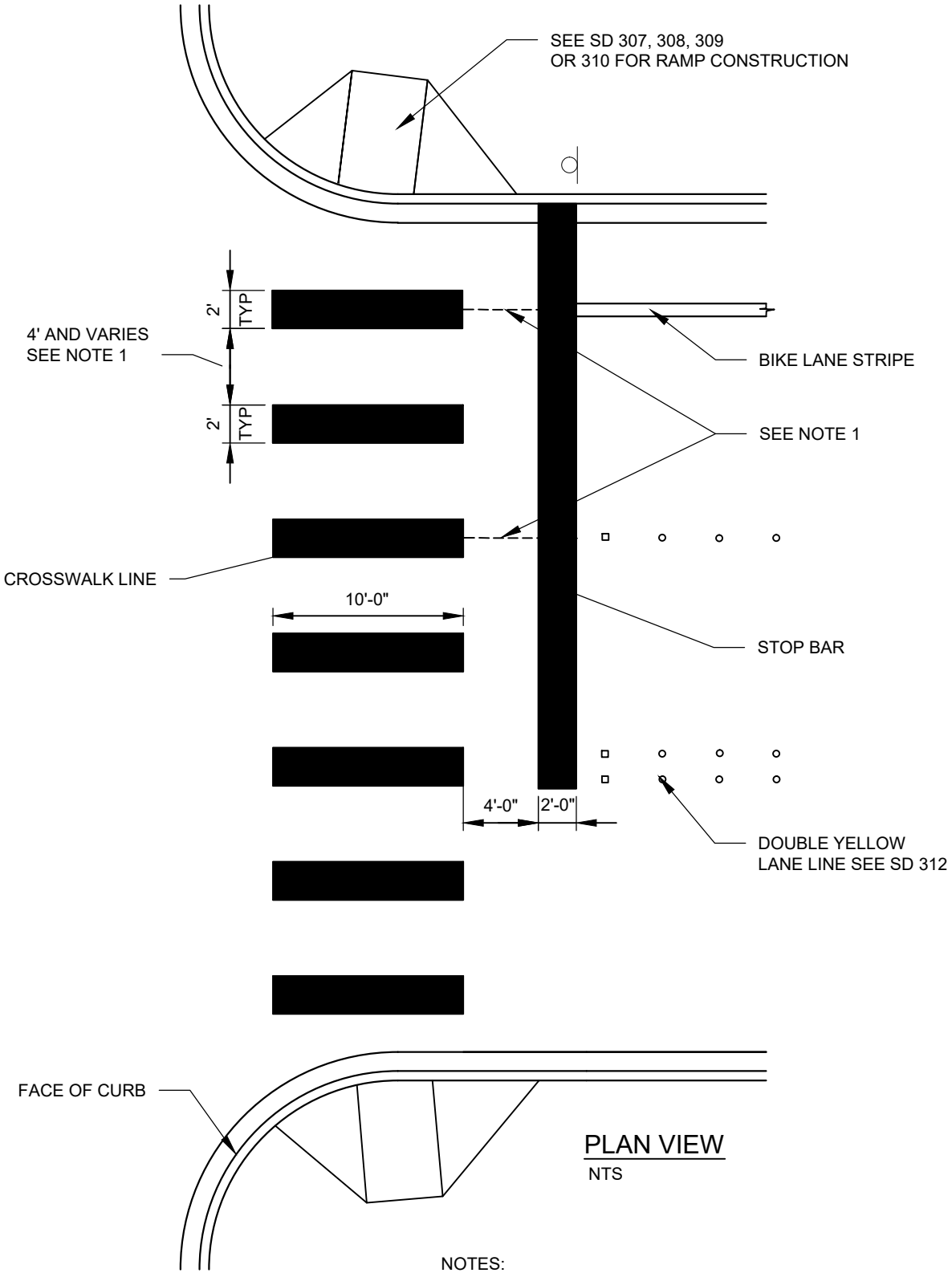
CityofRedmond
WASHINGTON

STANDARD DETAILS

LEGACY CROSSWALK & STOP BAR

FILE NAME: SD311A.DWG | DETAIL NUMBER: **311A**

DocuSign Envelope ID: F681597A-CCE8-405B-ACDB-A8564C559739



PLAN VIEW
NTS

NOTES:

1. CENTER CROSSWALK BARS ON LANE LINES AND AT CENTER OF LANES AS SHOWN IN ORDER TO AVOID TIRE WEAR.
2. USE WHITE THERMOPLASTIC UNLESS OTHERWISE DIRECTED BY THE ENGINEER.
3. INSTALLATION OF OFFSET STOP BAR SHALL BE ENGINEER-APPROVED.

Paul S. Cho

APPROVED BY: PAUL S. CHO
TRAFFIC OPERATIONS SAFETY AND ENGINEERING MANAGER

REVISION DATE: MARCH 01, 2020

CityofRedmond
WASHINGTON

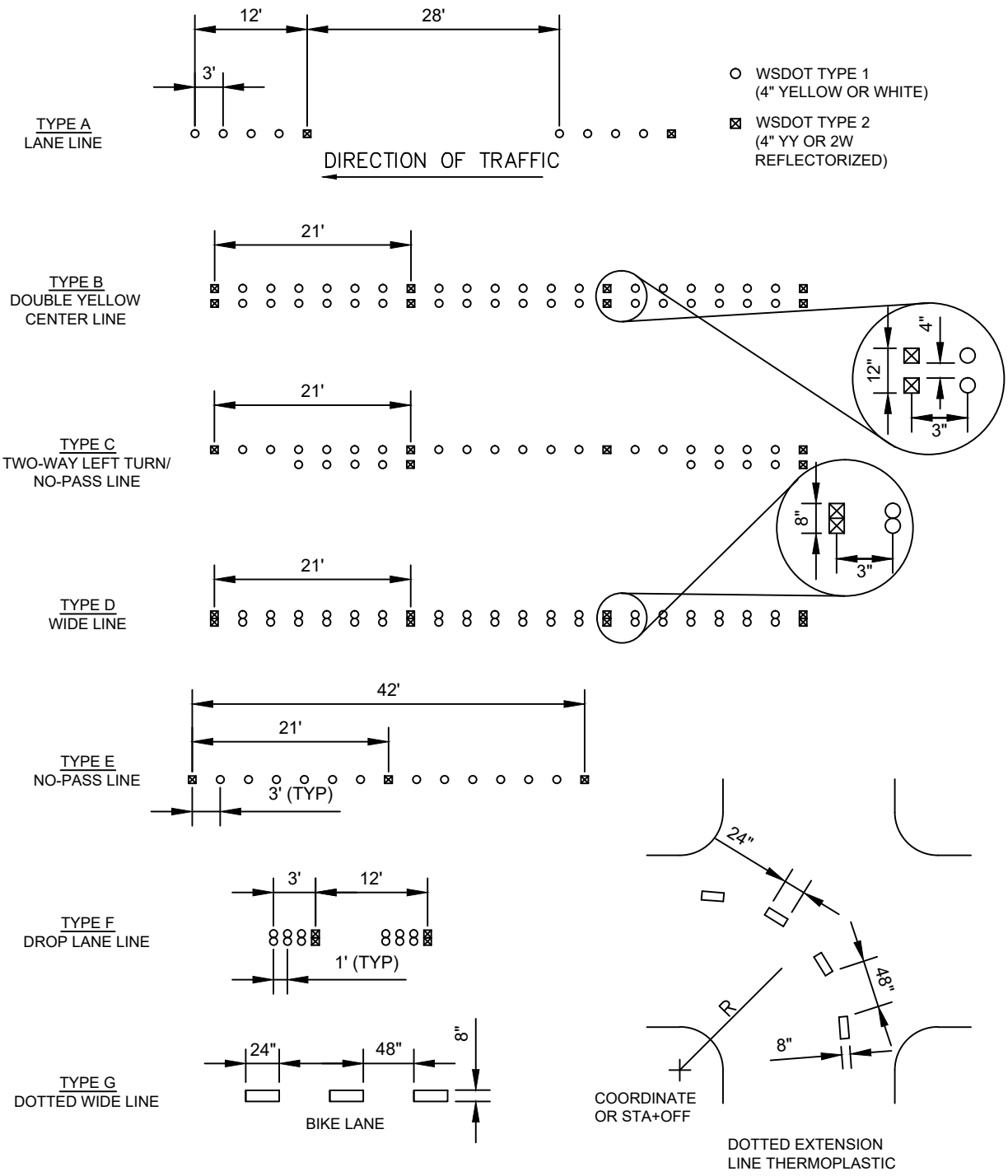
STANDARD DETAILS

CROSSWALK & STOP BAR

FILE NAME: SD311B

DETAIL NUMBER: **311B**

DocuSign Envelope ID: F681597A-CCE8-405B-ACDB-A8564C559739



NOTES:

1. FOR RAISED PAVEMENT MARKERS USE HOT MELT POLYMER BASED BITUMINOUS ADHESIVE.
2. BIKE LANE STRIPES ARE 8" PAINT, OR AS DIRECTED BY THE ENGINEER.
3. EDGE LANE STRIPES ARE 4" PAINT, OR AS DIRECTED BY THE ENGINEER.
4. FOR TEMPORARY PAINTED CHANNELIZATION, RETRO-REFLECTIVE GLASS BEADS SHALL BE APPLIED TO THE PAINT DURING APPLICATION. TYPE II RAISED PAVEMENT MARKERS SHALL BE INSTALLED TO MATCH COLOR AND LINE TYPE AT 40' INTERVALS.

Paul S. Cho

APPROVED BY: PAUL S. CHO
TRAFFIC OPERATIONS SAFETY AND ENGINEERING MANAGER

REVISION DATE: MARCH 01, 2020

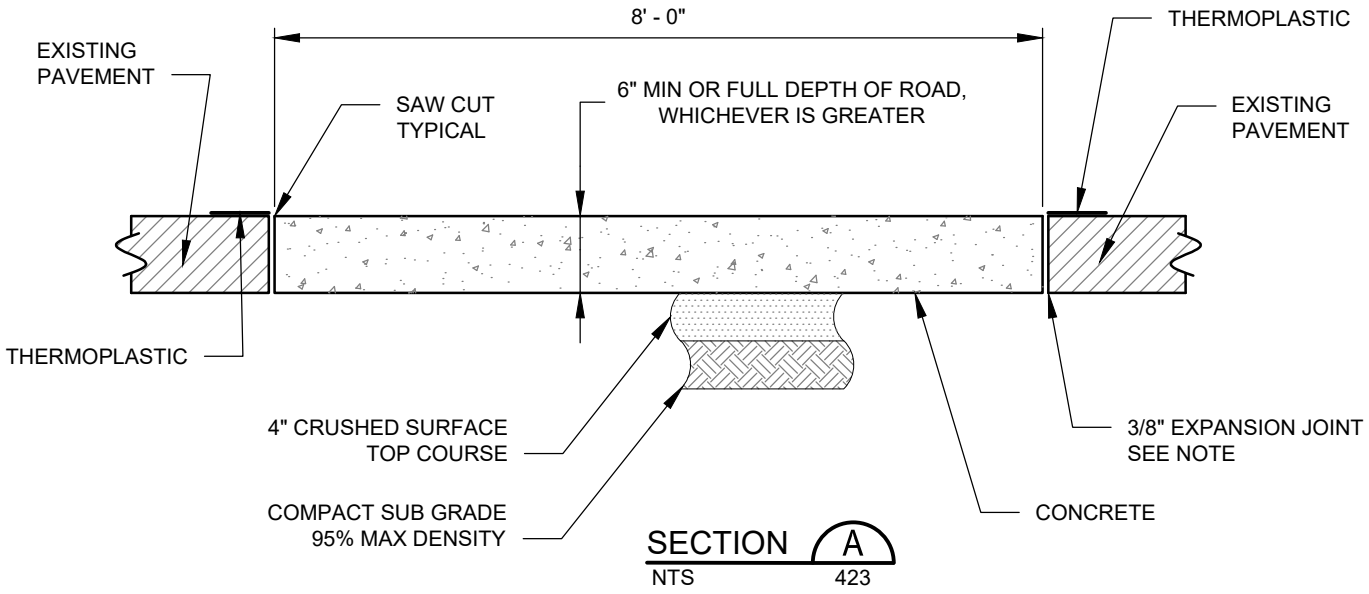
CityofRedmond
WASHINGTON

STANDARD DETAILS

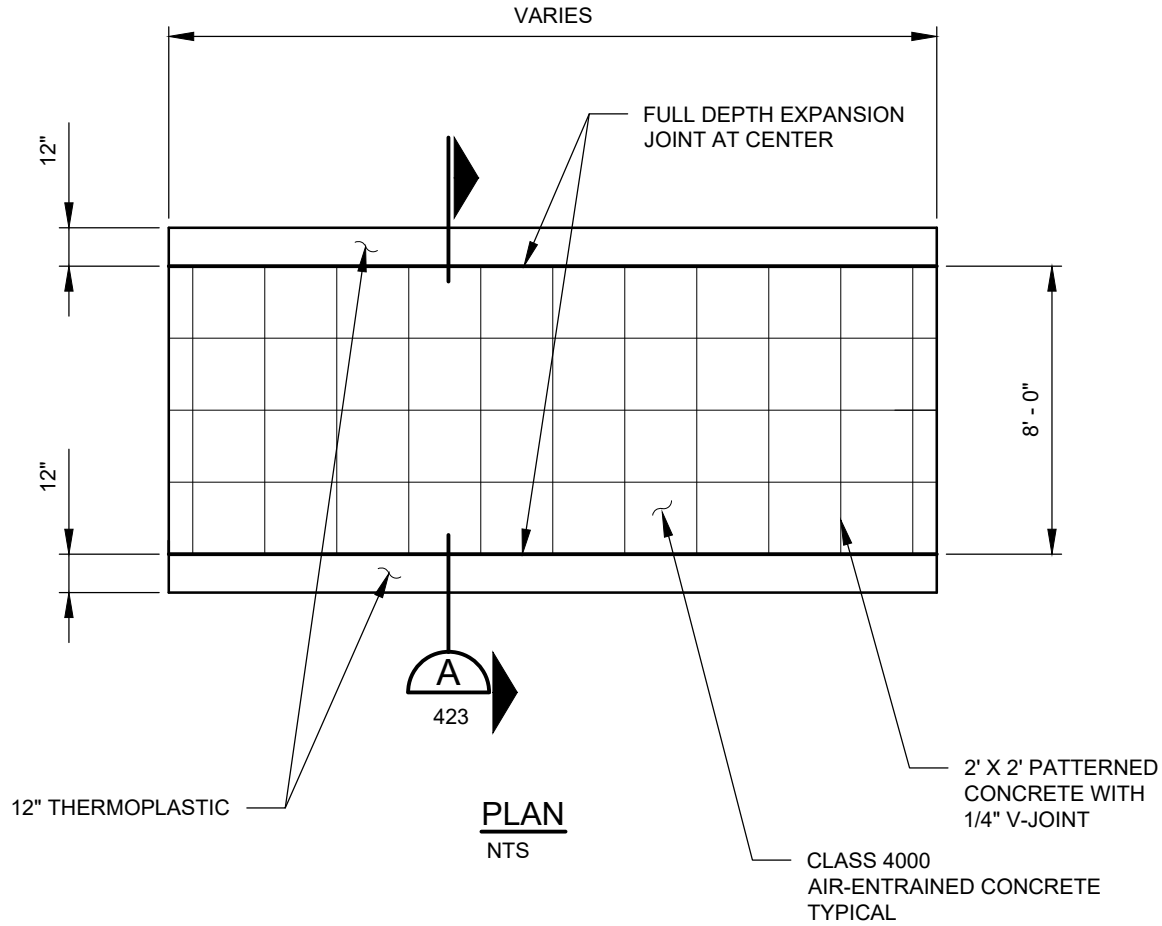
CHANNELIZATION
LANE LINE TYPES

FILE NAME: SD312.DWG | DETAIL NUMBER: **312**

DocuSign Envelope ID: F681597A-CCE8-405B-ACDB-A8564C559739



SECTION A
NTS 423



PLAN
NTS

NOTE:

EXPANSION JOINT FULL DEPTH WHEN WALK IS ADJACENT TO AN EXISTING CONCRETE SHEET.

Donell Cairns

APPROVED BY: DONALD CAIRNS
TRANSPORTATION PLANNING AND ENGINEERING MANAGER

REVISION DATE: MARCH 01, 2018

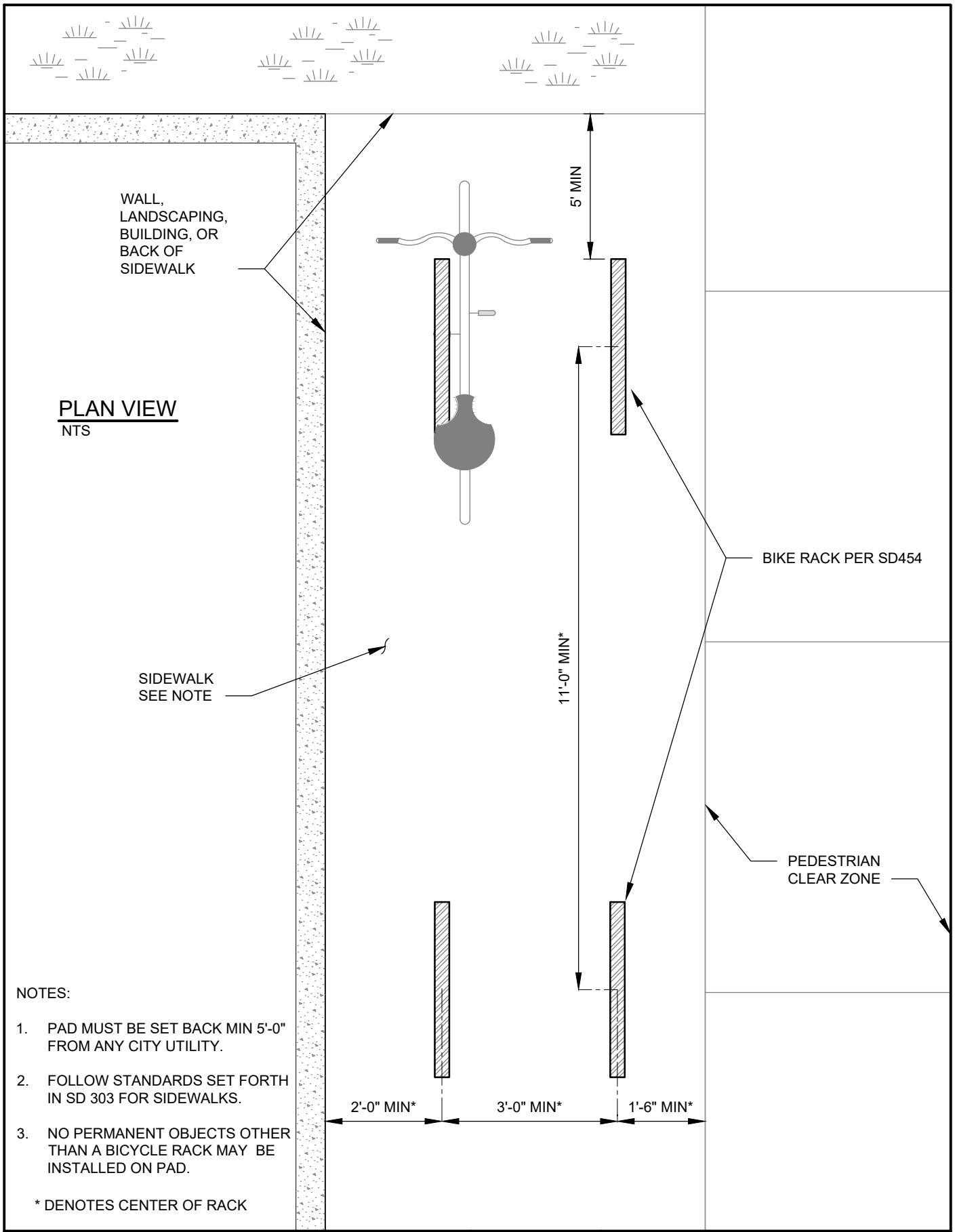
CityofRedmond WASHINGTON

STANDARD DETAILS

PATTERNED CONCRETE CROSSWALK

FILE NAME: SD313.DWG | DETAIL NUMBER: **313**

DocuSign Envelope ID: F681597A-CCE8-405B-ACDB-A8564C559739



PLAN VIEW
NTS

NOTES:

1. PAD MUST BE SET BACK MIN 5'-0" FROM ANY CITY UTILITY.
2. FOLLOW STANDARDS SET FORTH IN SD 303 FOR SIDEWALKS.
3. NO PERMANENT OBJECTS OTHER THAN A BICYCLE RACK MAY BE INSTALLED ON PAD.

* DENOTES CENTER OF RACK

Donell Cairns

APPROVED BY: DONALD CAIRNS
TRANSPORTATION PLANNING AND ENGINEERING MANAGER

REVISION DATE: MARCH 01, 2020

CityofRedmond
WASHINGTON

STANDARD DETAILS

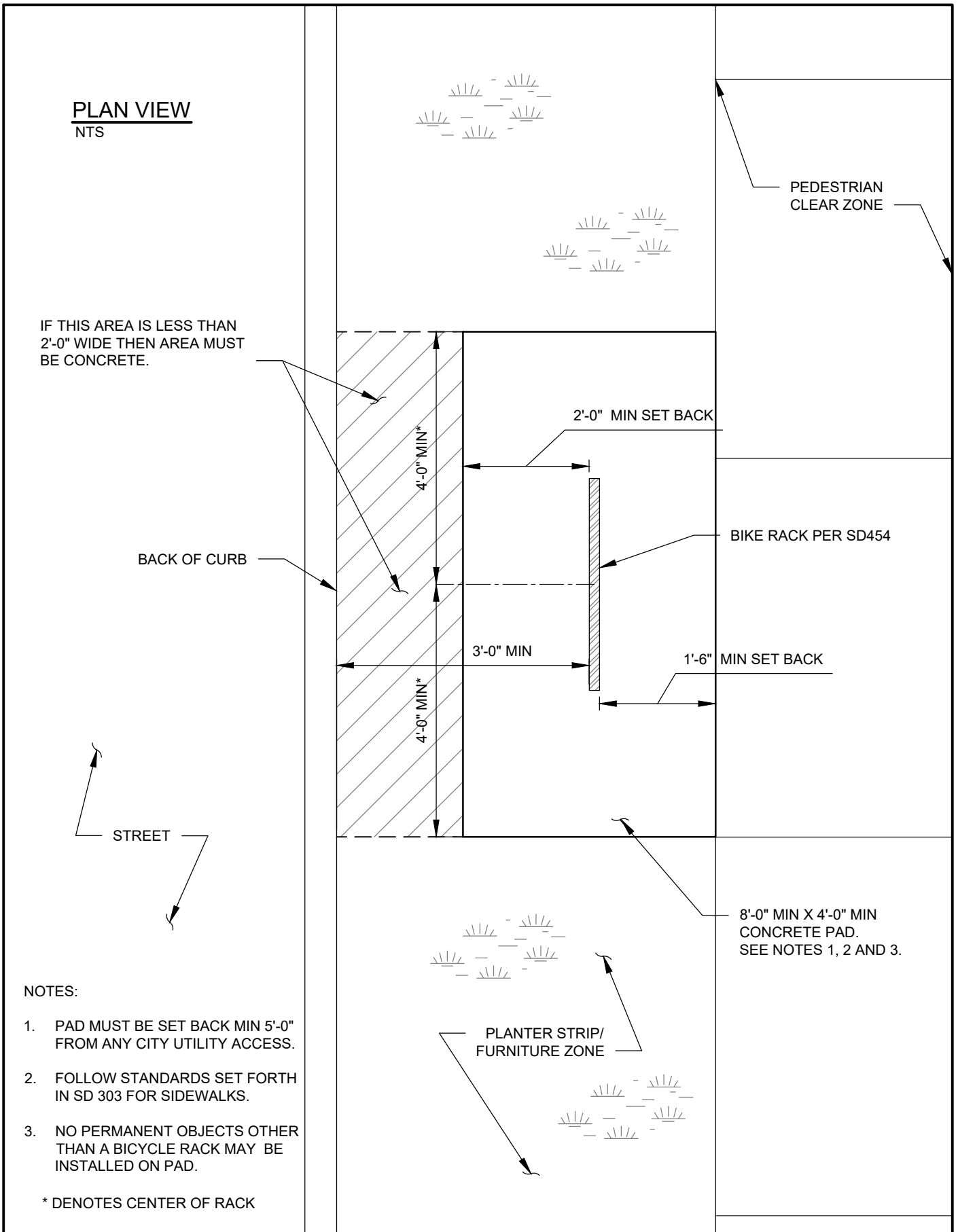
BACK OF SIDEWALK BICYCLE PARKING

FILE NAME: SD317.DWG

DETAIL NUMBER: **317**

DocuSign Envelope ID: F681597A-CCE8-405B-ACDB-A8564C559739

PLAN VIEW
NTS



NOTES:

1. PAD MUST BE SET BACK MIN 5'-0" FROM ANY CITY UTILITY ACCESS.
2. FOLLOW STANDARDS SET FORTH IN SD 303 FOR SIDEWALKS.
3. NO PERMANENT OBJECTS OTHER THAN A BICYCLE RACK MAY BE INSTALLED ON PAD.

* DENOTES CENTER OF RACK

Donell Cairns

APPROVED BY: DONALD CAIRNS
TRANSPORTATION PLANNING AND ENGINEERING MANAGER

REVISION DATE: MARCH 01, 2020

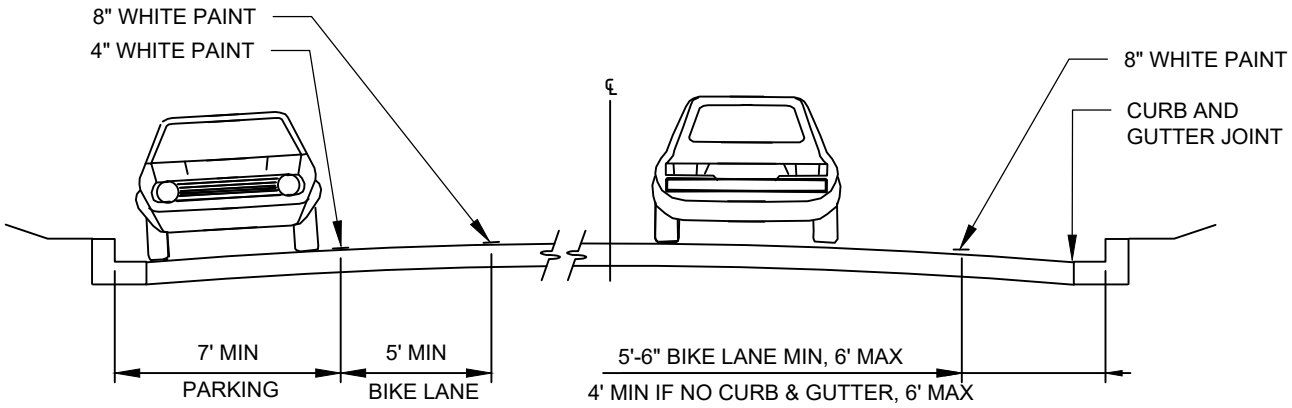
CityofRedmond
WASHINGTON

STANDARD DETAILS

ON STREET BICYCLE PARKING

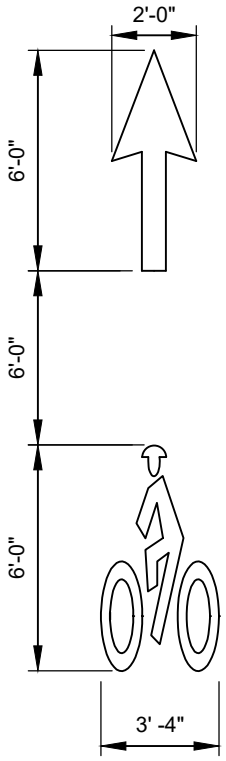
FILE NAME: SD318.DWG | DETAIL NUMBER: **318**

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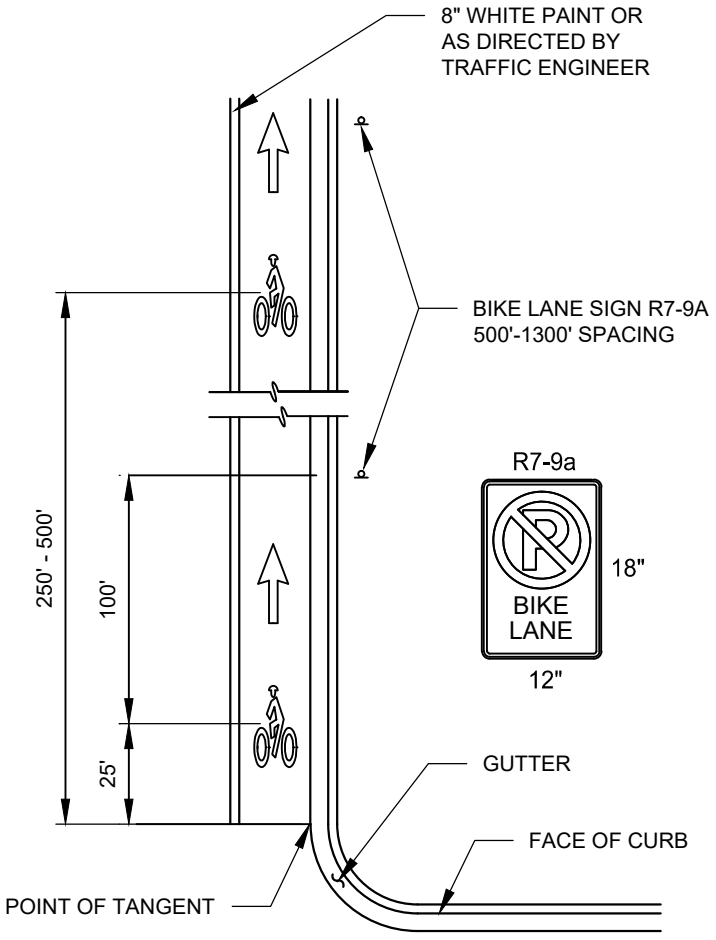


BICYCLE LANE WITH PARKING
NTS

BICYCLE LANE WITHOUT PARKING
NTS



BICYCLE LANE SYMBOL
NTS



TYPICAL BICYCLE LANE
NTS

NOTES:

1. BIKE LANE SYMBOL AND ARROW MATERIAL SHALL BE 90 MILL, PREFORMED, SKID RESISTANT THERMOPLASTIC.
2. SIGN MATERIAL SHALL BE 3M DG3.
3. BICYCLE SYMBOL FACES CENTERLINE.

Paul S. Cho

APPROVED BY: PAUL S. CHO
TRAFFIC OPERATIONS SAFETY AND ENGINEERING MANAGER

REVISION DATE: MARCH 01, 2020

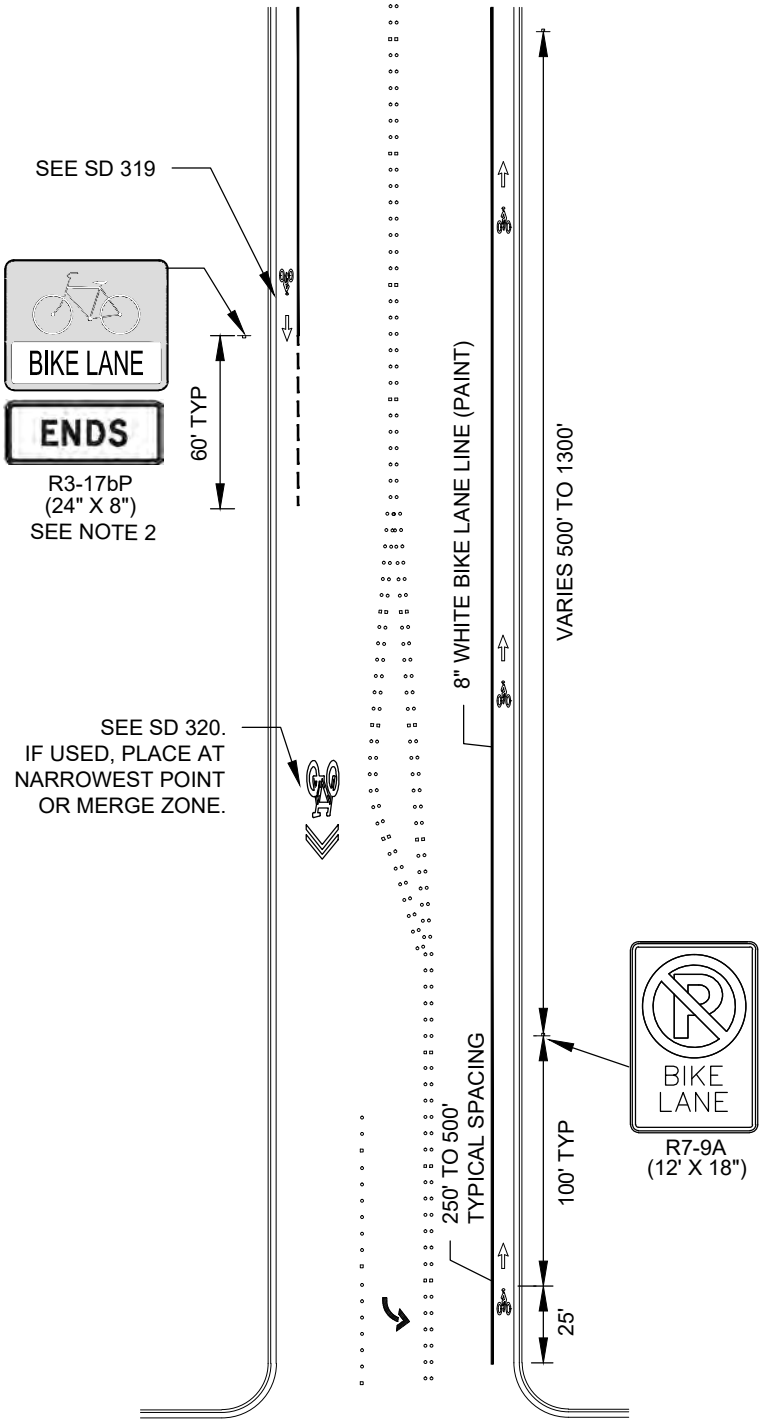
CityofRedmond
WASHINGTON

STANDARD DETAILS

BICYCLE LANES

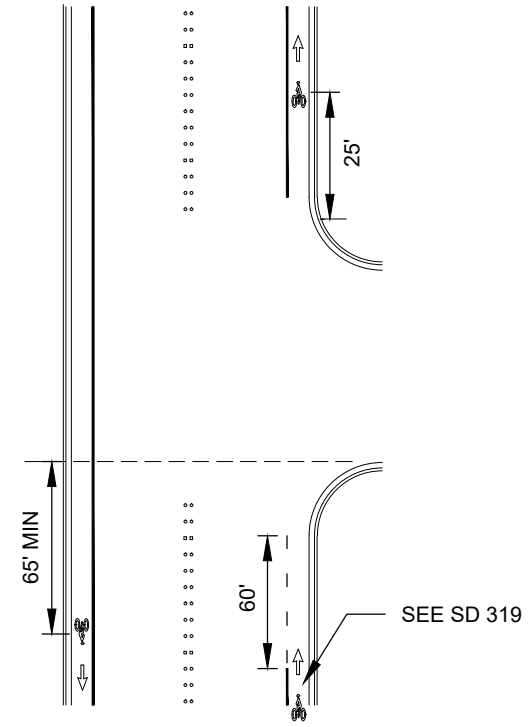
FILE NAME: SD319.DWG | DETAIL NUMBER: **319**

DocuSign Envelope ID: F681597A-CCE8-405B-ACDB-A8564C559739



BICYCLE LANE START/END TREATMENT

NTS



SIDE STREET TREATMENT

NTS

NOTES:

1. SIGN R3-17bP IS NOT TYPICALLY NEEDED. IF THIS SIGN IS USED, PAVEMENT MARKING SHALL BE INSTALLED ADJACENT TO THE SIGN.
2. FOR BIKE PAVEMENT MARKING DETAIL, SEE SD 319.

Paul S. Cho

APPROVED BY: PAUL S. CHO
TRAFFIC OPERATIONS SAFETY AND ENGINEERING MANAGER

REVISION DATE: MARCH 01, 2020

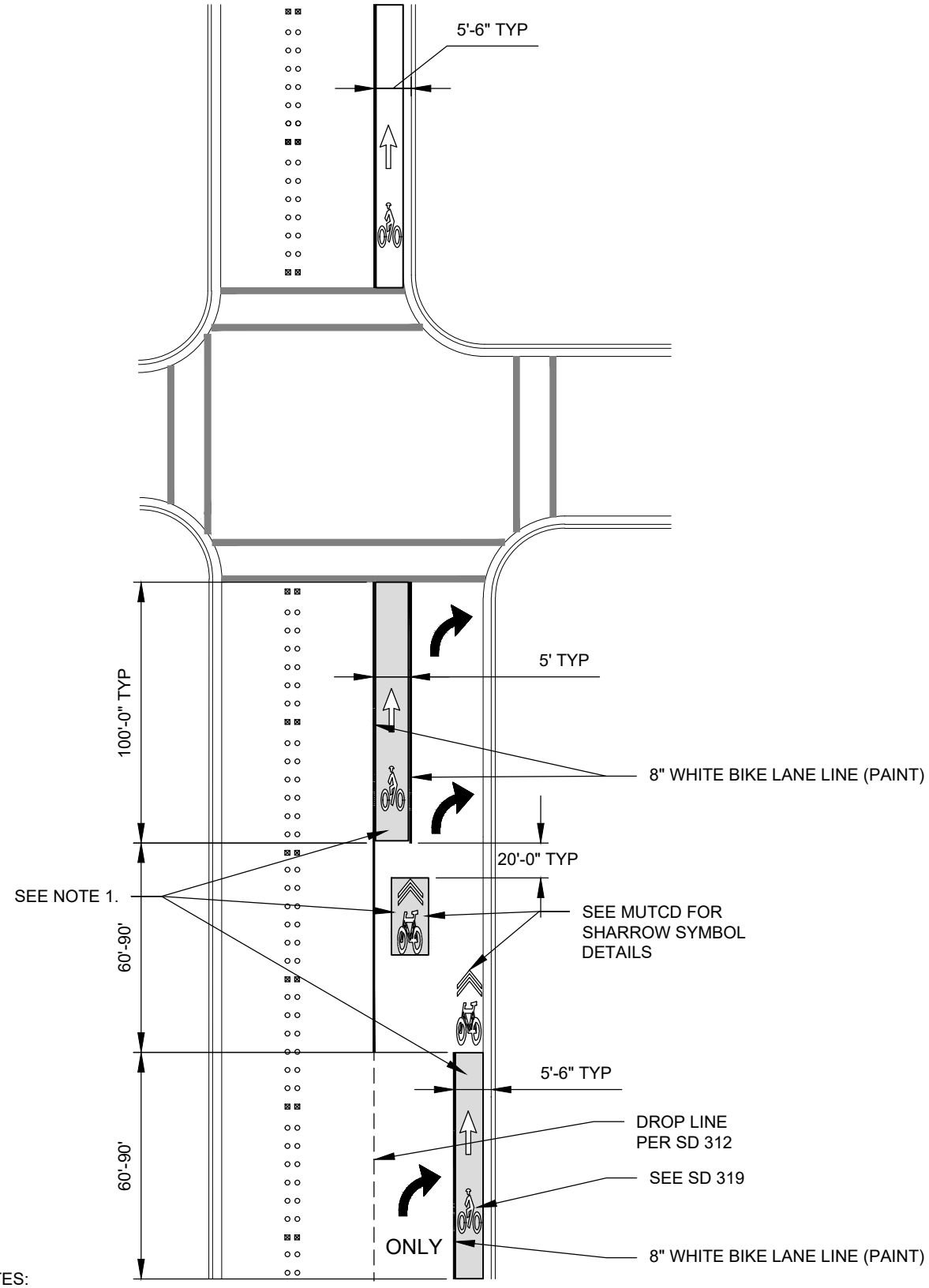
CityofRedmond
WASHINGTON

STANDARD DETAILS

BICYCLE LANE CHANNELIZATION

FILE NAME: SD319A.DWG | DETAIL NUMBER: **319A**

DocuSign Envelope ID: F681597A-CCE8-405B-ACDB-A8564C559739



NOTES:

1. GREEN BICYCLE LANE TREATMENT SHALL BE TYPE B PLASTIC, AND SHALL BE PREMARK BY ENNIS-FLINT OR APPROVED EQUAL.

Paul S. Cho

APPROVED BY: PAUL S. CHO
TRAFFIC OPERATIONS SAFETY AND ENGINEERING MANAGER

REVISION DATE: MARCH 01, 2020

CityofRedmond
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STANDARD DETAILS

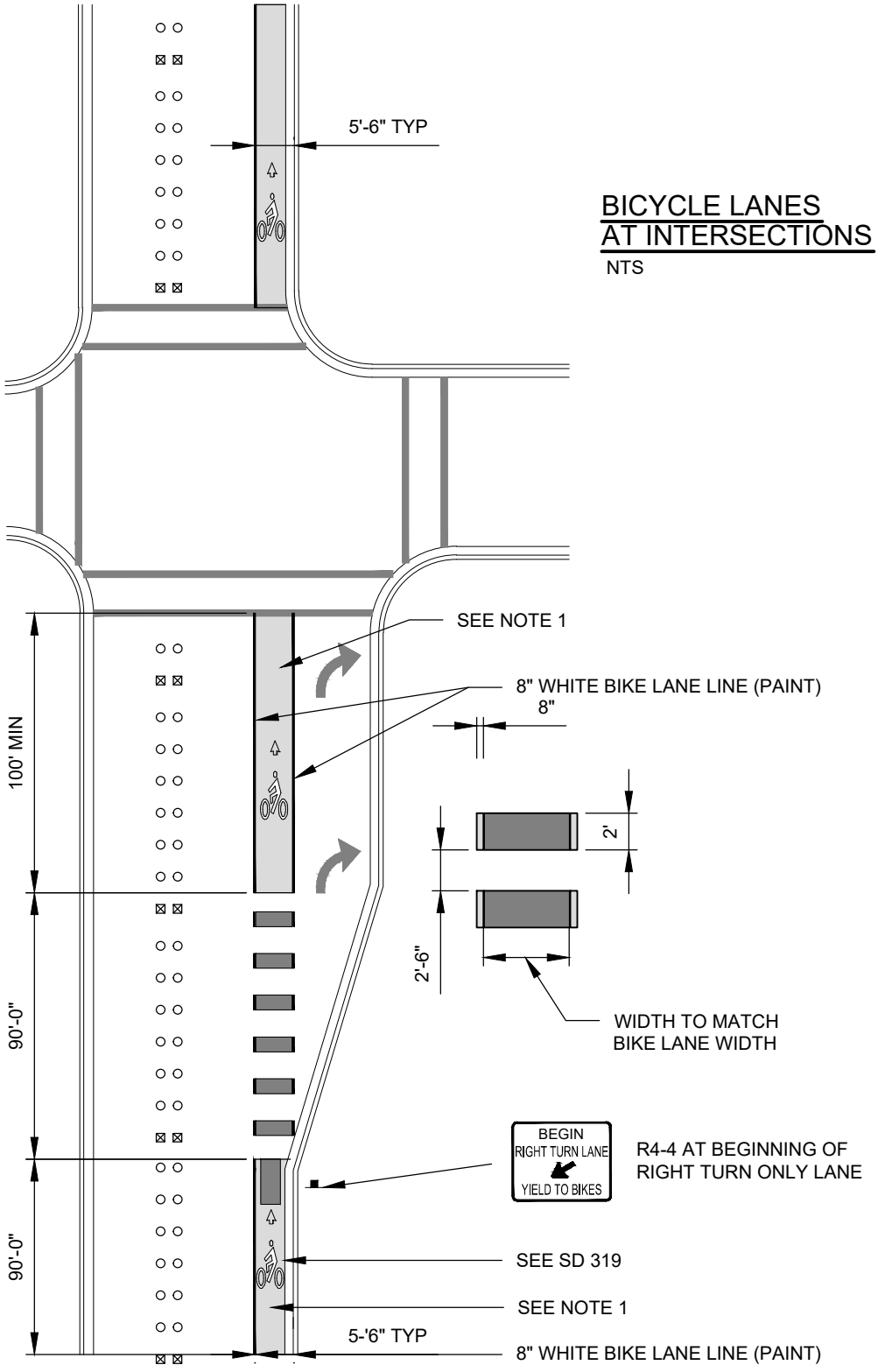
BIKE LANE TREATMENT AT DROP LANE RIGHT TURN

FILE NAME: SD319B.DWG | DETAIL NUMBER: **319B**

DocuSign Envelope ID: F681597A-CCE8-405B-ACDB-A8564C559739

BICYCLE LANES AT INTERSECTIONS

NTS



NOTES:

1. GREEN BICYCLE LANE TREATMENT SHALL BE TYPE B PLASTIC, AND SHALL BE PREMARK BY ENNIS-FLINT OR APPROVED EQUAL.

Paul S. Cho

APPROVED BY: PAUL S. CHO
TRAFFIC OPERATIONS SAFETY AND ENGINEERING MANAGER

REVISION DATE: MARCH 01, 2020

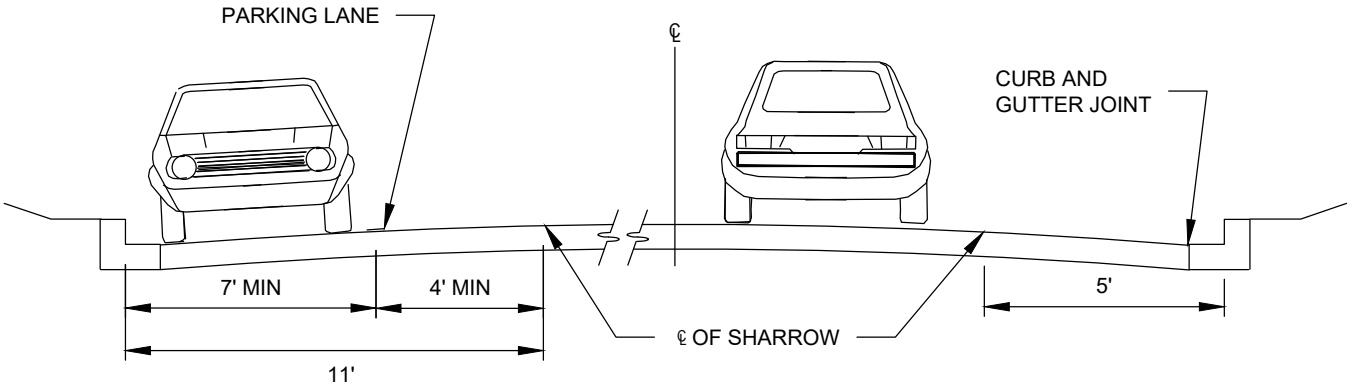
CityofRedmond
WASHINGTON

STANDARD DETAILS

BICYCLE LANES AT INTERSECTIONS

FILE NAME: SD319C.DWG | DETAIL NUMBER: **319C**

DocuSign Envelope ID: F681597A-CCE8-405B-ACDB-A8564C559739

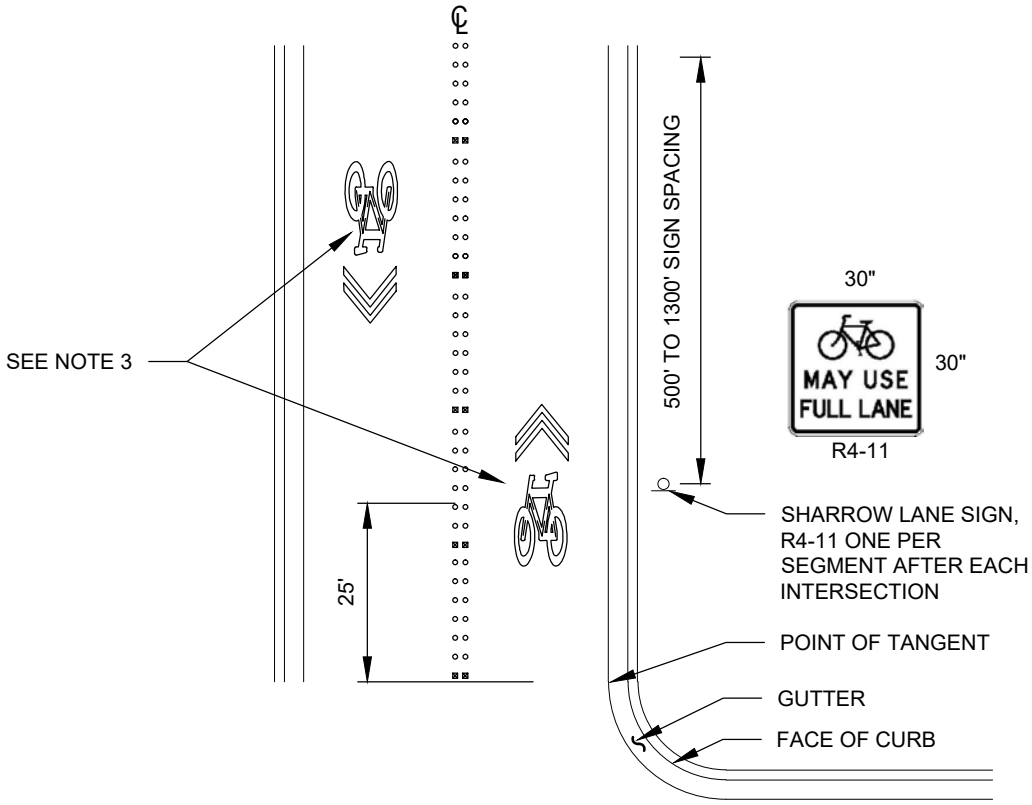


SHARROW LANE WITH PARKING

NTS

SHARROW LANE WITHOUT PARKING

NTS



TYPICAL SHARROW LAYOUT

NTS

NOTES:

1. ADJUSTMENT TO DIMENSIONS SHALL BE APPROVED BY THE ENGINEER.
2. MATERIAL SHALL BE PREFORMED SKID RESISTANT THERMOPLASTIC 90 MIL.
3. FOR LANE WIDTHS 14 FEET OR GREATER, THE SHARED LANE MARKING SHALL BE PLACED 2 FEET FROM THE FACE OF CURB, OTHERWISE, MARKING SHALL BE CENTERED IN THE LANE FOR SHARED LANE MARKING DETAILS, SEE MUTCD.

Paul S. Cho

APPROVED BY: PAUL S. CHO
TRAFFIC OPERATIONS SAFETY AND ENGINEERING MANAGER

REVISION DATE: MARCH 01, 2020

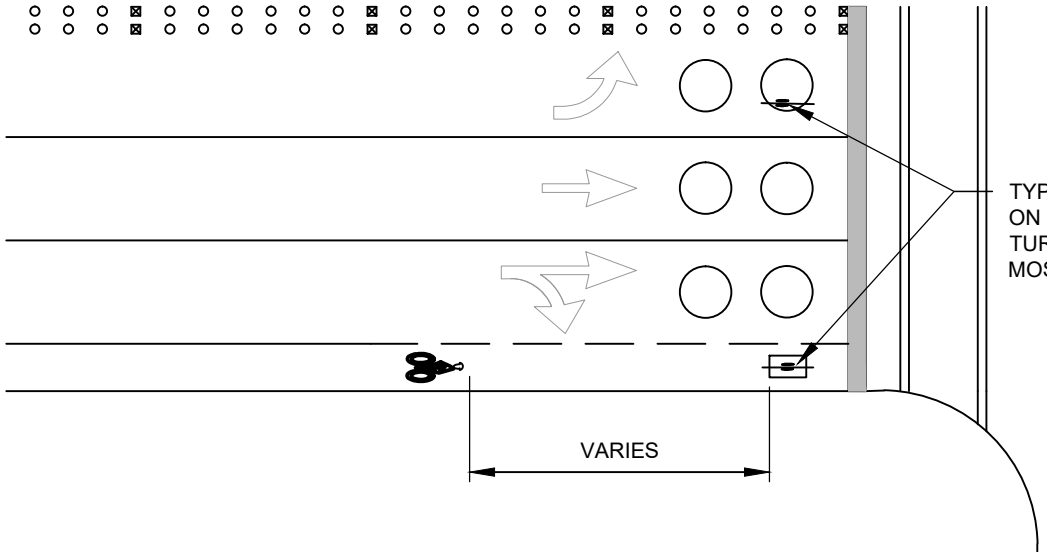
CityofRedmond
WASHINGTON

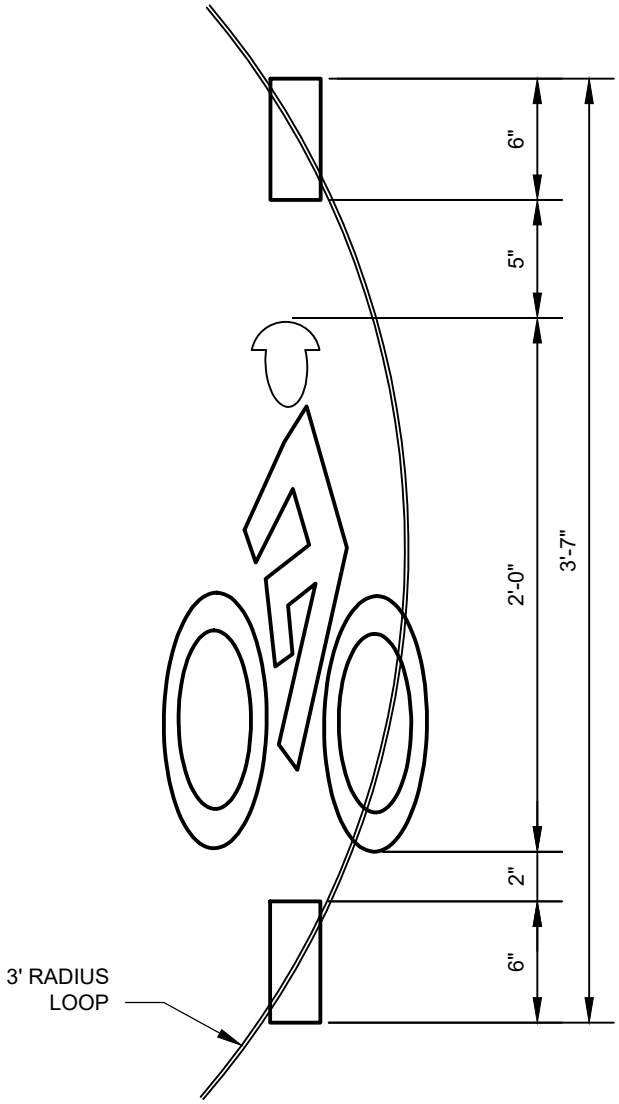
STANDARD DETAILS

SHARROW LANES

FILE NAME: SD320.DWG | DETAIL NUMBER: **320**

DocuSign Envelope ID: F681597A-CCE8-405B-ACDB-A8564C559739





NOTE:

MATERIAL SHALL BE PREFORMED, SKID RESISTANT, 90 MIL THERMOPLASTIC.

Paul S. Cho

APPROVED BY: PAUL S. CHO
TRAFFIC OPERATIONS SAFETY AND ENGINEERING MANAGER

REVISION DATE: MARCH 01, 2020

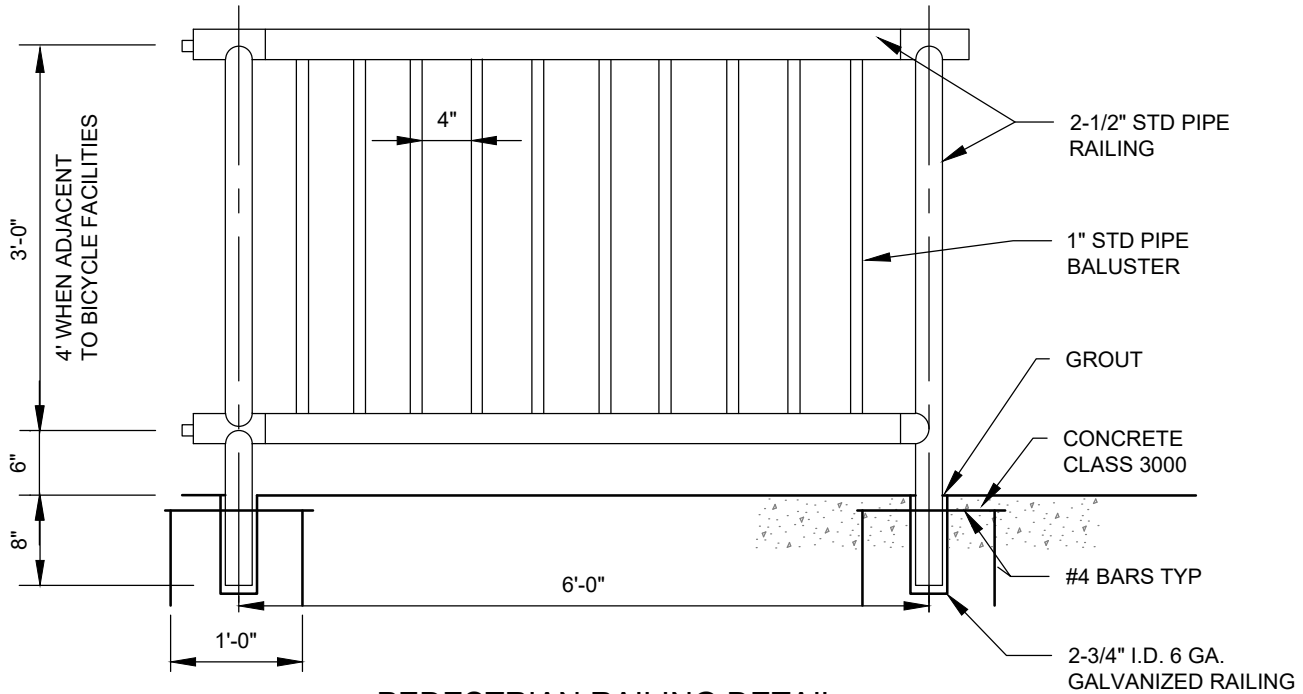
CityofRedmond
WASHINGTON

STANDARD DETAILS

BICYCLE DETECTOR PAVEMENT MARKING

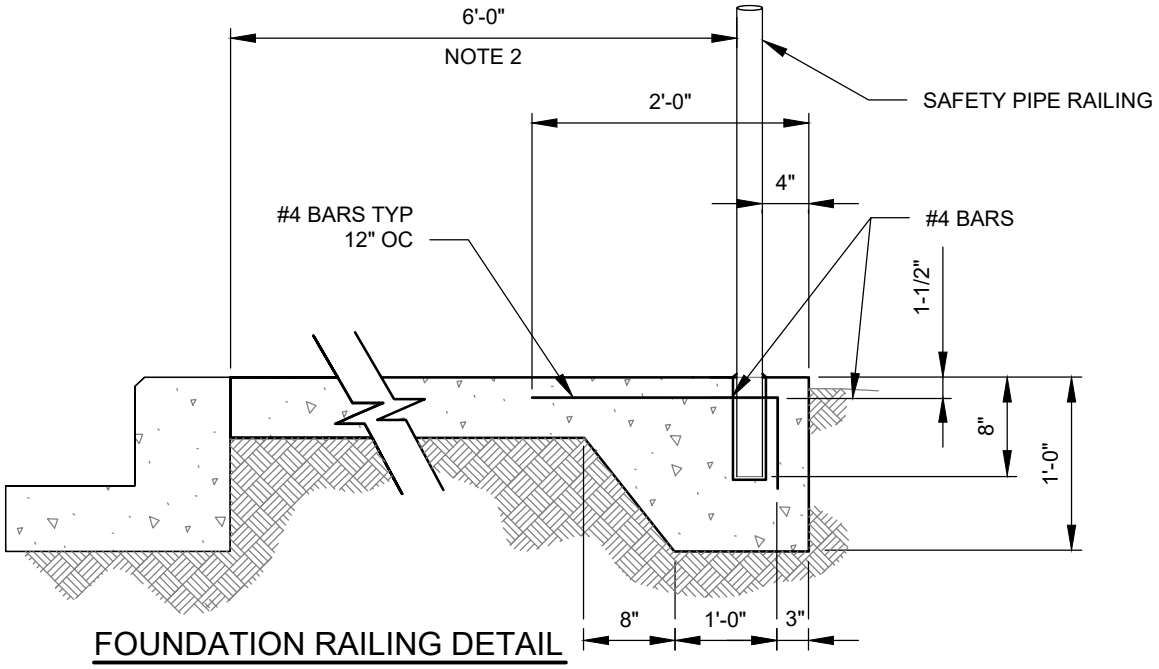
FILE NAME: SD320A.DWG | DETAIL NUMBER: **320A**

DocuSign Envelope ID: F681597A-CCE8-405B-ACDB-A8564C559739



PEDESTRIAN RAILING DETAIL

NTS



FOUNDATION RAILING DETAIL

NTS

NOTES:

1. PIPES SHALL BE ALUMINUM AND MEET ASTM B241/B241M-02 OR B429-02 ALLOY 6063-T6 SCHEDULE 40 (STD PIPE), OR AS APPROVED BY CITY ENGINEER.

2. WIDTH PER RZC APPENDIX 2 IN TABLE 1 AND 2.

Lisa W. Rigg

APPROVED BY: LISA W. RIGG
DEVELOPMENT ENGINEERING MANAGER

REVISION DATE: MARCH 01, 2018

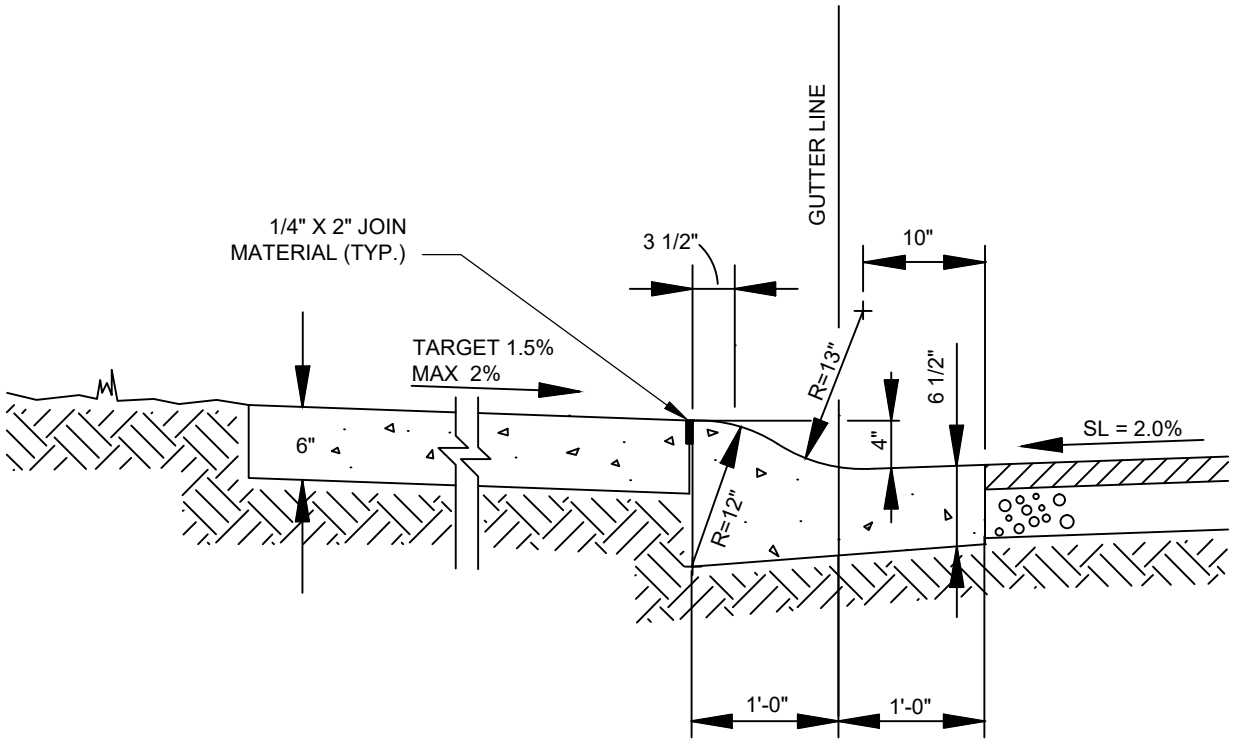
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STANDARD DETAILS

TYPICAL PEDESTRIAN RAILING

FILE NAME: SD321.DWG | DETAIL NUMBER: **321**

DocuSign Envelope ID: F681597A-CCE8-405B-ACDB-A8564C559739



SECTION
NTS

NOTES:

1. CONCRETE SHALL BE AIR ENTRAINED CLASS 3000.
2. ROLLED CURB AND GUTTER CAN BE USED ON CITY MAINTAINED STREETS ONLY FOR REPAIRS TO EXISTING ROLLED CURB AND GUTTER.

Paul S. Cho

APPROVED BY: PAUL S. CHO
TRAFFIC OPERATIONS SAFETY AND ENGINEERING MANAGER

REVISION DATE: MARCH 01, 2020

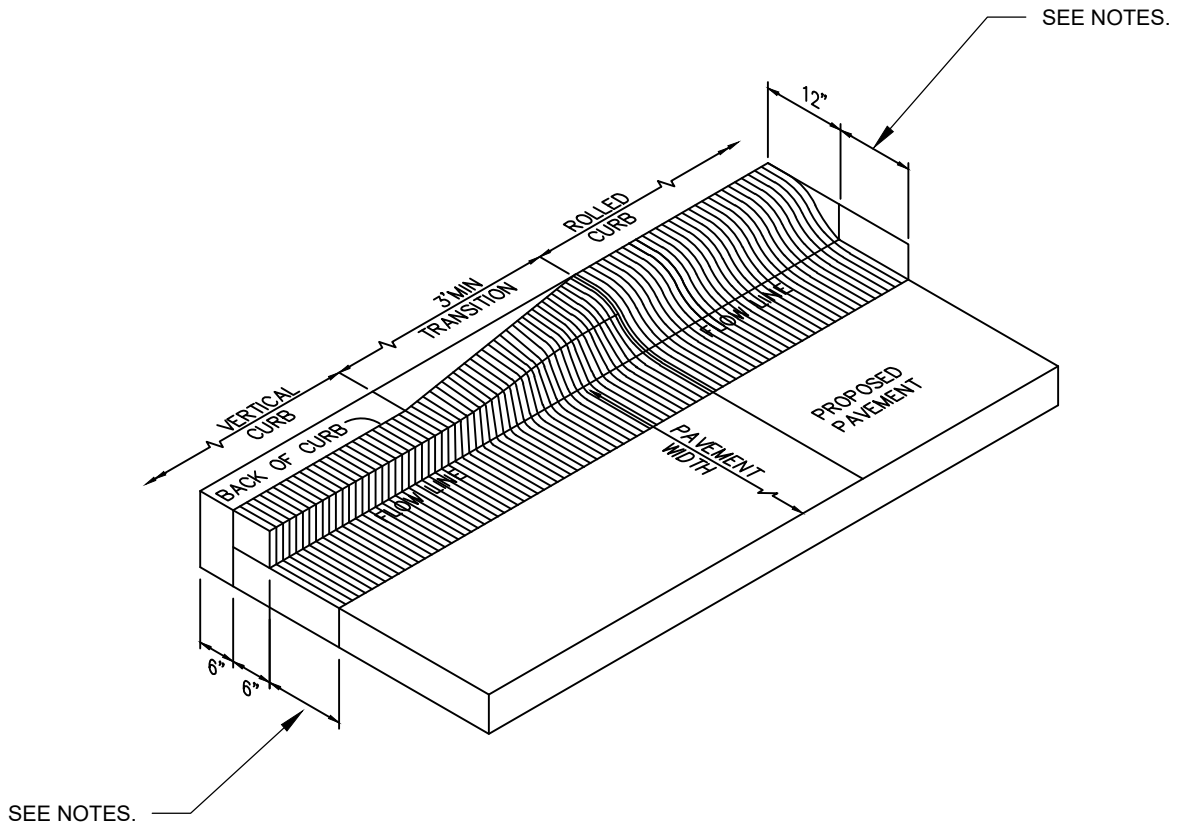
CityofRedmond
WASHINGTON

STANDARD DETAILS

ROLLED CURB AND GUTTER SECTION

FILE NAME: SD322.DWG | DETAIL NUMBER: **322**

DocuSign Envelope ID: F681597A-CCE8-405B-ACDB-A8564C559739



CURB TRANSITION

NTS

NOTES:

1. 18 INCH, BASED ON TYPE "A-1" IN TYPICAL CURB AND GUTTER DETAIL SD 304.
2. 12 INCH MAY BE PERMITTED FOR NEW PRIVATE STREET OR MATCHING EXISTING. SEE NOTE 2 AND 3 IN SD 304

Paul S. Cho

APPROVED BY: PAUL S. CHO
TRAFFIC OPERATIONS SAFETY AND ENGINEERING MANAGER

REVISION DATE: MARCH 01, 2020

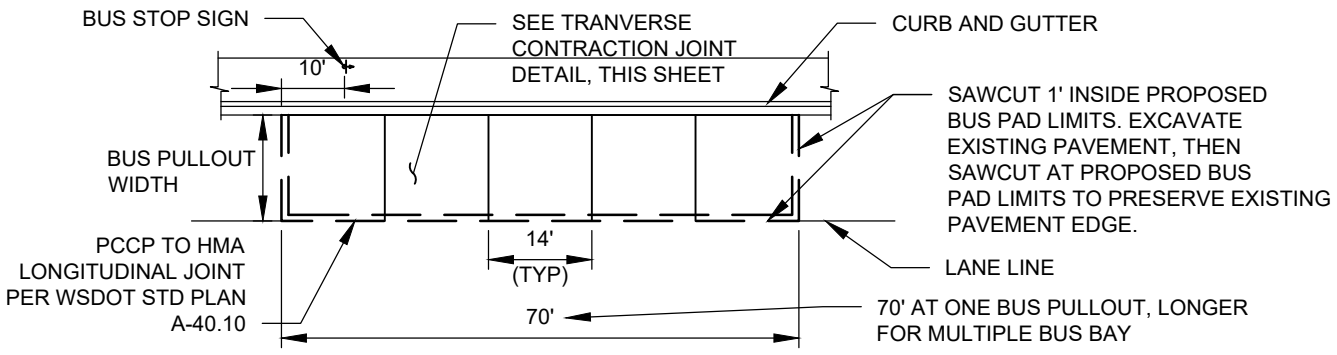
CityofRedmond WASHINGTON

STANDARD DETAILS

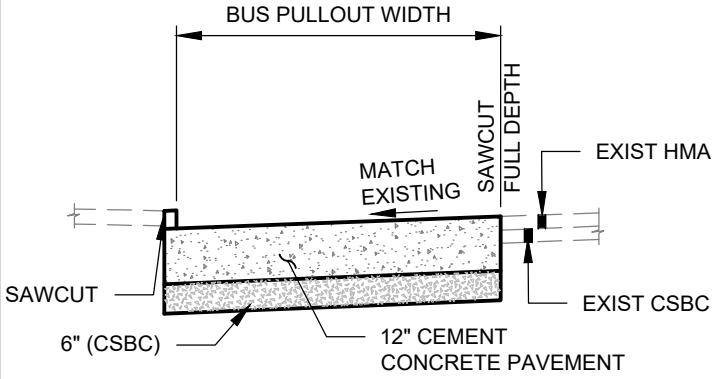
CURB TRANSITION

FILE NAME: SD323.DWG | DETAIL NUMBER: **323**

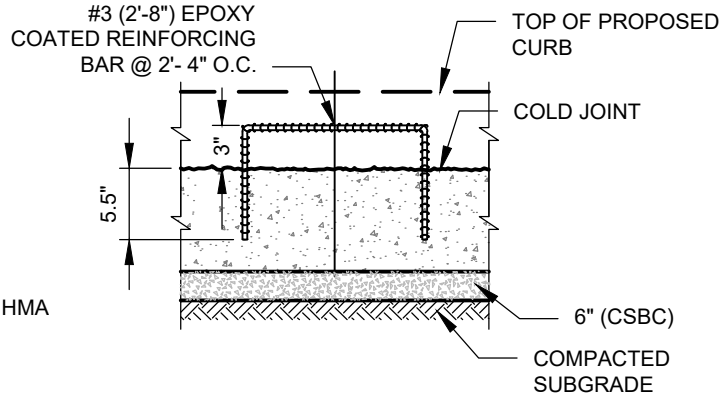
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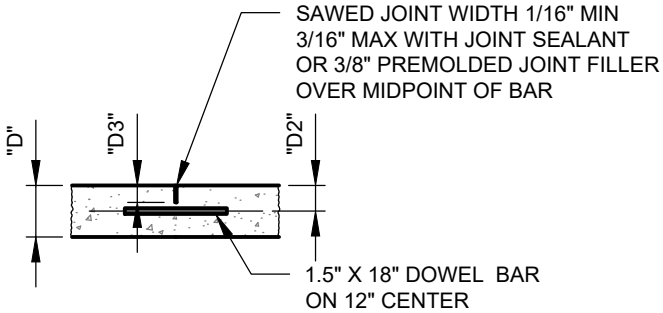
PLAN VIEW
NTS



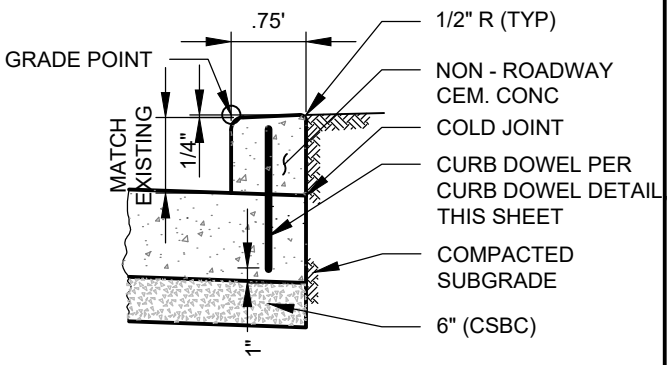
SECTION B-B
CONCRETE BUS PULLOUT
NTS



CEMENT CONCRETE TRAFFIC CURB DOWEL DETAIL
NTS



NOTE:
DOWEL BARS MUST NOT BE PLACED WITHIN 15 INCHES OF THE EDGE OF PAVEMENT OR PARALLEL JOINT



CEMENT CONCRETE TRAFFIC CURB DETAIL
NTS

TRANSVERSE CONTRACTION JOINT DETAIL (SECTION VIEW)
NTS

Paul S. Cho

APPROVED BY: PAUL S. CHO
TRAFFIC OPERATIONS SAFETY AND ENGINEERING MANAGER

REVISION DATE: MARCH 01, 2020

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STANDARD DETAILS

CONCRETE BUS PULLOUT DETAIL

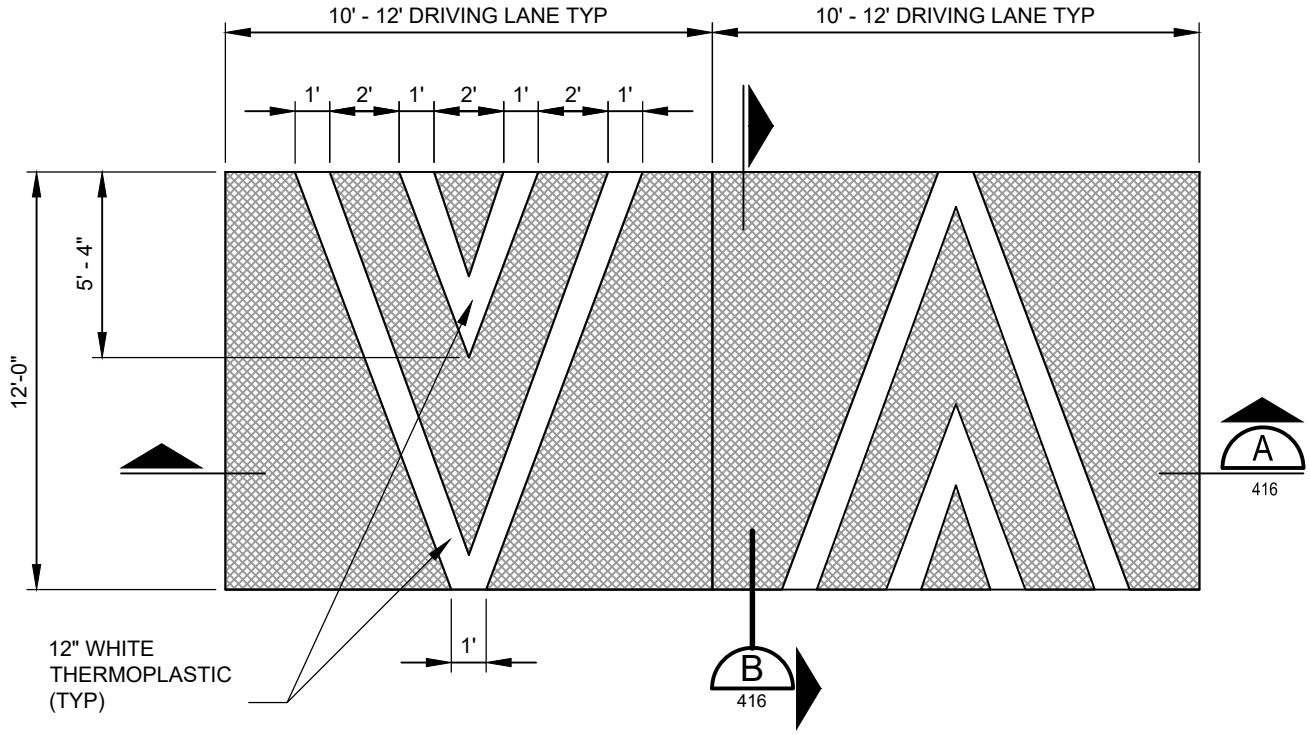
FILE NAME: SD324.DWG | DETAIL NUMBER: **324**

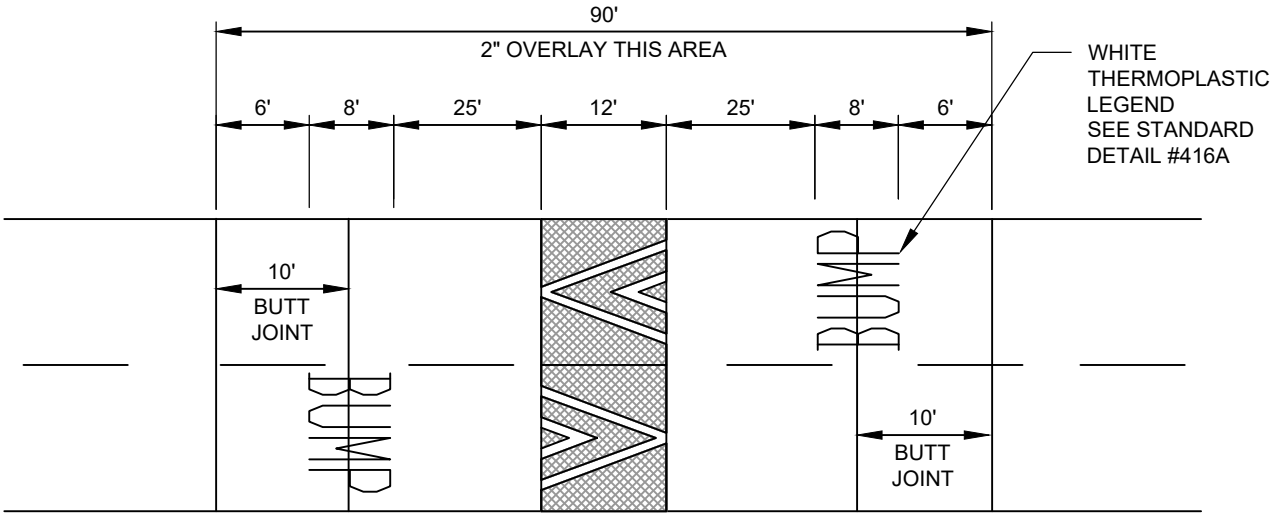
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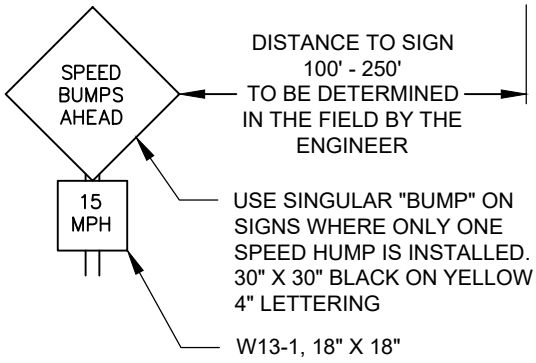
SECTION 4

TRAFFIC/TRANSPORTATION

DocuSign Envelope ID: F681597A-CCE8-405B-ACDB-A8564C559739







NOTES:

1. SIGNS & MARKINGS TYPICAL BOTH DIRECTIONS.
2. SEE "POST MOUNTED SIGN" STANDARD DRAWING 426C OR 426D.
3. A TEMPLATE MUST BE USED IN SHAPING SPEED HUMPS.
4. SPEED HUMPS MUST BE MADE IN TWO LIFTS.
5. 2" OVERLAY NOT REQUIRED FOR NEW PAVEMENT OR EXISTING PAVEMENT DETERMINED TO BE IN GOOD CONDITION BY THE ENGINEER.

Paul S. Cho

APPROVED BY: PAUL S. CHO
TRAFFIC OPERATIONS SAFETY AND ENGINEERING MANAGER

REVISION DATE: MARCH 01, 2020

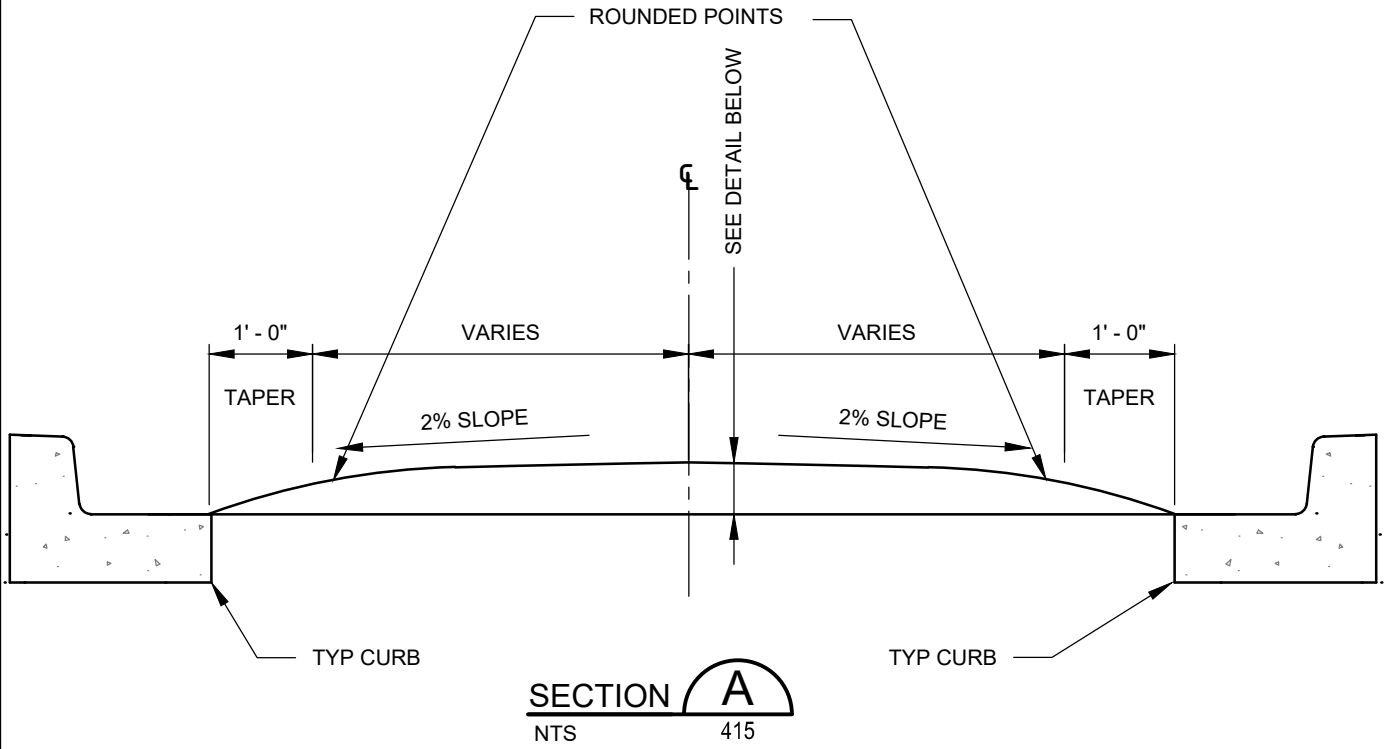
CityofRedmond
WASHINGTON

STANDARD DETAILS

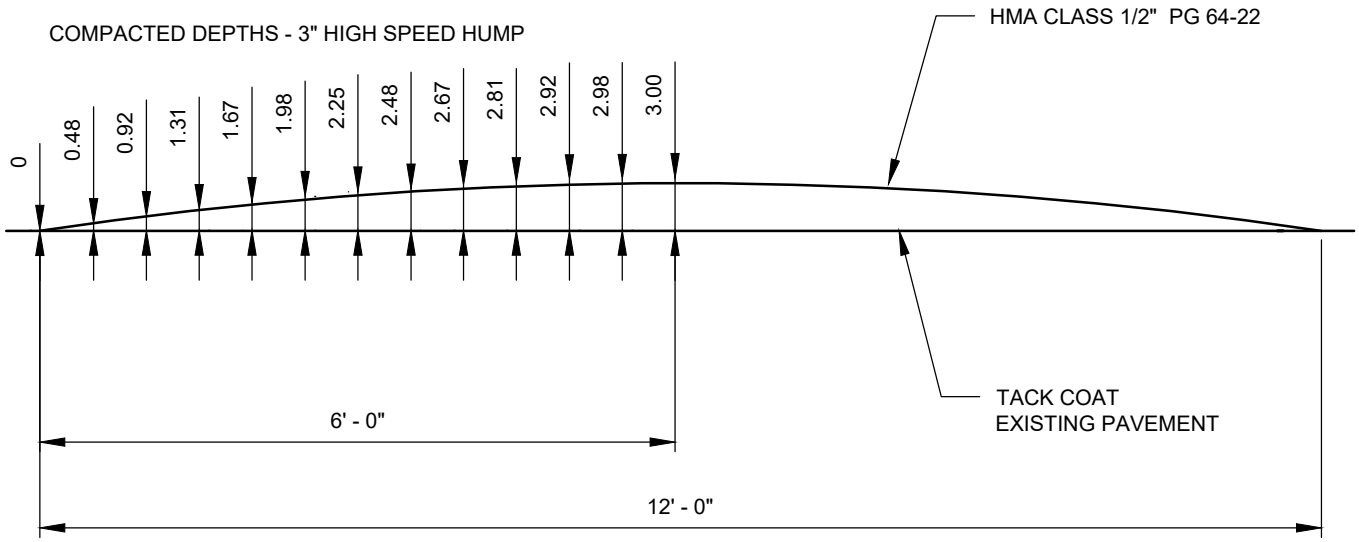
SPEED HUMP
(1 OF 2)

FILE NAME: SD415.DWG | DETAIL NUMBER: **415**

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SECTION A
NTS
415



SECTION B
NTS
415

APPROVED BY: PAUL S. CHO
TRAFFIC OPERATIONS SAFETY AND ENGINEERING MANAGER

REVISION DATE: MARCH 01, 2020

CityofRedmond
WASHINGTON

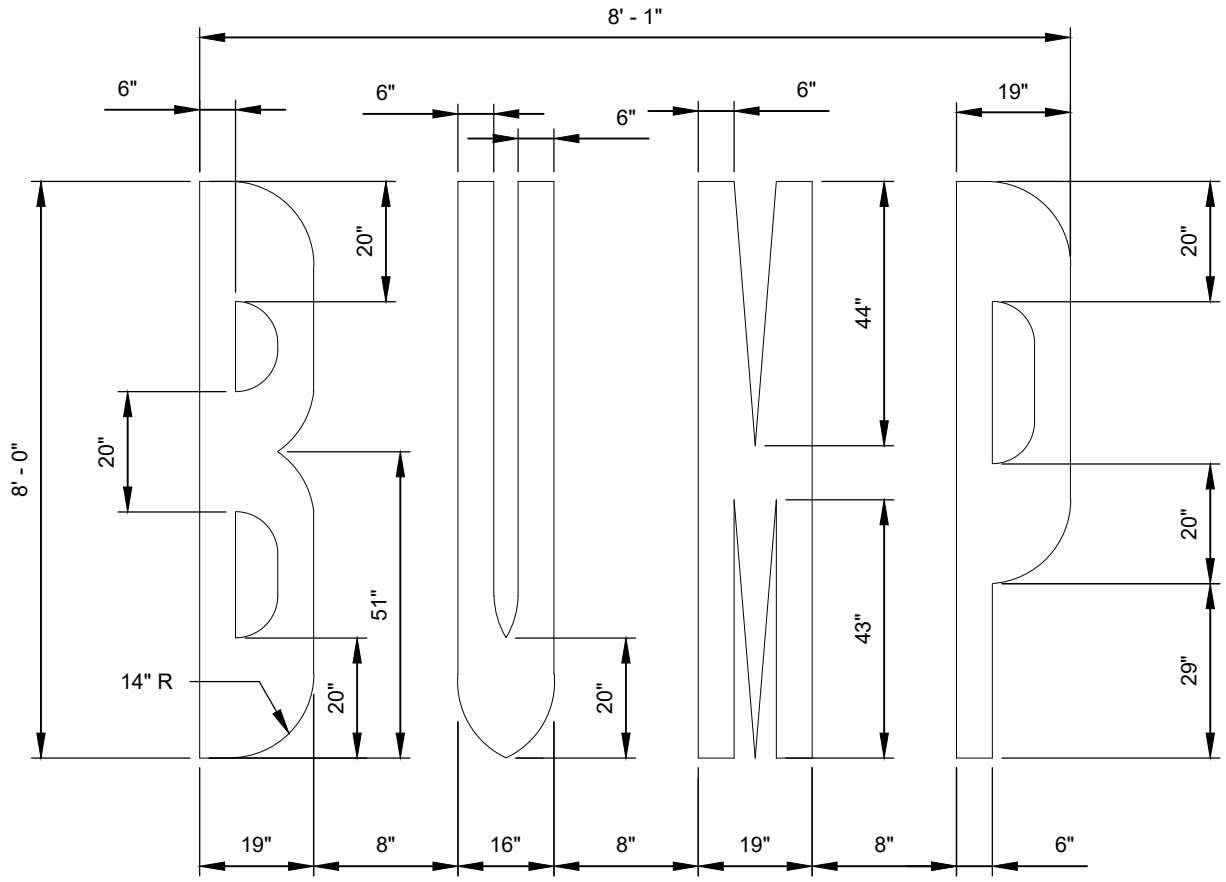
STANDARD DETAILS

SPEED HUMP (2 OF 2)

FILE NAME: SD416.DWG

DETAIL NUMBER: **416**

DocuSign Envelope ID: F681597A-CCE8-405B-ACDB-A8564C559739



BUMP LEGEND
NTS

Paul S. Cho

APPROVED BY: PAUL S. CHO
TRAFFIC OPERATIONS SAFETY AND ENGINEERING MANAGER

REVISION DATE: MARCH 01, 2020

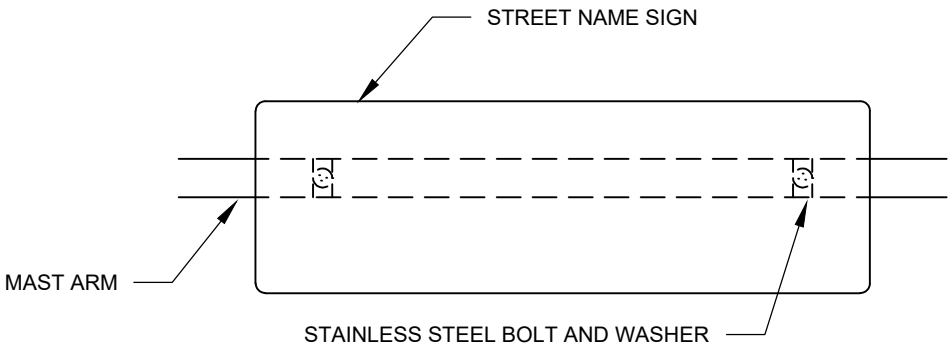
CityofRedmond
WASHINGTON

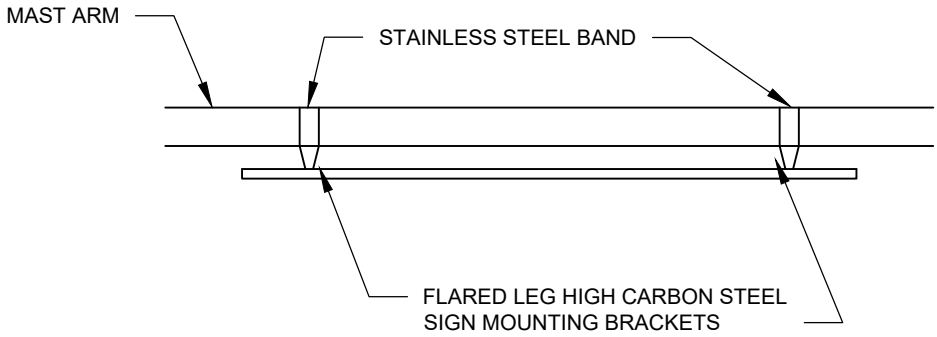
STANDARD DETAILS

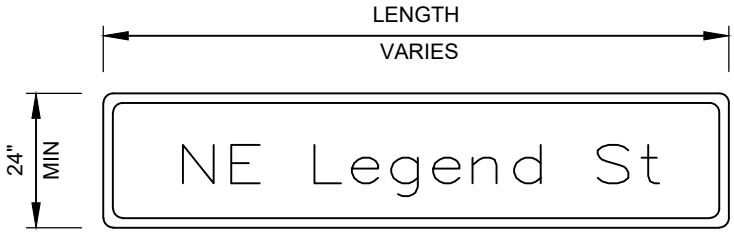
BUMP LEGEND

FILE NAME: SD416A.DWG | DETAIL NUMBER: **416A**

DocuSign Envelope ID: F681597A-CCE8-405B-ACDB-A8564C559739







NUMBER & LETTERS *

UPPER CASE 12" SIZE, D-SERIES

LOWER CASE 9" SIZE, D-SERIES

NOTES:

1. SUBMIT LAYOUT PROOF FOR APPROVAL BY THE TRAFFIC OPERATIONS STAFF.
2. BAND BRACKET AND SIGN TO MAST ARM USING 3/4 INCH WIDE X 0.045 INCH THICK STRENGTH STAINLESS STEEL BAND. SIGN MUST BE LEVEL.
3. WHITE SIGN LETTERS ON GREEN. USE 3M DIAMOND GRADE DG³ SHEETING.
4. AIM VERTICAL ANGLE CONSISTENT WITH SIGNAL DISPLAY.

MATERIALS:
ALUMINUM 0.100 INCH THICK STOCK WITH ROUNDED CORNERS.

DEMENSIONS:
PROVIDE LETTER SPACING, TEXT MARGINS, SIGN BORDERS AND CORNER RADII PER WSDOT SIGN FABRICATION MANUAL.

Paul S. Cho

APPROVED BY: PAUL S. CHO
TRAFFIC OPERATIONS SAFETY AND ENGINEERING MANAGER

REVISION DATE: MARCH 01, 2020

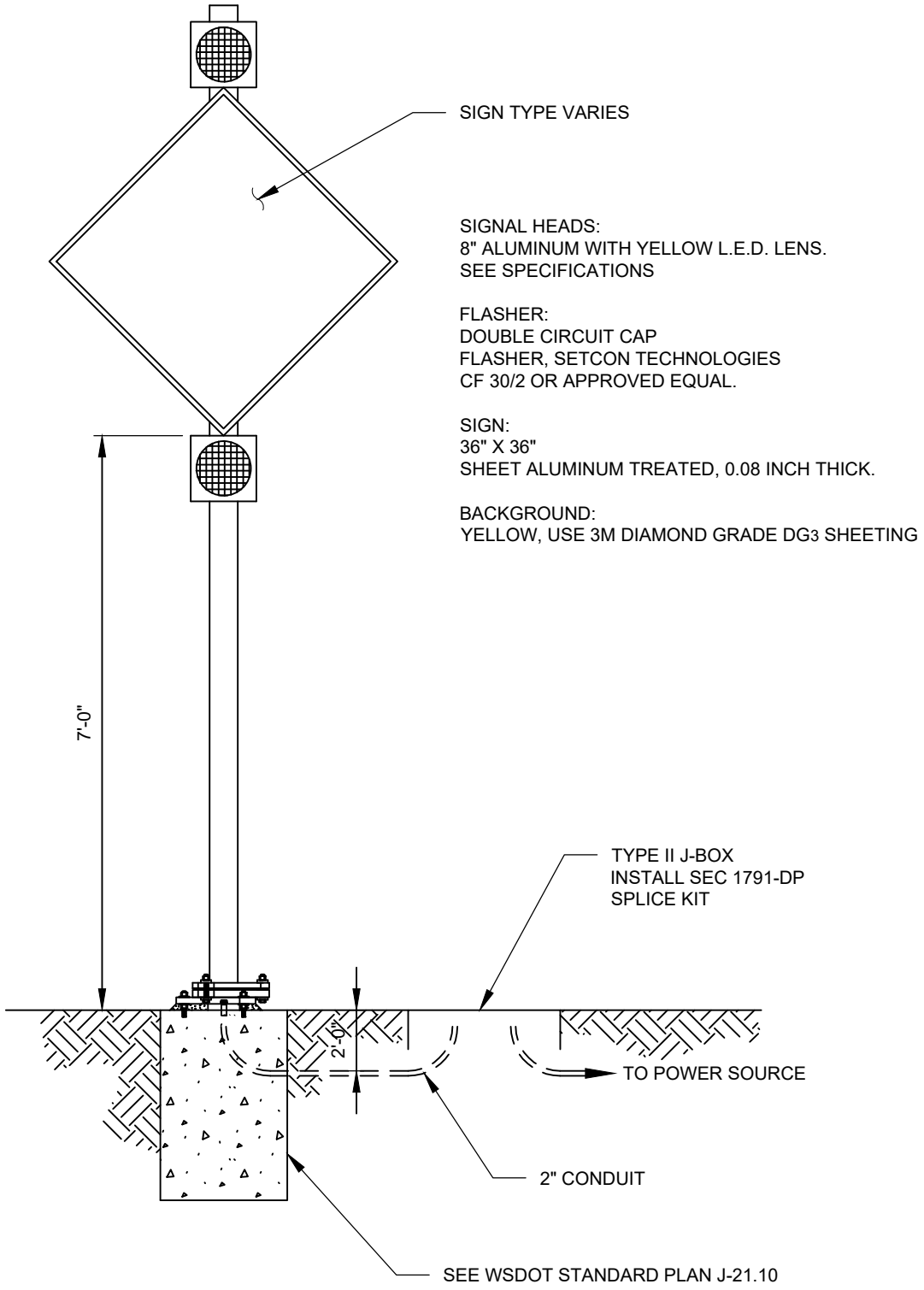
CityofRedmond WASHINGTON

STANDARD DETAILS

MAST ARM STREET NAME SIGNS

FILE NAME: SD417.DWG | DETAIL NUMBER: **417**

DocuSign Envelope ID: F681597A-CCE8-405B-ACDB-A8564C559739



Paul S. Cho

APPROVED BY: PAUL S. CHO
TRAFFIC OPERATIONS SAFETY AND ENGINEERING MANAGER

REVISION DATE: MARCH 01, 2020

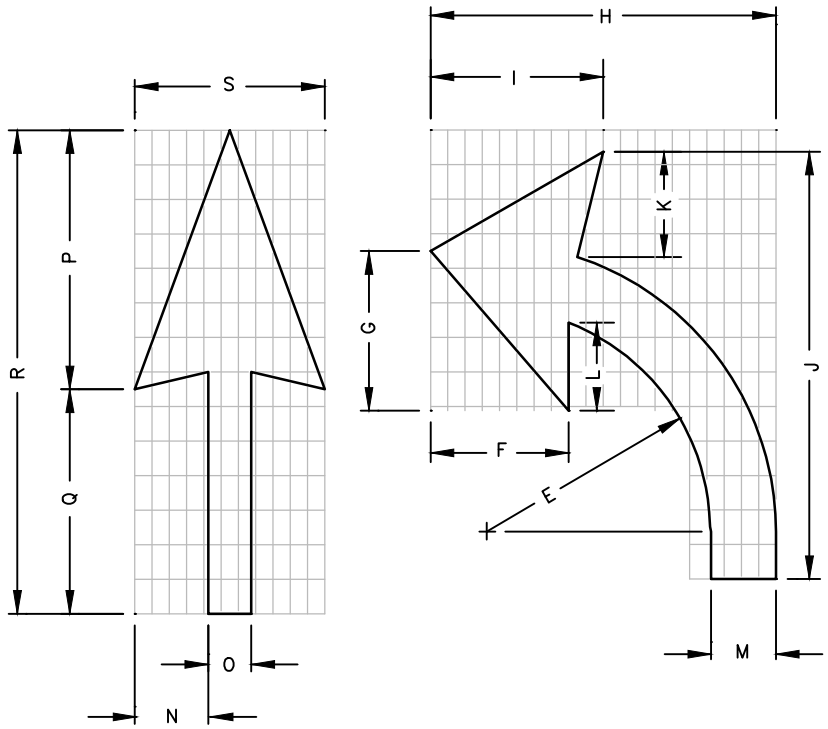
CityofRedmond
WASHINGTON

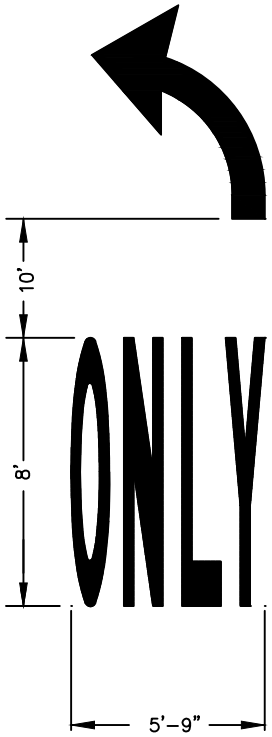
STANDARD DETAILS

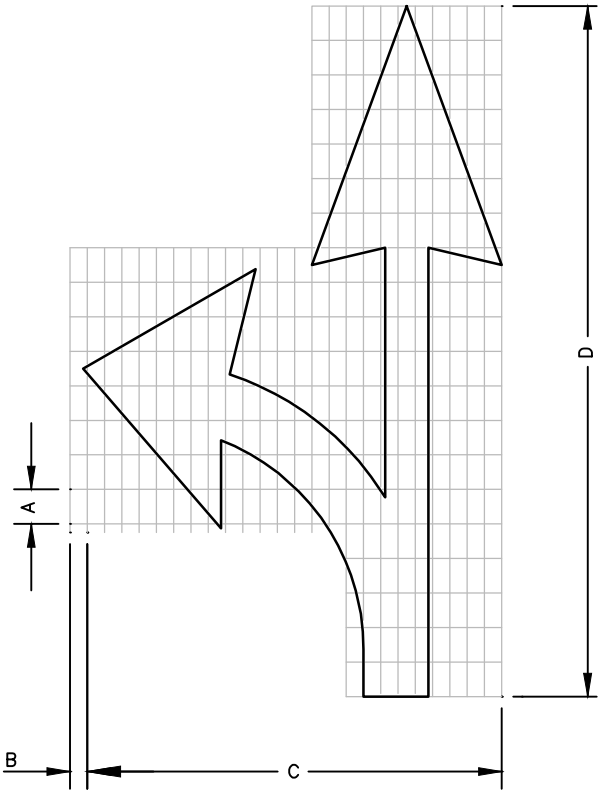
ADVANCE WARNING SIGN/FLASHER

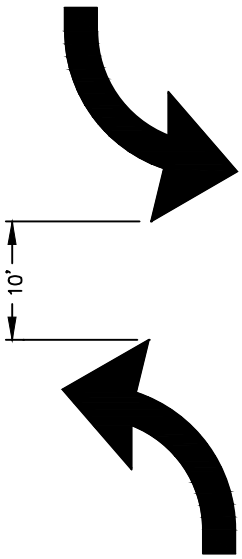
FILE NAME: SD418.DWG | DETAIL NUMBER: **418**

DocuSign Envelope ID: F681597A-CCE8-405B-ACDB-A8564C559739









NOTE:

USE THERMOPLASTIC UNLESS DIRECTED OTHERWISE BY CITY TRAFFIC ENGINEER

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S
	8"	4"	8'–0"	13'–4"	4'–4"	2'–8"	3'–1"	6'–7"	3'–4"	8'–3"	1'–11"	1'–8"	1'–3"	1'–5"	10"	5'–0"	4'–4"	9'–4"	3'–8"

Paul S. Cho

APPROVED BY: PAUL S. CHO
TRAFFIC OPERATIONS SAFETY AND ENGINEERING MANAGER

REVISION DATE: MARCH 01, 2020

CityofRedmond WASHINGTON

STANDARD DETAILS

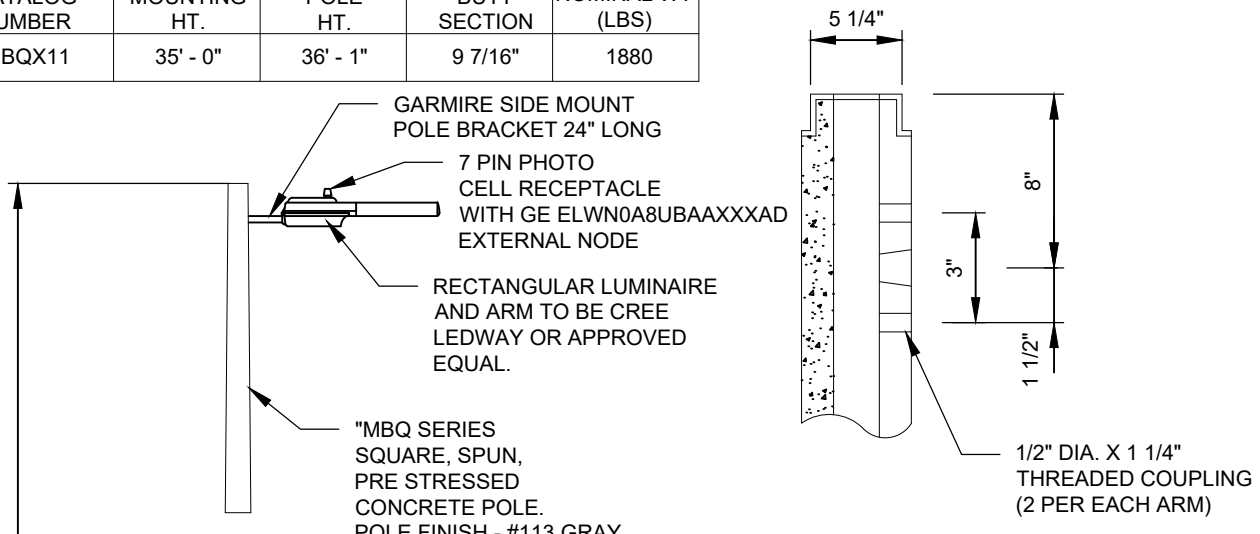
LANE-USE PAVEMENT MARKINGS

FILE NAME: SD419.DWG

DETAIL NUMBER: **419**

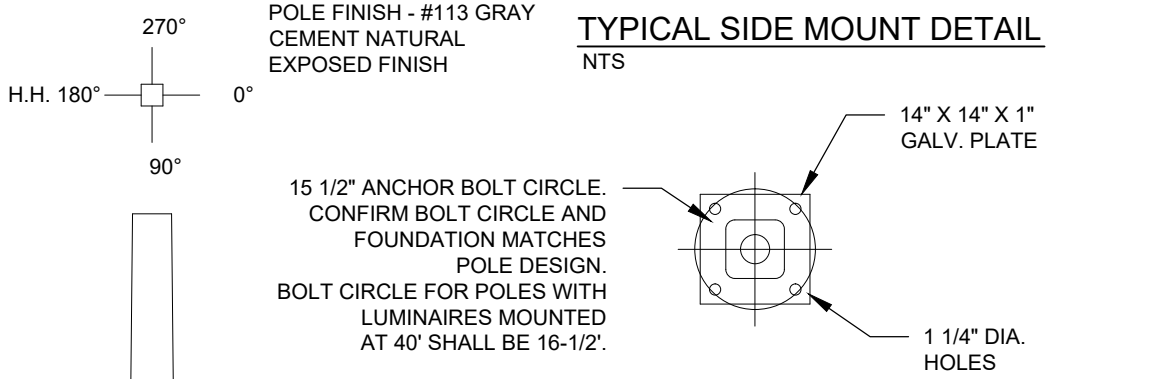
DocuSign Envelope ID: F681597A-CCE8-405B-ACDB-A8564C559739

CATALOG NUMBER	MOUNTING HT.	POLE HT.	BUTT SECTION	NOMINAL WT (LBS)
MBQX11	35' - 0"	36' - 1"	9 7/16"	1880



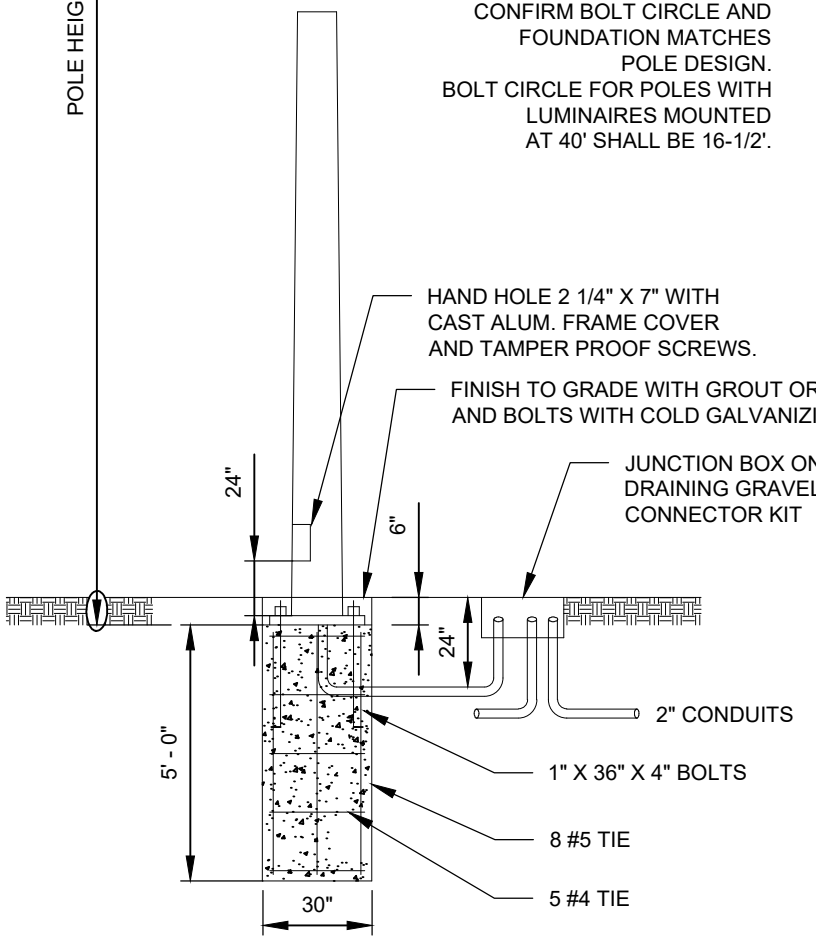
TYPICAL SIDE MOUNT DETAIL

NTS



BASE PLATE

NTS



NOTES:

1. BASE PLATE AND ANCHOR BOLTS INSTALLED BELOW FINISHED GRADE.
2. ENSURE POLE AND FIXTURE HAVE 3-FOOT CIRCUMFERENTIAL CLEARANCE FROM BUILDING AND ALL OBSTRUCTIONS.
3. ENSURE BOLT CIRCLE AND FOUNDATION MATCHES POLE DESIGN. POLES OVER 35-FOOT HEIGHT WILL USE CUSTOM BOLT CIRCLE. VERIFY WITH POLE MANUFACTURER.
4. FOR POLE IN SIDEWALK OR CONCRETE, SEE TEMPORARY WOOD FRAMING PER STANDARD DETAIL 430, BASE PLATE.

Paul S. Cho

APPROVED BY: PAUL S. CHO
TRAFFIC OPERATIONS SAFETY AND ENGINEERING MANAGER

REVISION DATE: MARCH 01, 2020

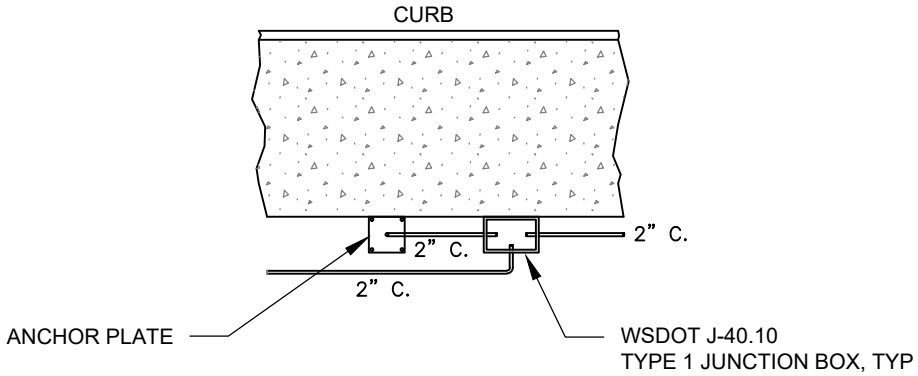
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STANDARD DETAILS

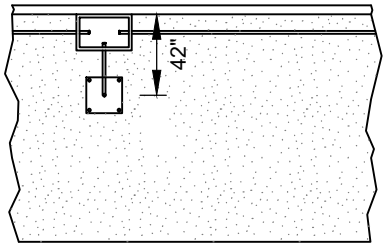
LUMINAIRE POLE (CONCRETE SQUARE)

FILE NAME: SD420.DWG | DETAIL NUMBER: **420**

DocuSign Envelope ID: F681597A-CCE8-405B-ACDB-A8564C559739



SIDEWALK
NTS



NO SIDEWALK/PLANTER/SIDEWALK WIDTH GREATER THAN 10'
NTS

Paul S. Cho

APPROVED BY: PAUL S. CHO
TRAFFIC OPERATIONS SAFETY AND ENGINEERING MANAGER

REVISION DATE: MARCH 01, 2020

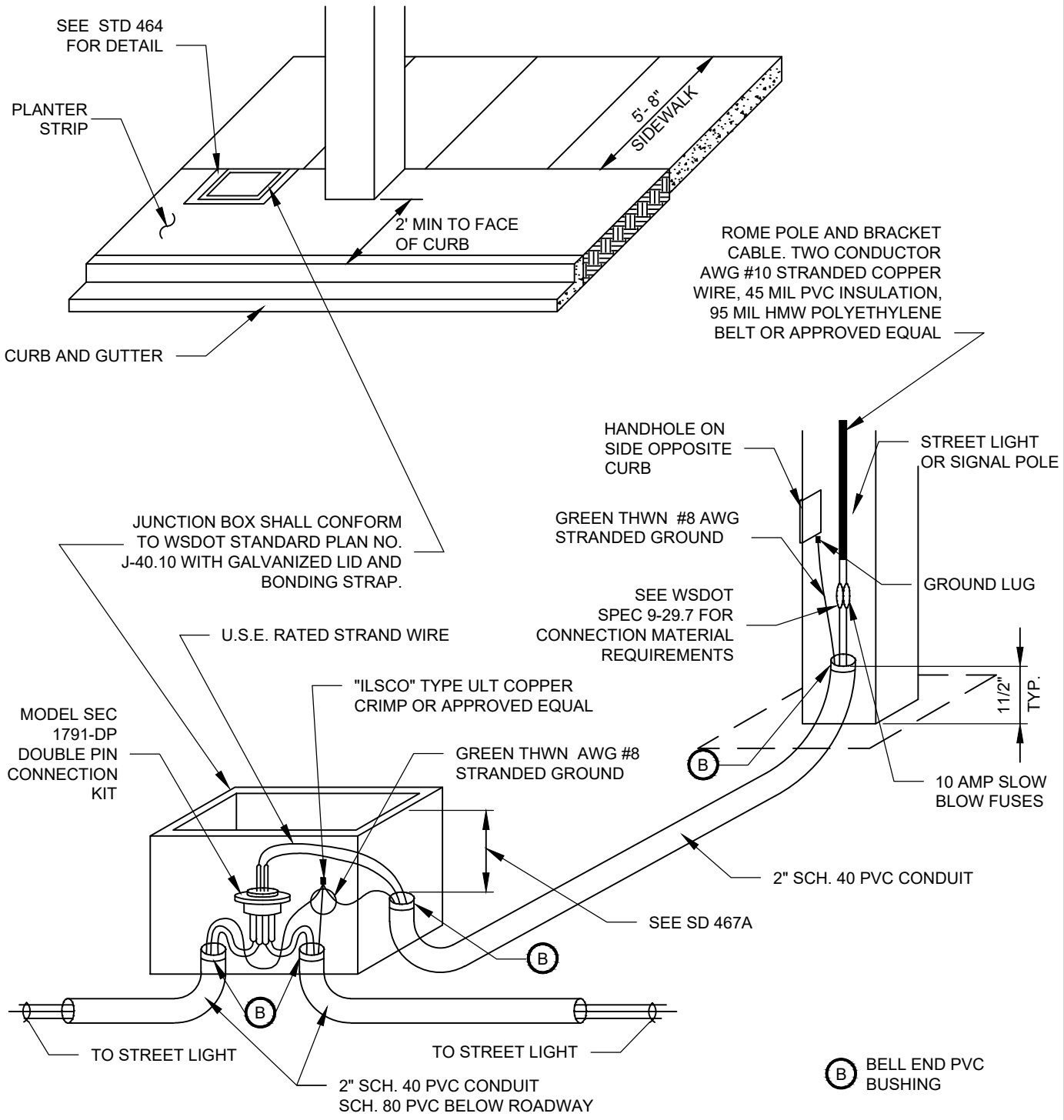
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STANDARD DETAILS

TYPICAL LUMINARE LOCATIONS

FILE NAME: SD420A.DWG | DETAIL NUMBER: **420A**

DocuSign Envelope ID: F681597A-CCE8-405B-ACDB-A8564C559739



NOTES:

1. ALL ELECTRICAL SPLICES MUST MEET WET RATING.
2. BOND FRAME AND LID.
3. SPLICE KIT REQUIRED FOR EACH LIGHT INCLUDING LAST LIGHT ON CIRCUIT.
4. SPLICE BOX SEC 1791-DP REQUIRED TO BRANCH CIRCUIT IN THREE OR MORE DIRECTIONS.

Paul S. Cho

APPROVED BY: PAUL S. CHO
TRAFFIC OPERATIONS SAFETY AND ENGINEERING MANAGER

REVISION DATE: MARCH 01, 2020

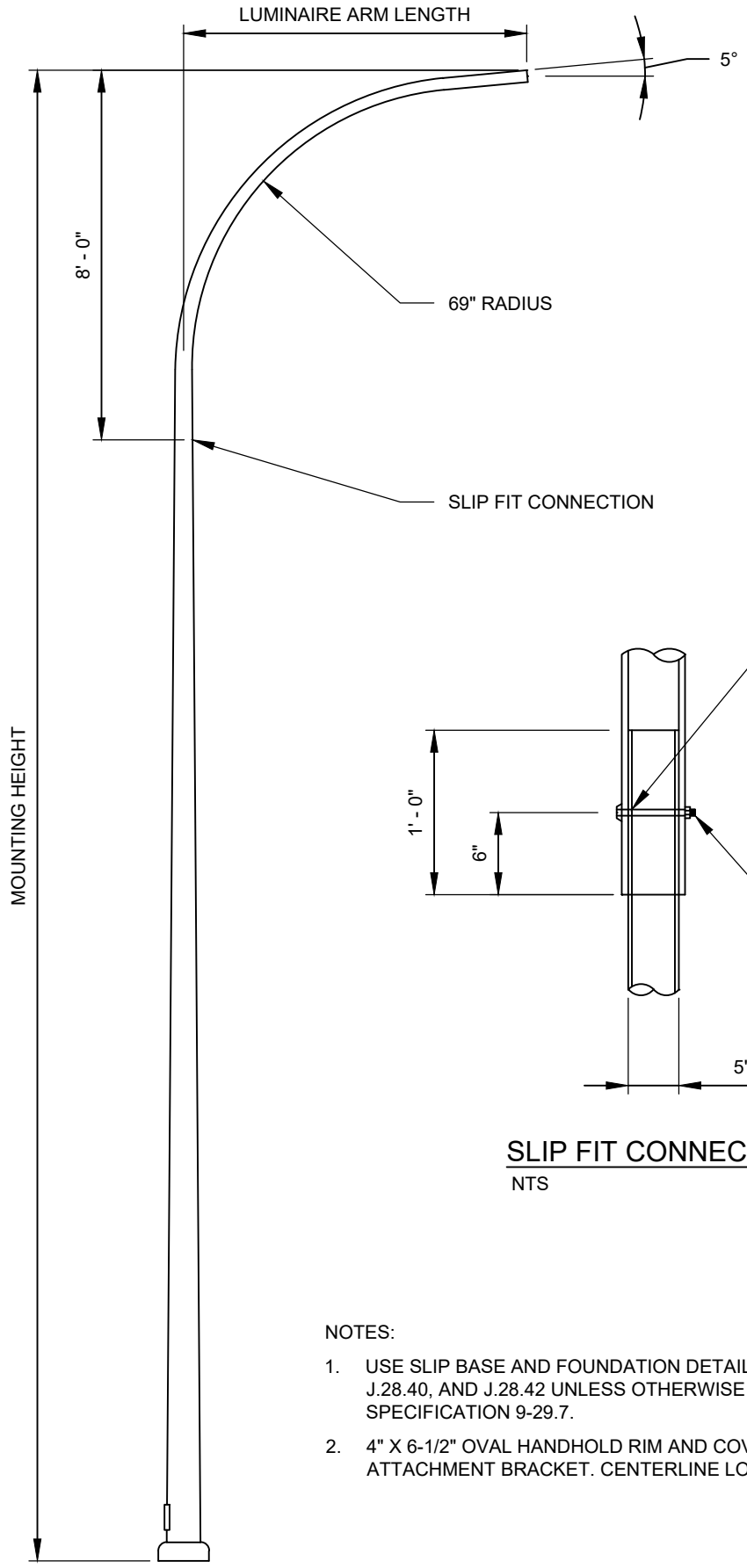
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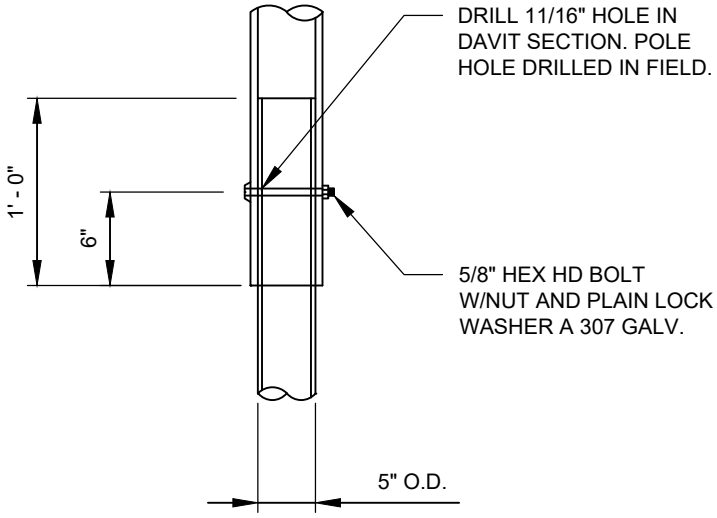
STANDARD DETAILS

UNIFORM LUMINAIRE WIRING

FILE NAME: SD421.DWG | DETAIL NUMBER: **421**

DocuSign Envelope ID: F681597A-CCE8-405B-ACDB-A8564C559739





SLIP FIT CONNECTION
NTS

NOTES:

1. USE SLIP BASE AND FOUNDATION DETAIL PER WSDOT STD. PLANS J.28.30, J.28.40, AND J.28.42 UNLESS OTHERWISE SPECIFIED. SEE WSDOT STD SPECIFICATION 9-29.7.
2. 4" X 6-1/2" OVAL HANDHOLD RIM AND COVER WITH GROUND AND CONDUCTOR ATTACHMENT BRACKET. CENTERLINE LOCATED AT 11" ABOVE POLE BASE.

Paul S. Cho

APPROVED BY: PAUL S. CHO
TRAFFIC OPERATIONS SAFETY AND ENGINEERING MANAGER

REVISION DATE: MARCH 01, 2020

CityofRedmond
WASHINGTON

STANDARD DETAILS

"J" SERIES LIGHT STANDARD

FILE NAME: SD425.DWG | DETAIL NUMBER: **425**

DocuSign Envelope ID: F681597A-CCE8-405B-ACDB-A8564C559739



SIGN FABRICATION DETAIL

NTS

MUTCD TABLE 2D-2. MINIMUM LETTER HEIGHTS ON STREET NAME SIGNS

			MINIMUM LETTER HEIGHT		BLADE SIZE	
TYPE OF MOUNTING	TYPE OF STREET	SPEED LIMIT	INITIAL UPPER CASE	LOWER CASE	MIN	MAX
OVERHEAD	ALL TYPES	ALL SPEED LIMITS	12 INCHES	9 INCHES	18" HT.	18" HT.
POST-MOUNTED	MULTI-LANE	MORE THAN 40 MPH	8 INCHES	6 INCHES	10" X 36"	10" X 48"
POST-MOUNTED	MULTI-LANE	40 MPH OR LESS	6 INCHES	4.5 INCHES	8" X 30"	8" X 36"
POST-MOUNTED	2-LANE	ALL SPEED LIMITS	6 INCHES*	4.5 INCHES*	8" X 30"	8" X 36"

* ON LOCAL TWO-LANE STREETS WITH SPEED LIMITS OF 25 MPH OR LESS, 4 INCH INITIAL UPPER-CASE LETTERS WITH 3 INCH LOWER CASE LETTERS MAY BE USED.

NOTES:

1. LETTERS SHALL BE HIGHWAY B SERIES FONT.
2. SIGN CORNERS SHALL BE ROUNDED.
3. FOR INTERSECTIONS THAT HAVE DIFFERING SPEEDS, THE HIGHEST SPEED SHALL DICTATE THE SIZE OF ALL STREET NAME SIGNS.
4. SIGN MATERIAL SHALL BE 0.080 INCH THICK STOCK ALUMINUM WITH WHITE SIGN LETTERS ON GREEN.
5. UNLESS OTHERWISE SPECIFIED, ALL SIGN SHEETING SHALL BE 3M DIAMOND GRADE.

Paul S. Cho

APPROVED BY: PAUL S. CHO
TRAFFIC OPERATIONS SAFETY AND ENGINEERING MANAGER

REVISION DATE: MARCH 01, 2020

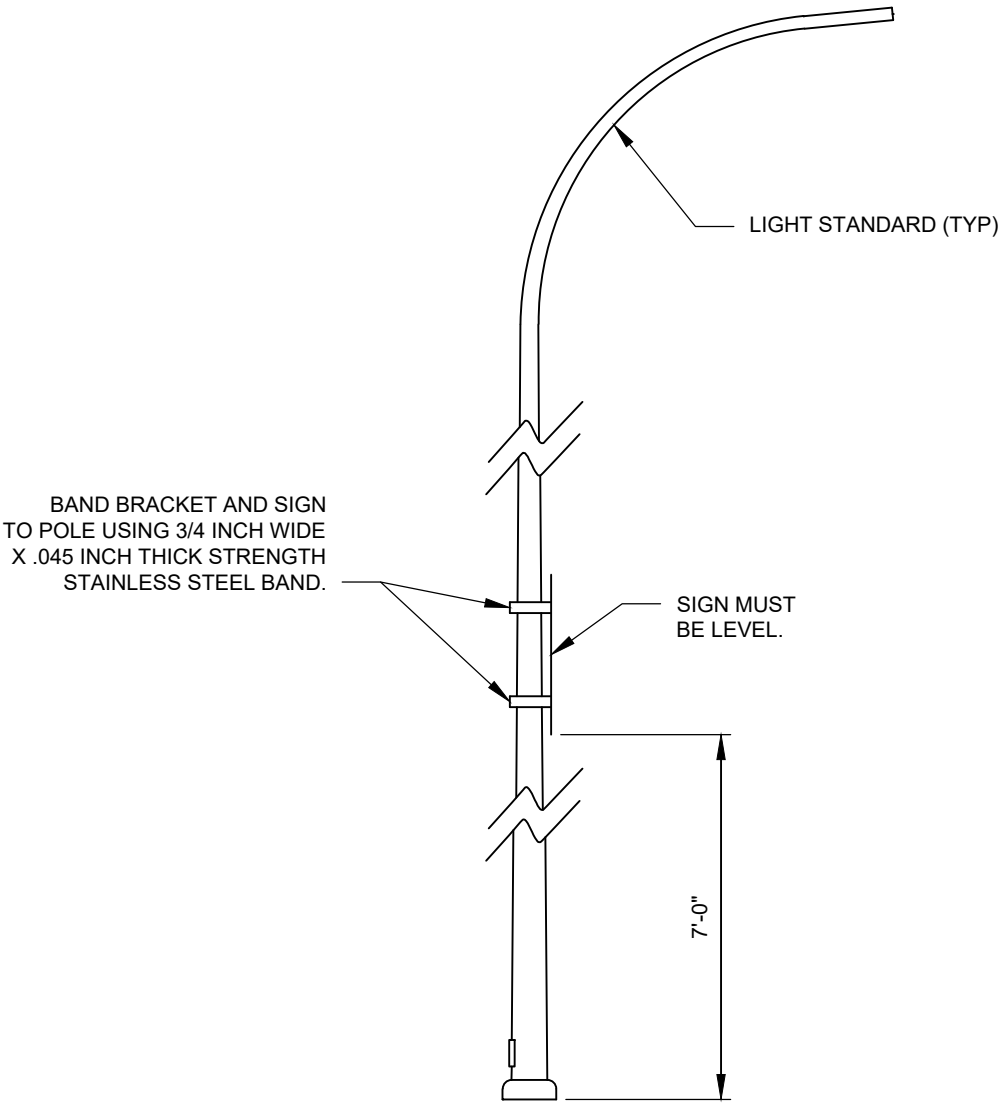
CityofRedmond WASHINGTON

STANDARD DETAILS

SIGN AND POST DETAIL

FILE NAME: SD426A.DWG | DETAIL NUMBER: **426A**

DocuSign Envelope ID: F681597A-CCE8-405B-ACDB-A8564C559739



SIGN MOUNTING DETAIL

NTS

NOTES:

1. SIGN MOUNTED ON STREETLIGHTS SHALL BE BANDED (3/4" WIDE 0.045 THICKNESS STAINLESS STEEL BANDING WITH BANDING BUCKLES AND BOLT FLARED LEG BUCKLES).
2. ATTACH SIGN TO BUCKLES WITH STAINLESS STEEL BOLT, STAINLESS STEEL WASHER, AND NYLON WASHER.

Paul S. Cho

APPROVED BY: PAUL S. CHO
TRAFFIC OPERATIONS SAFETY AND ENGINEERING MANAGER

REVISION DATE: MARCH 01, 2020

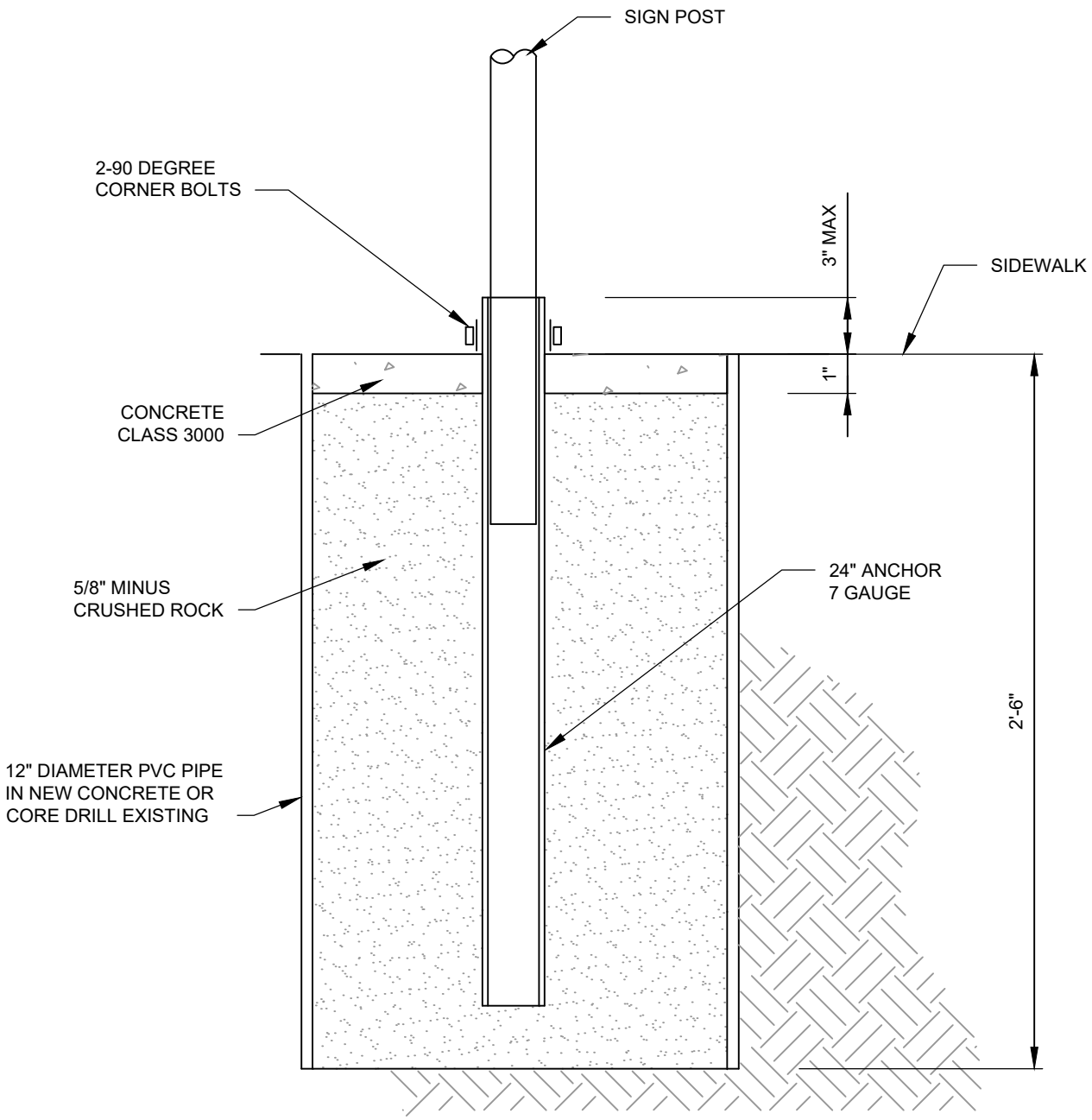
CityofRedmond WASHINGTON

STANDARD DETAILS

STREET LIGHT POLE MOUNTING SIGN

FILE NAME: SD426B.DWG | DETAIL NUMBER: **426B**

DocuSign Envelope ID: F681597A-CCE8-405B-ACDB-A8564C559739



NOTES:

1. POST: 2" X 2" 14 GAUGE (0.83) QWIK PUNCH A.S.T.M. A570 WITH ANCHOR.
2. SIGN HEIGHT: FROM THE GROUND TO THE BOTTOM OF THE SIGN SHALL BE 7'-0" PER MUTCD.
3. OFFSET LOCATION PER MUTCD. SIGN POST NOT TO EXTEND PAST TOP OF SIGN. ATTACH SIGN TO POST WITH 3/8" X 3" GALVANIZED BOLTS WITH WASHERS ON FRONT AND BACK.

Paul S. Cho

APPROVED BY: PAUL S. CHO
TRAFFIC OPERATIONS SAFETY AND ENGINEERING MANAGER

REVISION DATE: MARCH 01, 2020

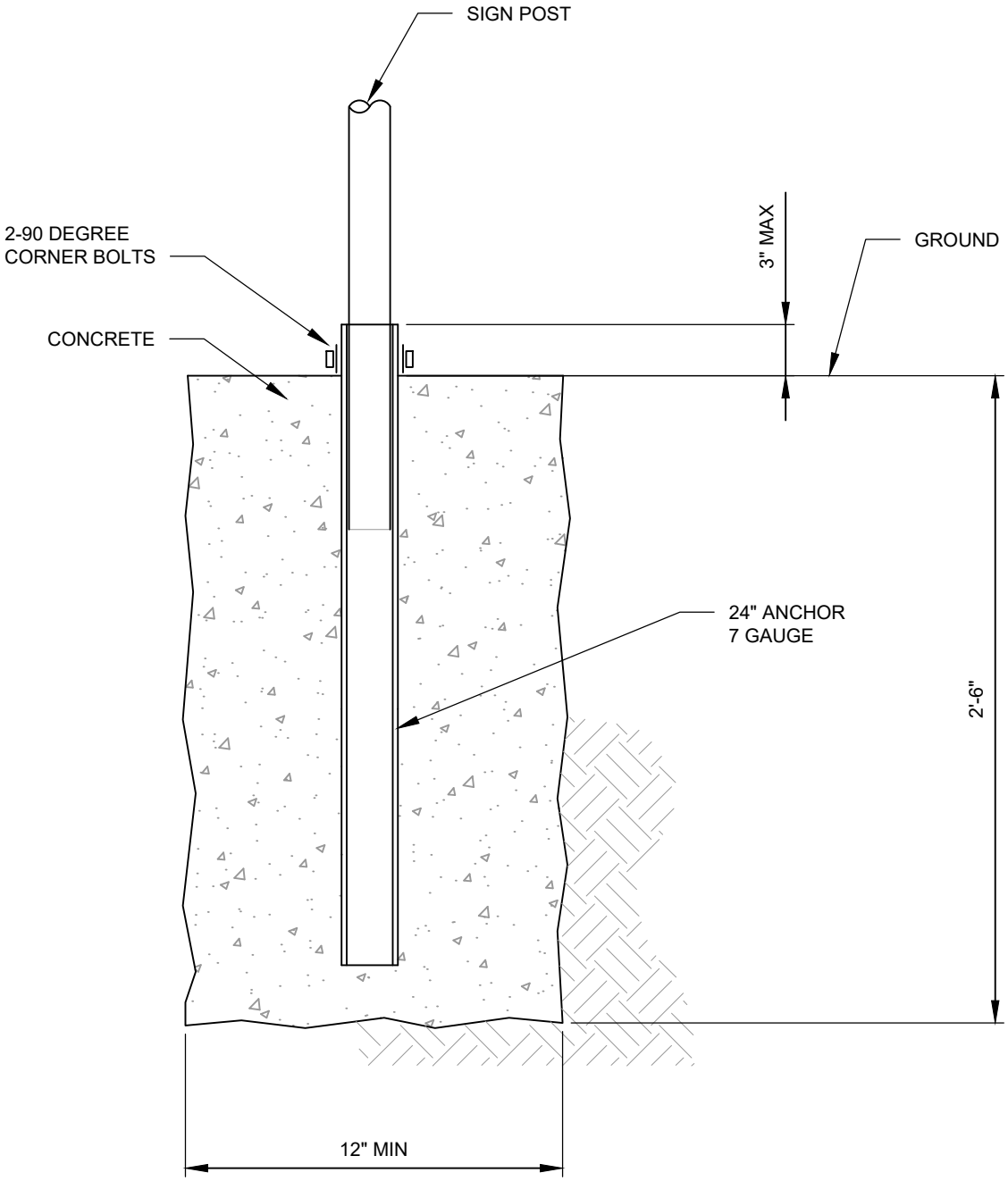
CityofRedmond
WASHINGTON

STANDARD DETAILS

SIGN POST IN CONCRETE/ASPHALT

FILE NAME: SD426C.DWG | DETAIL NUMBER: **426C**

DocuSign Envelope ID: F681597A-CCE8-405B-ACDB-A8564C559739



NOTES:

1. POSTS: 2"x2" 14 GAUGE (.083) QWIK PUNCH A.S.T.M. A570, WITH ANCHOR.
2. SIGN HEIGHT: FROM THE GROUND TO THE BOTTOM OF THE SIGN SHALL BE 7'-0" PER MUTCD.
3. OFFSET LOCATION PER MUTCD: SIGN POST NOT TO EXTEND PAST TOP OF SIGN. ATTACH SIGN TO POST WITH 3/8"x3" GALVANIZED BOLTS WITH WASHERS ON FRONT AND BACK.

Paul S. Cho

APPROVED BY: PAUL S. CHO
TRAFFIC OPERATIONS SAFETY AND ENGINEERING MANAGER

REVISION DATE: MARCH 01, 2020

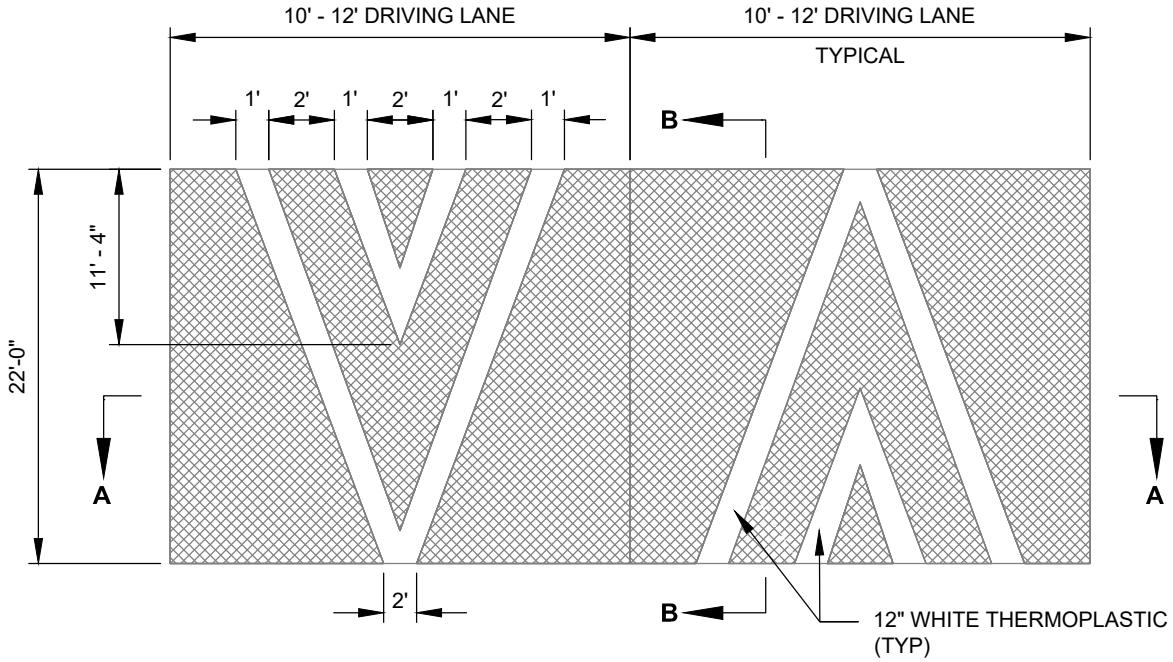
CityofRedmond
WASHINGTON

STANDARD DETAILS

SIGN POST IN GROUND

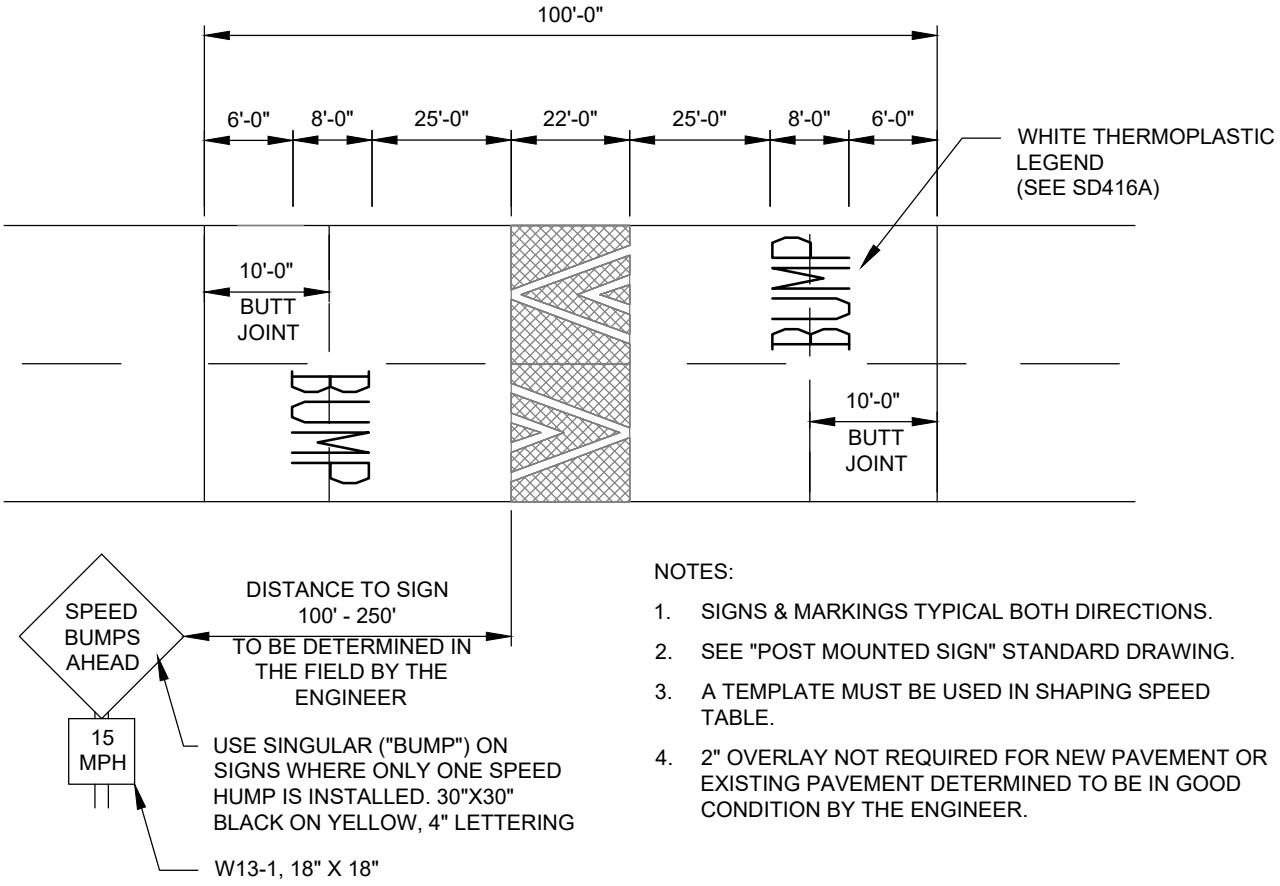
FILE NAME: SD426D.DWG | DETAIL NUMBER: **426D**

DocuSign Envelope ID: F681597A-CCE8-405B-ACDB-A8564C559739



SPEED TABLE DETAIL (1 OF 2)

NTS



NOTES:

1. SIGNS & MARKINGS TYPICAL BOTH DIRECTIONS.
2. SEE "POST MOUNTED SIGN" STANDARD DRAWING.
3. A TEMPLATE MUST BE USED IN SHAPING SPEED TABLE.
4. 2" OVERLAY NOT REQUIRED FOR NEW PAVEMENT OR EXISTING PAVEMENT DETERMINED TO BE IN GOOD CONDITION BY THE ENGINEER.

Paul S. Cho

APPROVED BY: PAUL S. CHO
TRAFFIC OPERATIONS SAFETY AND ENGINEERING MANAGER

REVISION DATE: MARCH 01, 2020

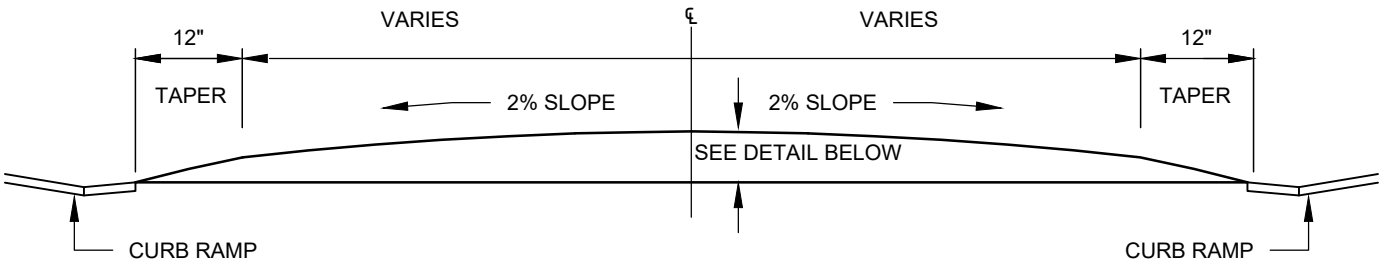
CityofRedmond
WASHINGTON

STANDARD DETAILS

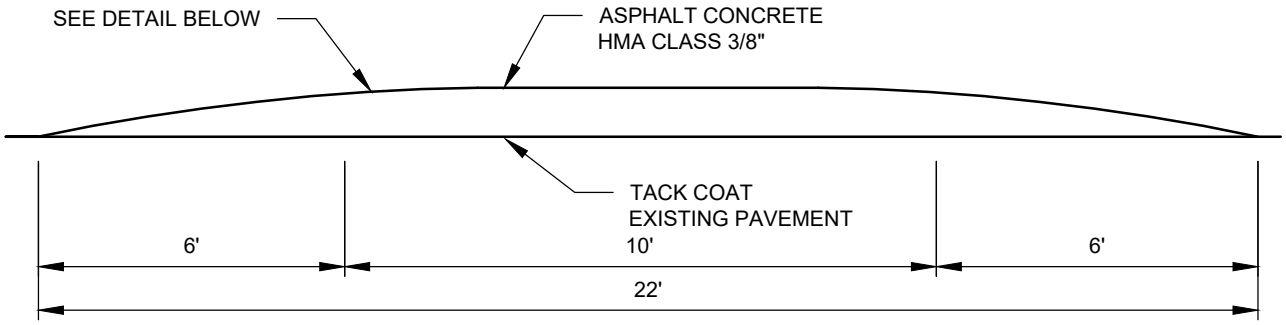
SPEED TABLE (1 OF 2)

FILE NAME: SD427.DWG | DETAIL NUMBER: **427**

DocuSign Envelope ID: F681597A-CCE8-405B-ACDB-A8564C559739

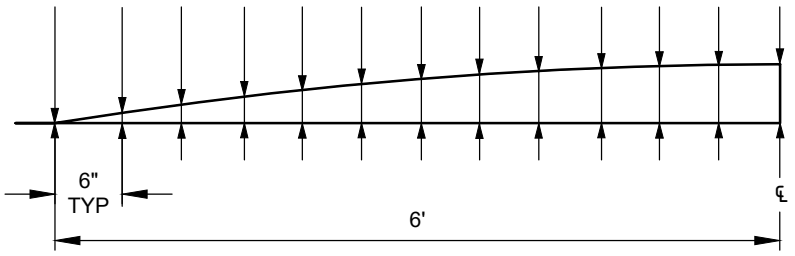


SPEED TABLE SECTION A-A
NTS



SPEED TABLE SECTION B-B
NTS

0	0.64	1.22	1.75	2.22	2.64	3.00	3.31	3.56	3.75	3.89	3.97	4.00"	← 4" SPEED TABLE
0	0.56	1.07	1.53	1.94	2.31	2.63	2.89	3.11	3.28	3.40	3.48	3.50"	← 3.5" SPEED TABLE
0	0.48	0.92	1.31	1.67	1.98	2.25	2.48	2.67	2.81	2.92	2.96	3.00"	← 3" SPEED TABLE



SPEED TABLE DETAIL (TYP)
NTS

APPROVED BY: PAUL S. CHO
TRAFFIC OPERATIONS SAFETY AND ENGINEERING MANAGER

REVISION DATE: MARCH 01, 2020

CityofRedmond
WASHINGTON

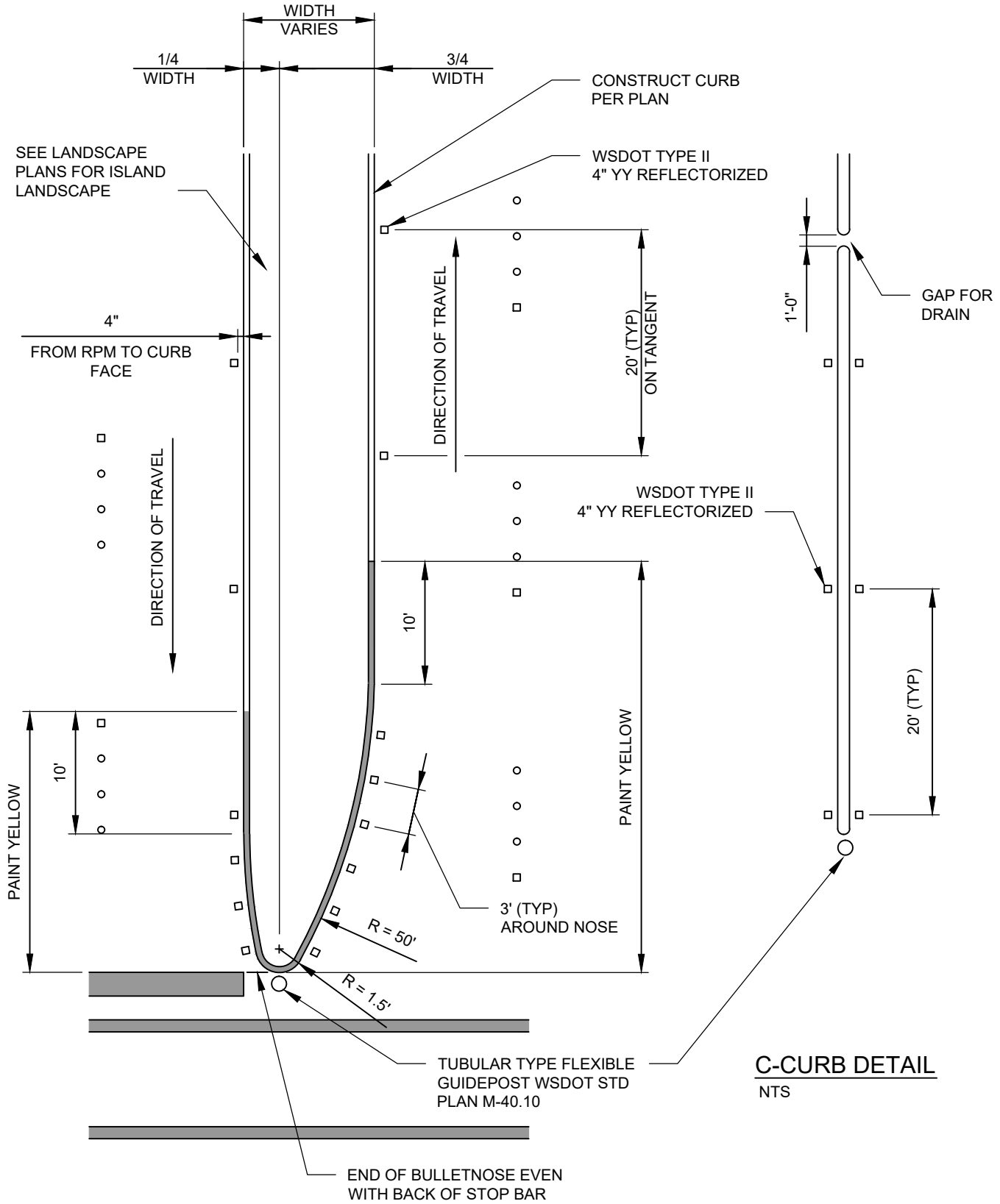
STANDARD DETAILS

SPEED TABLE (2 OF 2)

FILE NAME: SD428.DWG

DETAIL NUMBER: **428**

DocuSign Envelope ID: F681597A-CCE8-405B-ACDB-A8564C559739



C-CURB DETAIL

NTS

OFFSET BULLETNOSE DETAIL

NTS

Paul S. Cho

APPROVED BY: PAUL S. CHO
TRAFFIC OPERATIONS SAFETY AND ENGINEERING MANAGER

REVISION DATE: MARCH 01, 2020

CityofRedmond
WASHINGTON

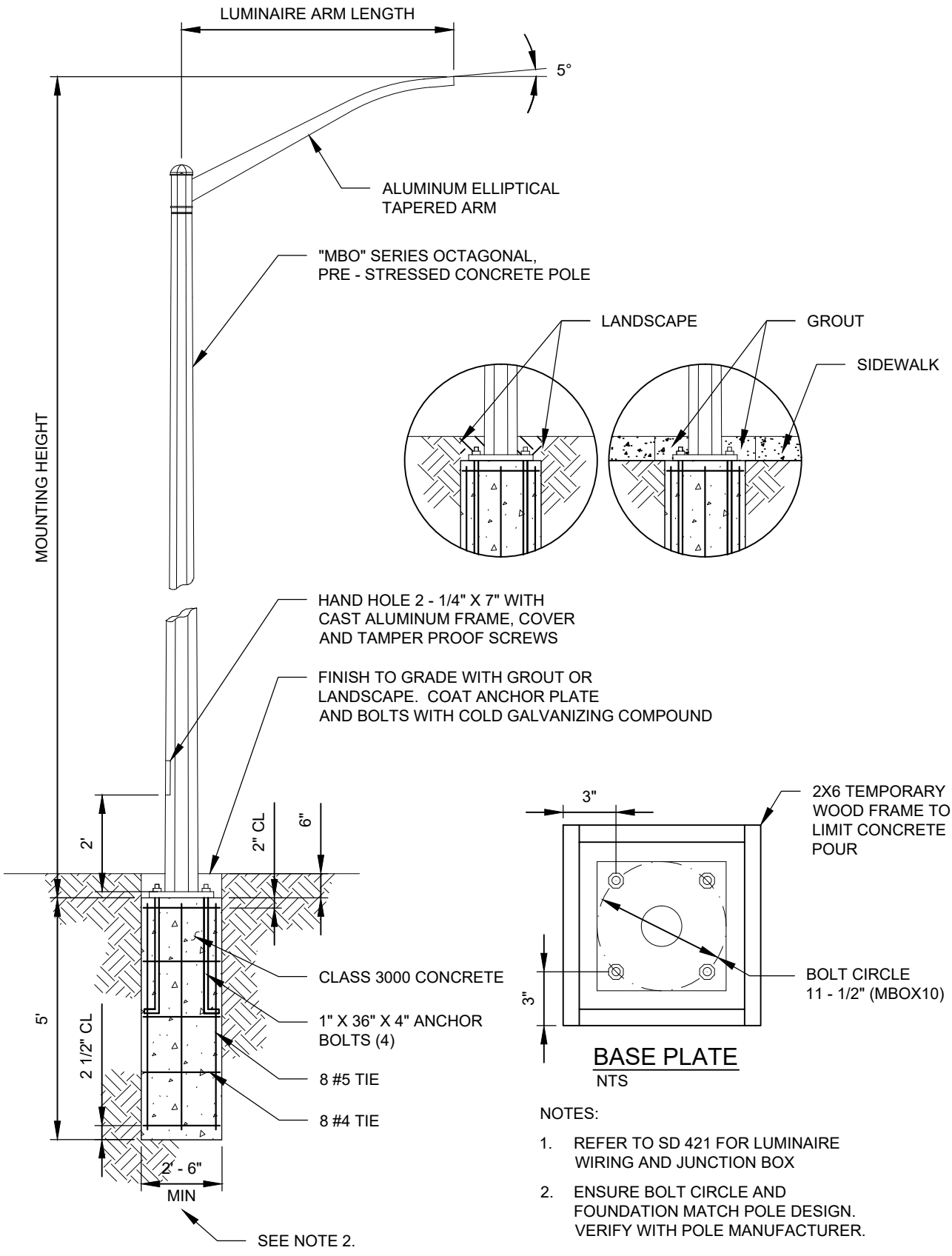
STANDARD DETAILS

BULLETNOSE AND C-CURB DETAIL

FILE NAME: SD429.DWG

DETAIL NUMBER: **429**

DocuSign Envelope ID: F681597A-CCE8-405B-ACDB-A8564C559739



BASE PLATE
NTS

NOTES:

1. REFER TO SD 421 FOR LUMINAIRE WIRING AND JUNCTION BOX
2. ENSURE BOLT CIRCLE AND FOUNDATION MATCH POLE DESIGN. VERIFY WITH POLE MANUFACTURER.

Paul S. Cho

APPROVED BY: PAUL S. CHO
TRAFFIC OPERATIONS SAFETY AND ENGINEERING MANAGER

REVISION DATE: MARCH 01, 2020

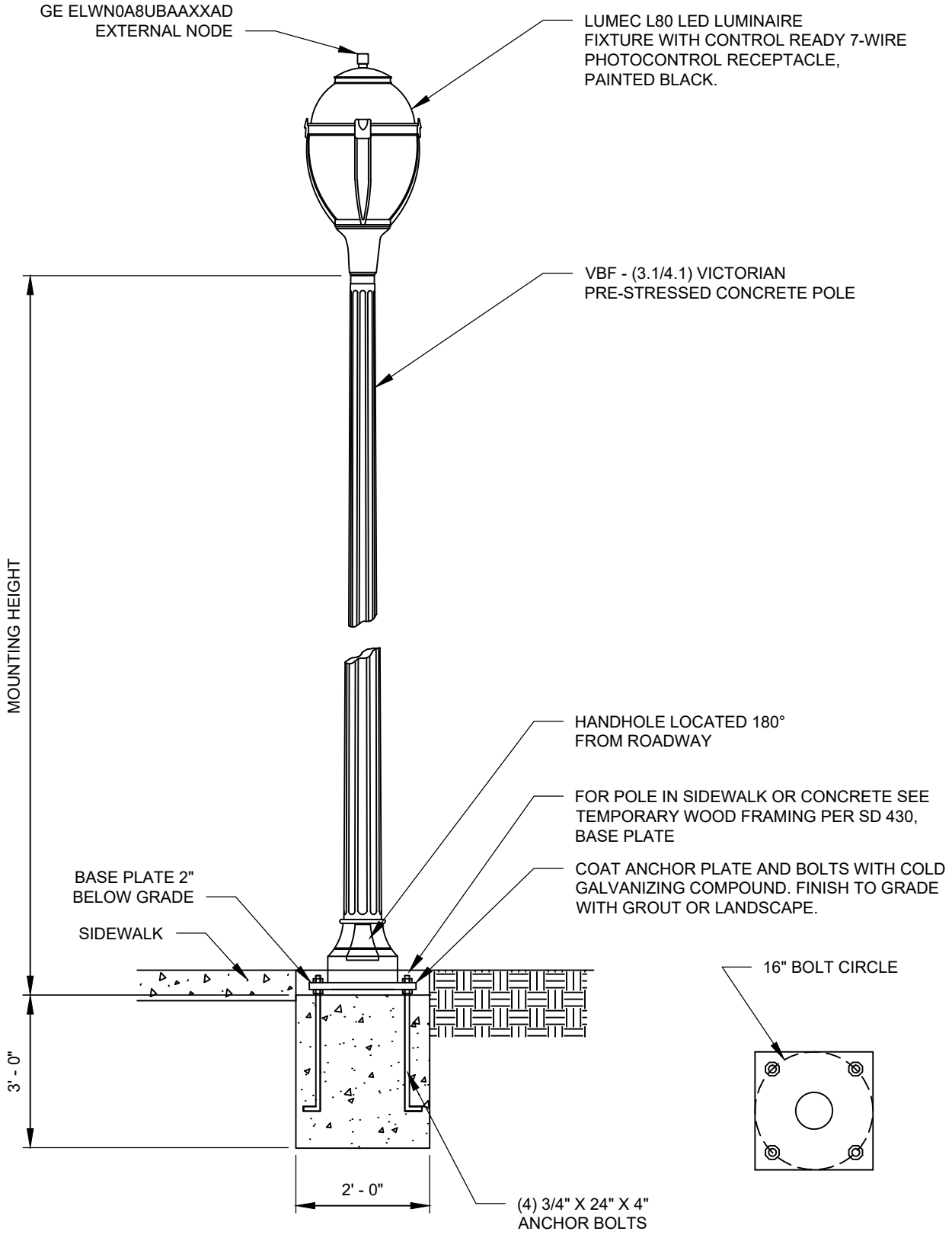
CityofRedmond WASHINGTON

STANDARD DETAILS

CONCRETE OCTAGONAL POLE

FILE NAME: SD430.DWG | DETAIL NUMBER: **430**

DocuSign Envelope ID: F681597A-CCE8-405B-ACDB-A8564C559739



ELEVATION
NTS

BASE PLATE
NTS

Paul S. Cho

APPROVED BY: PAUL S. CHO
TRAFFIC OPERATIONS SAFETY AND ENGINEERING MANAGER

REVISION DATE: MARCH 01, 2020

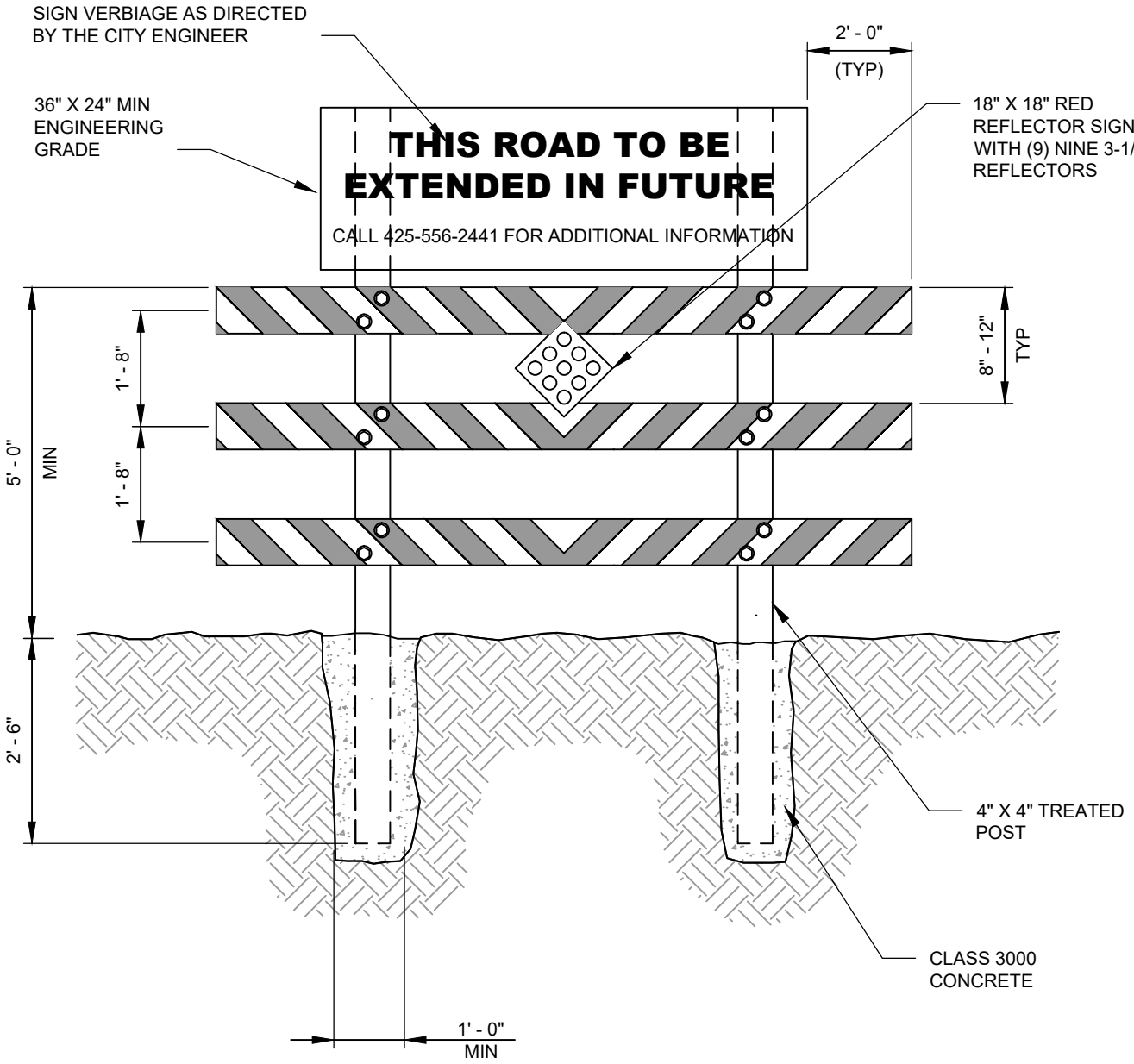
CityofRedmond
WASHINGTON

STANDARD DETAILS

CONCRETE PEDESTRIAN SCALE POLE

FILE NAME: SD430B.DWG | DETAIL NUMBER: **430B**

DocuSign Envelope ID: F681597A-CCE8-405B-ACDB-A8564C559739



TYPE 3 BARRICADE

NTS

NOTES:

1. STRIPES SHALL BE RED ON WHITE DIAMOND GRADE REFLECTORIZED TAPE.
2. USE WSDOT STANDARD DETAIL PLAN K-80.20.00 FOR TEMPORARY TYPE III BARRICADE.
3. ALL SIGNS ATTACHED TO BARRICADE WITH GALVANIZED WOOD SCREWS.

Paul S. Cho

APPROVED BY: PAUL S. CHO
TRAFFIC OPERATIONS SAFETY AND ENGINEERING MANAGER

REVISION DATE: MARCH 01, 2020

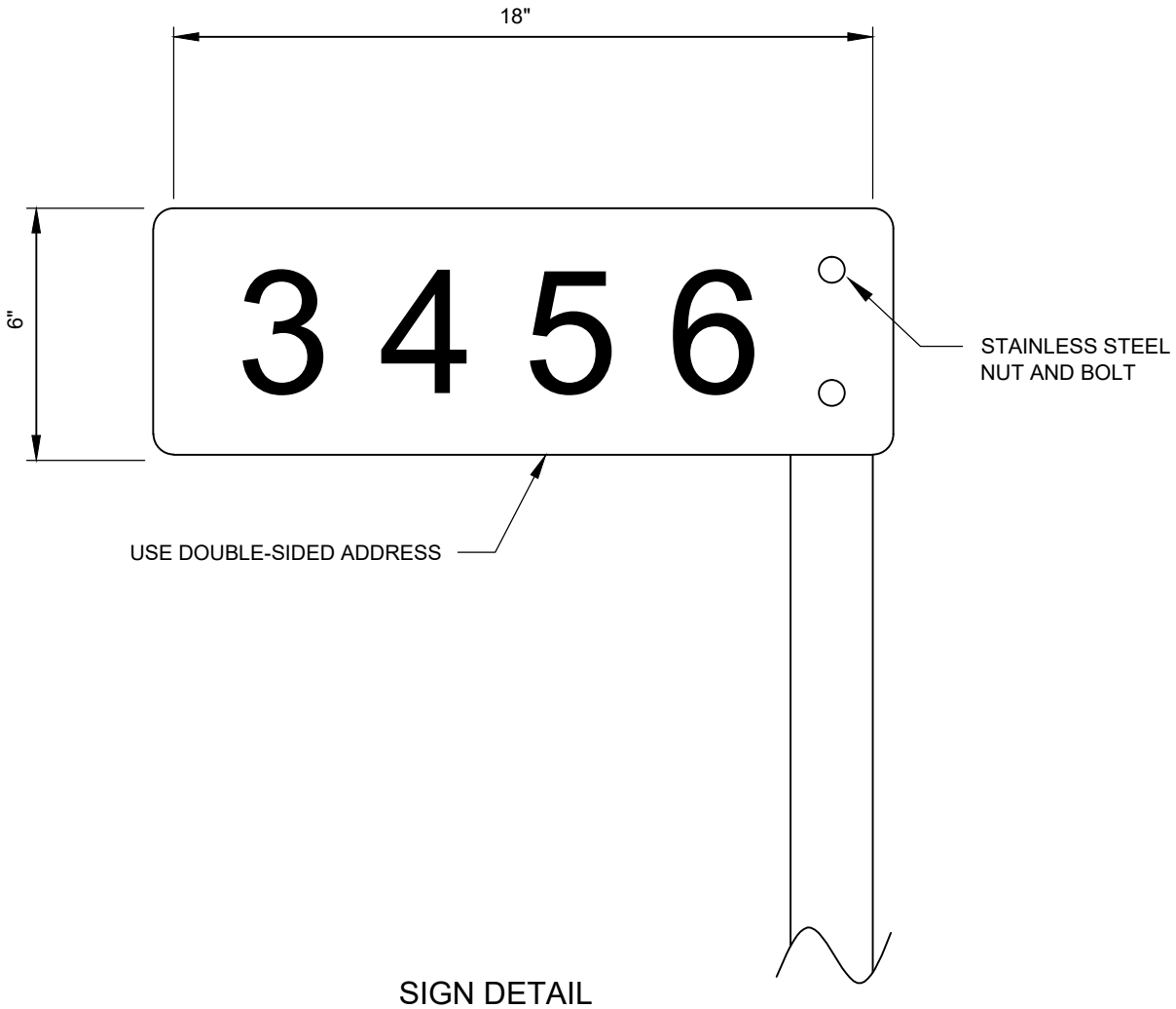
CityofRedmond WASHINGTON

STANDARD DETAILS

TYPE 3 BARRICADE

FILE NAME: SD431.DWG | DETAIL NUMBER: **431**

DocuSign Envelope ID: F681597A-CCE8-405B-ACDB-A8564C559739



SIGN DETAIL

NTS

NOTES:

1. LETTER GRAPHICS SHALL BE 3" HIGHWAY B SERIES FONT.
2. SIGN CORNERS SHALL BE ROUNDED.
3. SIGN MATERIAL SHALL BE 0.080 THICK STOCK ALUMINUM WITH WHITE SIGN NUMBERS ON HIGHWAY BLUE HIGH INTENSITY OR DIAMOND GRADE GRADE SHEETING.
4. MULTIPLE SIGNS ARE ALLOWED ON THE SAME POST, WITH HEIGHT FROM THE GROUND TO THE BOTTOM OF LOWEST SIGN BEING A MINIMUM 7'.
5. POST INSTALLED PER SD 426C OR 426D.
6. SIGN SHALL BE LOCATED OUTSIDE ROW.

Paul S. Cho

APPROVED BY: PAUL S. CHO
TRAFFIC OPERATIONS SAFETY AND ENGINEERING MANAGER

REVISION DATE: MARCH 01, 2020

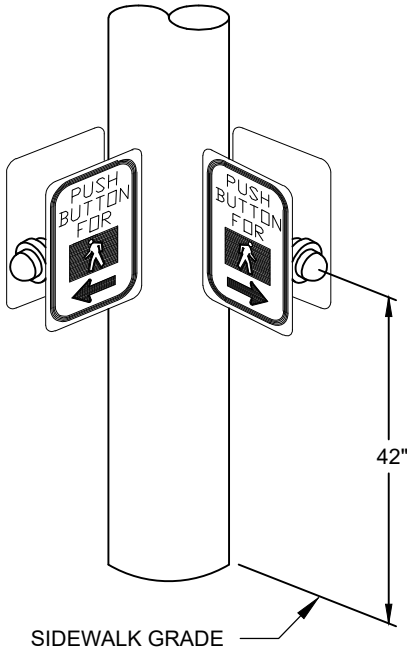
CityofRedmond
WASHINGTON

STANDARD DETAILS

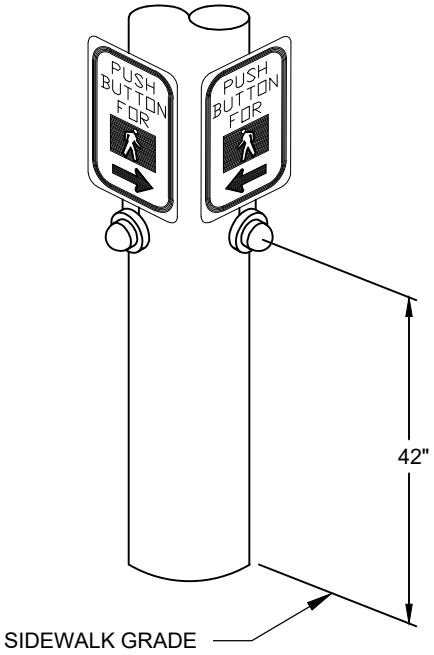
PRIVATE ADDRESS SIGN DETAIL

FILE NAME: SD432.DWG | DETAIL NUMBER: **432**

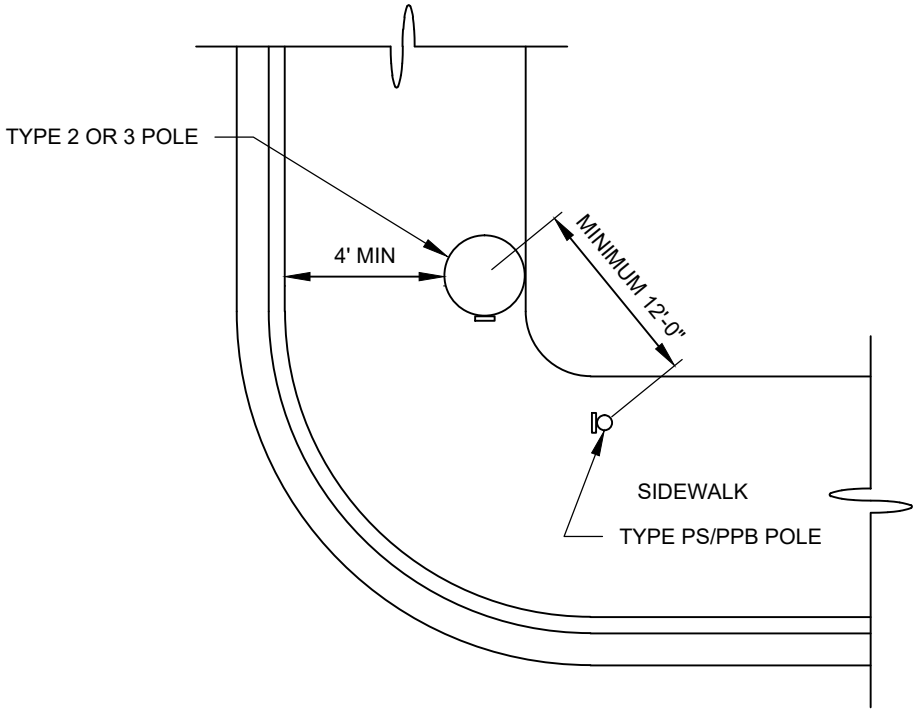
DocuSign Envelope ID: F681597A-CCE8-405B-ACDB-A8564C559739



STYLE H-1
NTS



STYLE ADA
NTS



PLAN VIEW
NTS

NOTES:

1. PEDESTRIAN PUSH - BUTTON SHALL BE ACCESSIBLE STYLE UNLESS OTHERWISE SPECIFIED IN THE PLANS.
2. SEE TYPICAL PLACEMENT OF PED BUTTON POLES PER MUTCD FIGURE 4E-4 OPTION B OR D, FOR POLE PLACEMENT LOCATION RELATIVE TO WHEELCHAIR RAMPS.

Paul S. Cho

APPROVED BY: PAUL S. CHO
TRAFFIC OPERATIONS SAFETY AND ENGINEERING MANAGER

REVISION DATE: MARCH 01, 2020

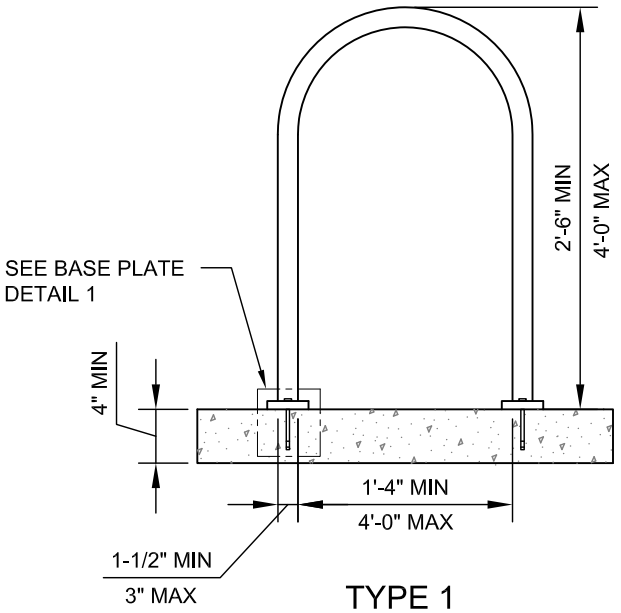
CityofRedmond
WASHINGTON

STANDARD DETAILS

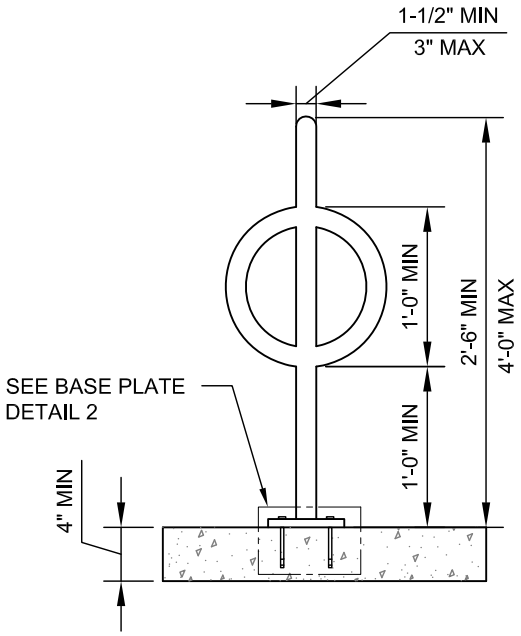
PEDESTRIAN PUSH BUTTON ORIENTATION

FILE NAME: SD453.DWG | DETAIL NUMBER: **453**

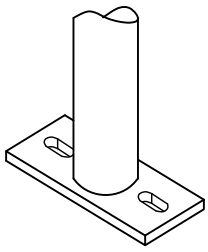
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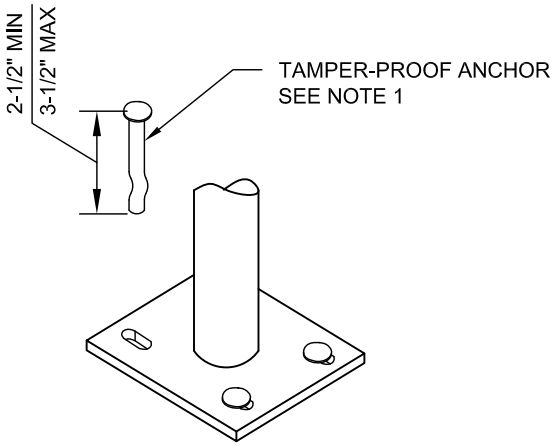
TYPE 1
NTS



TYPE 2
NTS



BASE PLATE DETAIL 1
NTS



BASE PLATE DETAIL 2
NTS

NOTES:

1. SECURE RACKS TO CONCRETE WITH TAMPER-PROOF ANCHORS AS PROVIDED BY VENDOR, OR CONCRETE SPIKES. ANCHOR HEAD WILL BE SIZED TO SECURED RACK AND BETWEEN 2-1/2" AND 3-1/2" LONG.
2. THE HOLES HAVE TO BE AT LEAST 6" AWAY FROM ANY CRACKS IN THE BASE MATERIAL.
3. OTHER BICYCLE RACKS MAY BE APPROVED BY THE TRANSPORTATION ENGINEER.

Donald Cairns

APPROVED BY: DONALD CAIRNS
TRANSPORTATION PLANNING AND ENGINEERING MANAGER

REVISION DATE: JULY 01, 2014

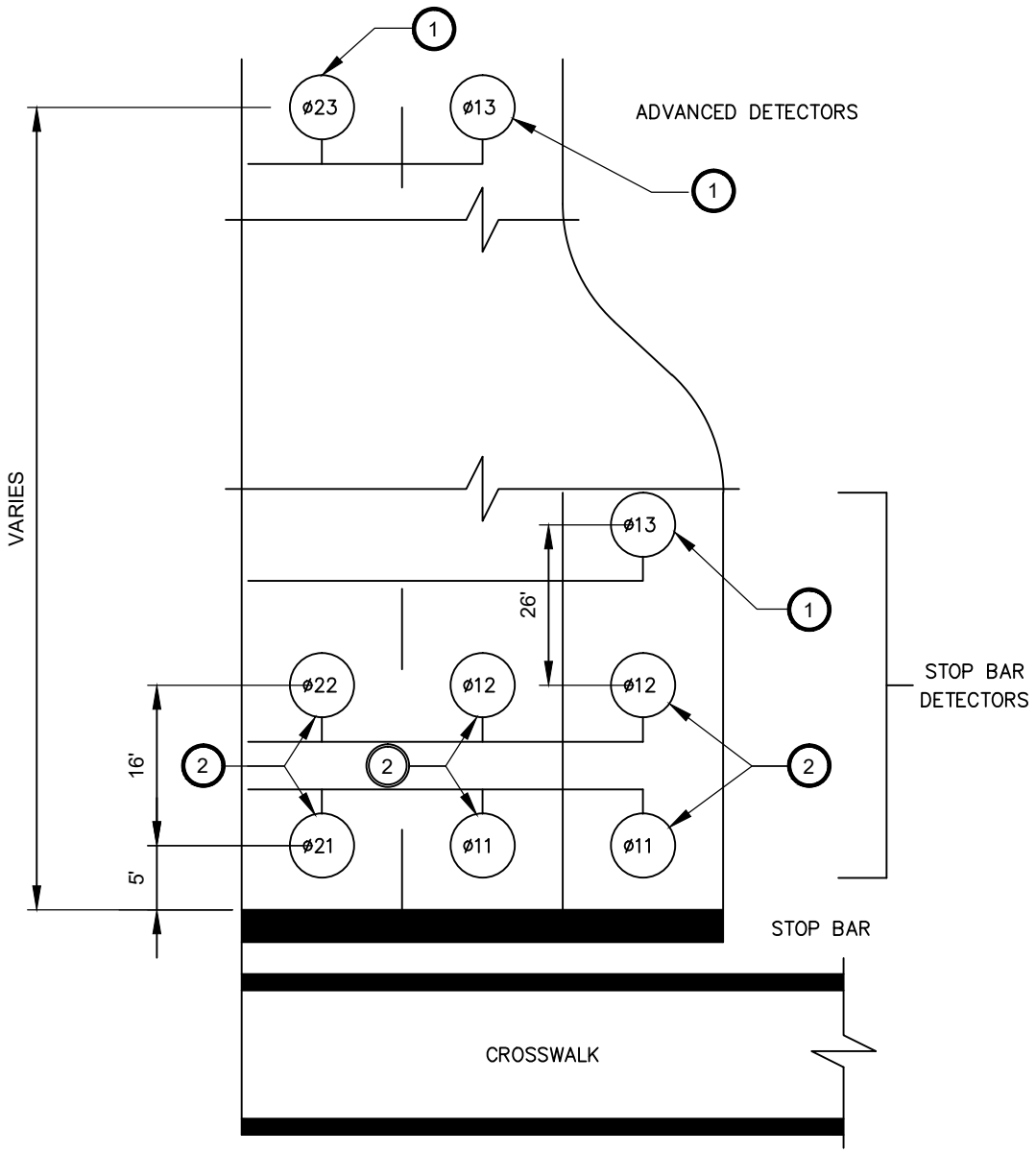
CityofRedmond
WASHINGTON

STANDARD DETAILS

APPROVED BICYCLE RACKS

FILE NAME: SD454.DWG | DETAIL NUMBER: **454**

DocuSign Envelope ID: F681597A-CCE8-405B-ACDB-A8564C559739



NOTES:

1. SPLICE INDIVIDUAL LEADS TO SHIELDED, TWISTED CONDUCTOR PAIR IN ADJACENT JUNCTION BOX.
2. CONNECT DETECTOR LEADS IN SERIES AND SPLICE TO SHIELDED, TWISTED CONDUCTOR PAIR IN ADJACENT JUNCTION BOX.
3. LOOPS TO BE CENTERED IN LANES.
4. NUMBER CORRESPONDS TO THE PHASE NUMBER AS SHOWN ON THE DESIGN.
5. SEE STANDARD DETAIL 455, 456 AND WSDOT STANDARD PLAN J-50 FOR LOOP CONSTRUCTION DETAILS. SEE STANDARD DETAIL 311A AND 311B FOR CROSSWALK AND STOP LINE DETAILS.
6. FINAL LOOP LOCATION TO BE APPROVED BY THE ENGINEER.

Paul S. Cho

APPROVED BY: PAUL S. CHO
TRAFFIC OPERATIONS SAFETY AND ENGINEERING MANAGER

REVISION DATE: MARCH 01, 2020

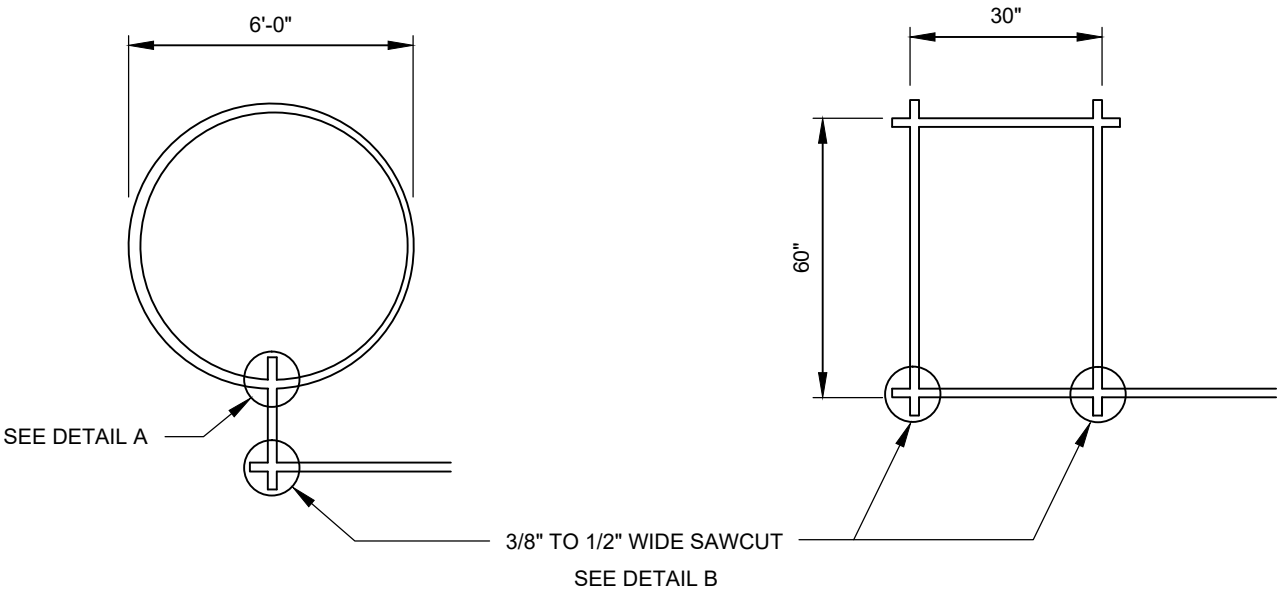
CityofRedmond
WASHINGTON

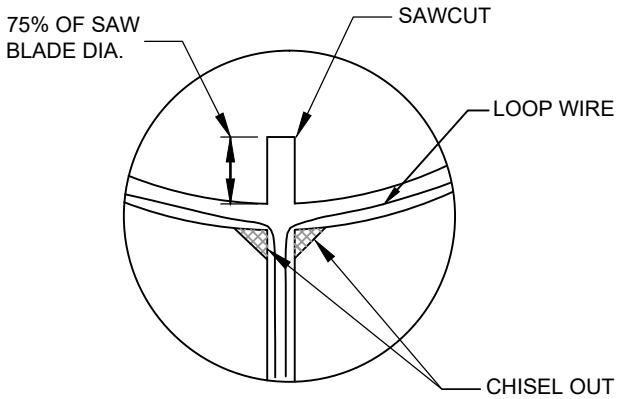
STANDARD DETAILS

LOOP DETECTOR NUMBERING AND SPACING

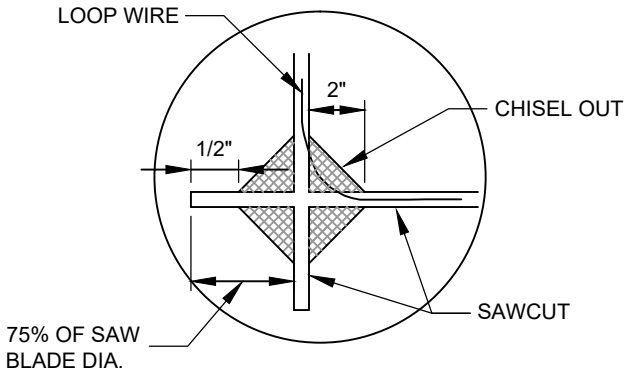
FILE NAME: SD454A.DWG | DETAIL NUMBER: **454A**

DocuSign Envelope ID: F681597A-CCE8-405B-ACDB-A8564C559739





DETAIL A
NTS



DETAIL B
NTS

NOTES:

1. DEPTH OF SAWCUT SHALL BE 2.5" UNLESS SPECIFIED OTHERWISE (2.75" AT PAVEMENT JOINTS)
2. ALL AREAS WHERE LOOP WIRES ARE TO BE PLACED SHALL HAVE A UNIFORM DEPTH AND SMOOTHNESS.
3. LOOP SEALANT SHALL BE CRAFCO MSI 34271. APPLY PER MANUFACTURE'S RECOMMENDATIONS.
4. ALL LOOPS SHALL HAVE 4 TURNS OF WIRE.
5. BICYCLE LOOPS SHALL HAVE 5 TURNS OF WIRE.
6. SAWCUT SHALL BE CONSTRUCTED TO MINIMIZE NUMBER OF BENDS BETWEEN LOOPS AND THE ADJACENT BOX.

Paul S. Cho

APPROVED BY: PAUL S. CHO
TRAFFIC OPERATIONS SAFETY AND ENGINEERING MANAGER

REVISION DATE: MARCH 01, 2020

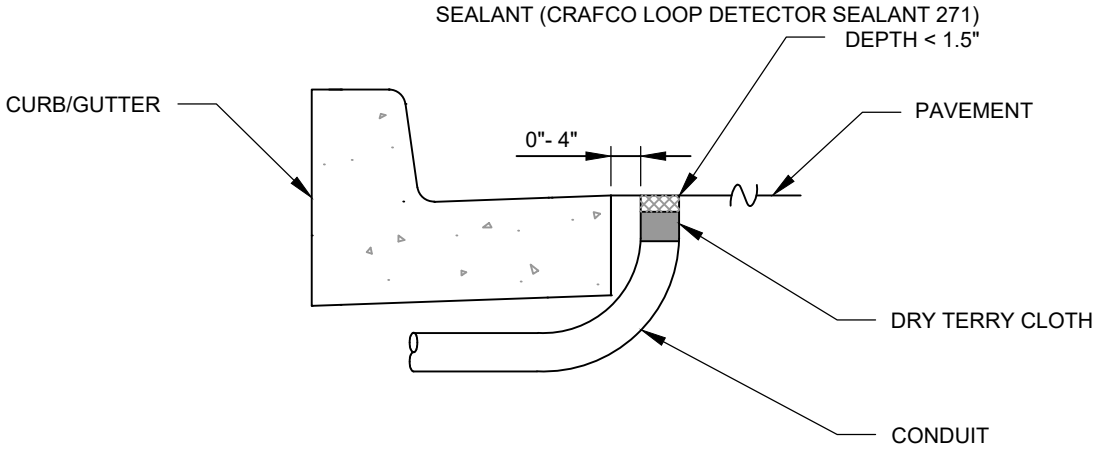
CityofRedmond
WASHINGTON

STANDARD DETAILS

LOOP DETECTOR SAWCUT

FILE NAME: SD455.DWG | DETAIL NUMBER: **455**

DocuSign Envelope ID: F681597A-CCE8-405B-ACDB-A8564C559739

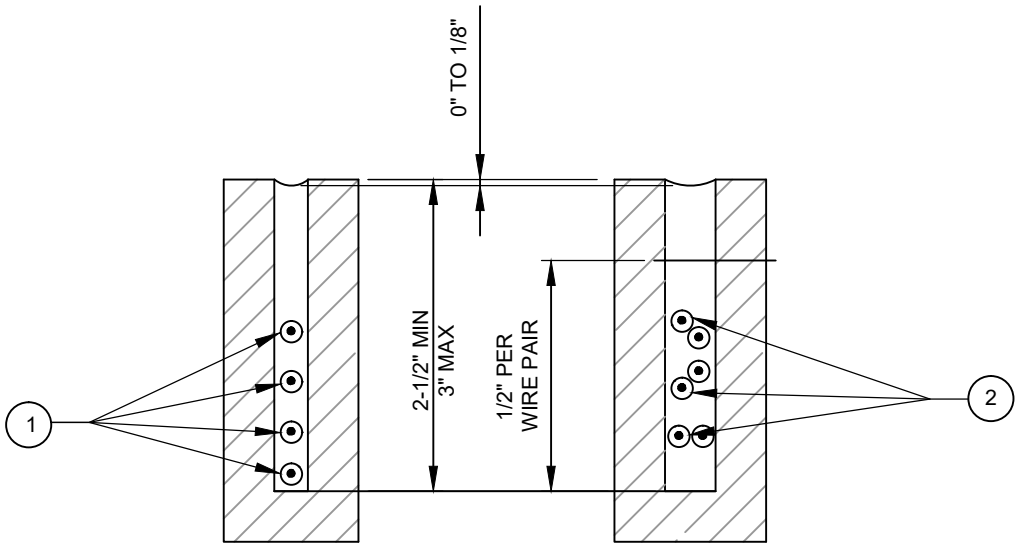


CONDUIT UNDER CURB

NTS

NOTE:

HOLES > 3-1/2" DIA. REQUIRE AN ASPHALT PATCH.
ASPHALT SHALL BE HMA FOR PAVEMENT REPAIR.



1/4" LOOP SAWCUT

NTS

1/2" LEAD-IN SAWCUT

NTS

CROSS-SECTION OF SAWCUTS

NTS

NOTES:

1. LOOP WIRE - NUMBER VARIES. (SEE LOOP WINDING DETAILS)
2. LEAD - IN WIRES: ONE PAIR FOR EACH LOOP SERVED. THREE PAIRS MAXIMUM PER SAWCUT.
3. EXTEND SAWCUT SUFFICIENT LENGTH TO PROVIDE FULL DEPTH AROUND CORNER.
4. STOP BAR DETECTION STUB-OUT TYPICALLY 13 FEET FROM STOP LINE.

Paul S. Cho

APPROVED BY: PAUL S. CHO
TRAFFIC OPERATIONS SAFETY AND ENGINEERING MANAGER

REVISION DATE: MARCH 01, 2020

CityofRedmond
WASHINGTON

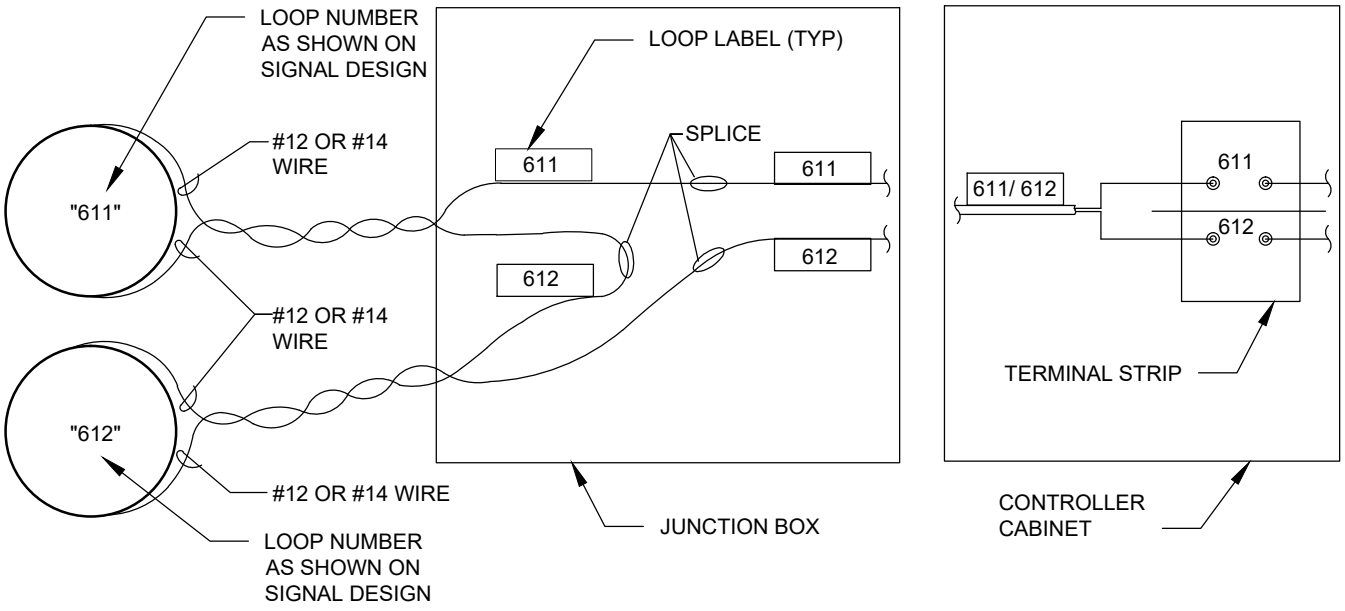
STANDARD DETAILS

SAWCUT AND CONDUIT UNDER CURB

FILE NAME: SD456.DWG

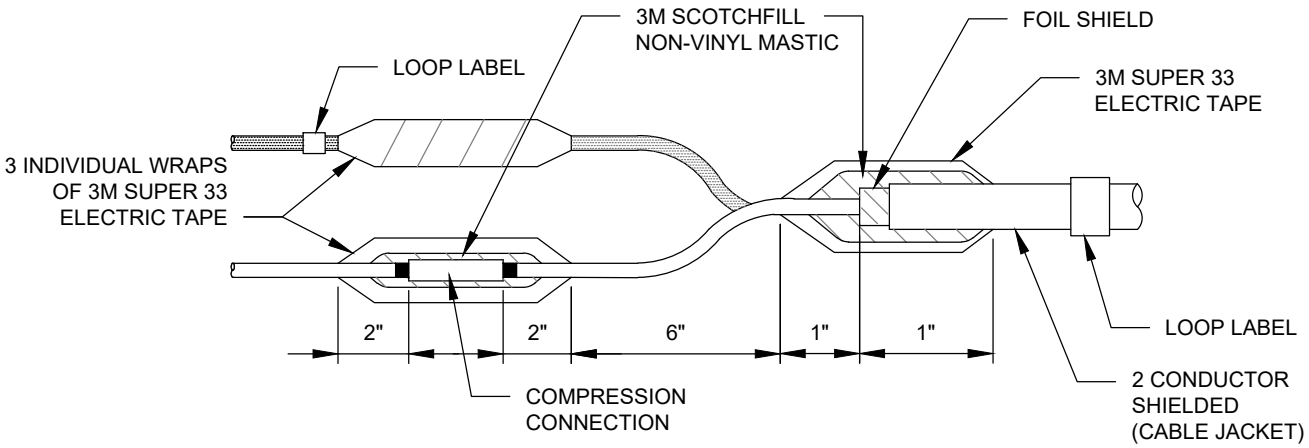
DETAIL NUMBER: **456**

DocuSign Envelope ID: F681597A-CCE8-405B-ACDB-A8564C559739



LOOP WIRE LABELING DETAIL

NTS



LOOP SPLICE DETAIL

NTS

Paul S. Cho

APPROVED BY: PAUL S. CHO
TRAFFIC OPERATIONS SAFETY AND ENGINEERING MANAGER

REVISION DATE: MARCH 01, 2020

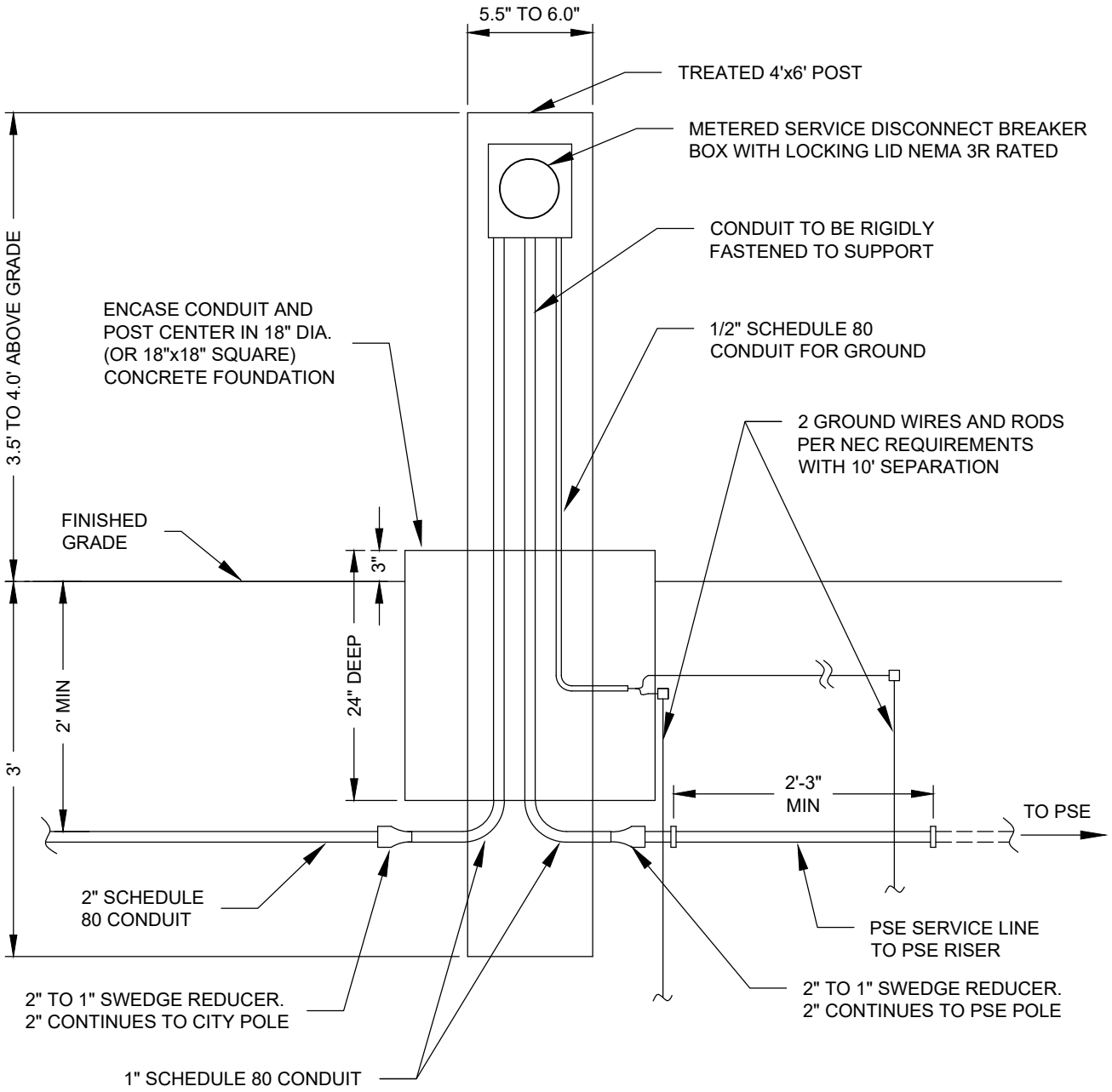
CityofRedmond
WASHINGTON

STANDARD DETAILS

LOOP DETECTOR SPLICE AND WIRING LABEL

FILE NAME: SD457.DWG | DETAIL NUMBER: **457**

DocuSign Envelope ID: F681597A-CCE8-405B-ACDB-A8564C559739



SERVICE DISCONNECT DETAIL

NTS

NOTES:

1. CONTRACTOR SHALL COORDINATE POWER SERVICE CONNECTION WITH PUGET SOUND ENERGY (PSE) AND CITY OF REDMOND.
2. SEE SPECIFICATION 9-29.24(1) FOR SERVICE DISCONNECT CABINET TYPE.

Paul S. Cho

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STANDARD DETAILS

SERVICE DISCONNECT DETAIL

FILE NAME: SD458.DWG | DETAIL NUMBER: **458**

DocuSign Envelope ID: F681597A-CCE8-405B-ACDB-A8564C559739

NOTES:

1. CABINET FOUNDATION SHALL BE CLASS 3000 AIR ENTRAINED CONCRETE.
2. WHERE CABINET FOUNDATION IS LOCATED ADJACENT TO A SIDEWALK, CONSTRUCT THE TOP FLUSH WITH SIDEWALK GRADE, OMITTING CHAMFER WHERE TOP AND SIDEWALK ABUT.
3. FOUNDATION DESIGN IS TYPICAL, CONTRACTOR SHALL UTILIZE CABINET MANUFACTURER'S SPECIFICATIONS TO ASSURE PROPER FIT OF CABINET ON BASE WITH RESPECT TO CONDUIT PLACEMENT. ENGINEER MUST APPROVE FORM WORK BEFORE PLACEMENT OF CONCRETE.
4. EXPANSION ANCHOR BOLTS (KWIK-BOLT, WEJ-IT, OR EQUAL) MAY BE USED TO FIT CABINETS TO EXISTING FOUNDATION.
5. SILICON SEAL SHALL BE PLACED BETWEEN CABINET AND BASE.
6. SEE PLANS FOR DOOR ORIENTATION.
7. A SPARE 3"ø CONDUIT SHALL BE INSTALLED FROM CONTROLLER CABINET TO NEAREST J-BOX.
8. A 1"ø CONDUIT SHALL BE INSTALLED UNDER SERVICE CABINET FOR GROUND.
9. IF UPS CABINET NOT PART OF PROJECT, INSTALL CITY FURNISHED CAP FOR EXPOSED CONDUITS.

Paul S. Cho

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STANDARD DETAILS

CABINET FOUNDATION

FILE NAME: SD459A.DWG | DETAIL NUMBER: **459A**

DocuSign Envelope ID: F681597A-CCE8-405B-ACDB-A8564C559739

NOTES:

1. CABINET FOUNDATION SHALL BE CLASS 3000 AIR ENTRAINED CONCRETE.
2. WHERE CABINET FOUNDATION IS LOCATED ADJACENT TO A SIDEWALK, CONSTRUCT THE TOP FLUSH WITH SIDEWALK GRADE, OMITTING CHAMFER WHERE TOP AND SIDEWALK ABUT.
3. FOUNDATION DESIGN IS TYPICAL, CONTRACTOR SHALL UTILIZE CABINET MANUFACTURER'S SPECIFICATIONS TO ASSURE PROPER FIT OF CABINET ON BASE WITH RESPECT TO CONDUIT PLACEMENT. INSPECTOR MUST APPROVE FORM WORK BEFORE PLACEMENT OF CONCRETE.
4. EXPANSION ANCHOR BOLTS (KWIK-BOLT, WEJ-IT, OR EQUAL) MAY BE USED TO FIT CABINETS TO EXISTING FOUNDATION.
5. SILICON SEAL SHALL BE PLACED BETWEEN CABINET AND BASE.
6. SEE PLANS FOR DOOR ORIENTATION.
7. A SPARE 3"ø CONDUIT SHALL BE INSTALLED FROM CONTROLLER CABINET TO NEAREST J-BOX.
8. A 1"ø CONDUIT SHALL BE INSTALLED UNDER SERVICE CABINET FOR GROUND.

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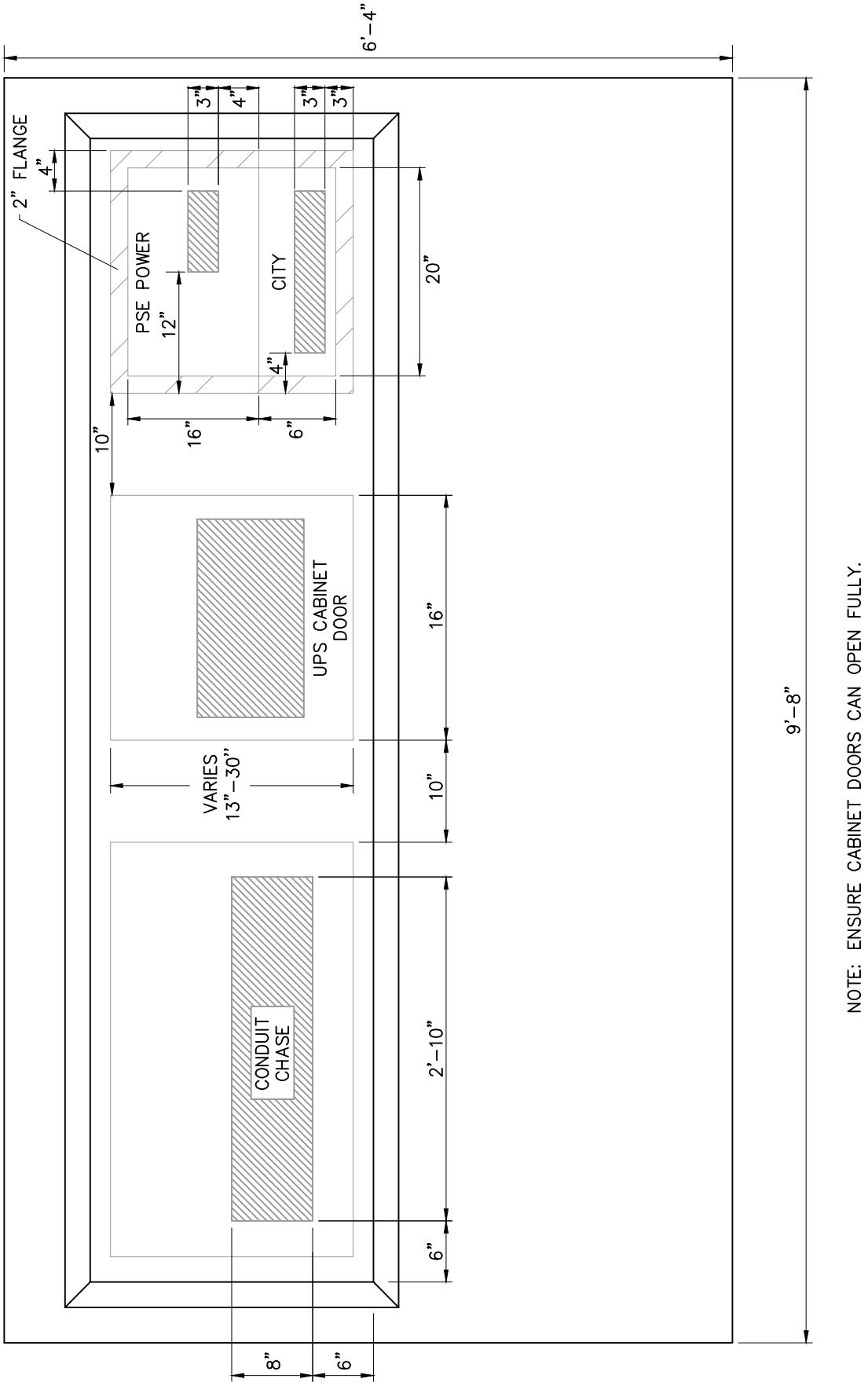
CityofRedmond WASHINGTON

STANDARD DETAILS

SERVICE CABINET FOUNDATION

FILE NAME: SD459C.DWG | DETAIL NUMBER: **459C**

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STANDARD DETAILS

CONTROLLER AND SERVICE CABINET FOOTPRINT

FILE NAME: SD460.DWG | DETAIL NUMBER: **460**

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COMPONENT SCHEDULE

1. METER BASE: 200 AMP, BYPASS TYPE, 4 JAW, SINGLE PHASE, WITH 5TH JAW INSTALLED AT 9:00 POSITION, B–LINE U264

2. PANELBOARD: 120/240 VAC, 1 PHASE, 3 WIRE, 250 AMP COPPER BUS (WITH RATING LABEL), MAIN BREAKER 200A FRAME, 125 AMP TRIP, 2 POLE, EATON ED2125 65K AIC SERIES RATED BOLT–ON BRANCH BREAKERS, EATON TYPE BAB, 12 CKT
   - 3–15/2 ILLUMINATION BRANCH
   - 2–20/1 SPARE (IF TRAFFIC SIGNAL USED, REPLACE ONE WITH 1–50/1)
   - 1–15/1 CONTROL BRANCH

3. CONTACTORS: SQUARE D 8910DPA32V02U1, LIGHTING RATED, 30 AMP, 2 POLE, 120 VAC COIL

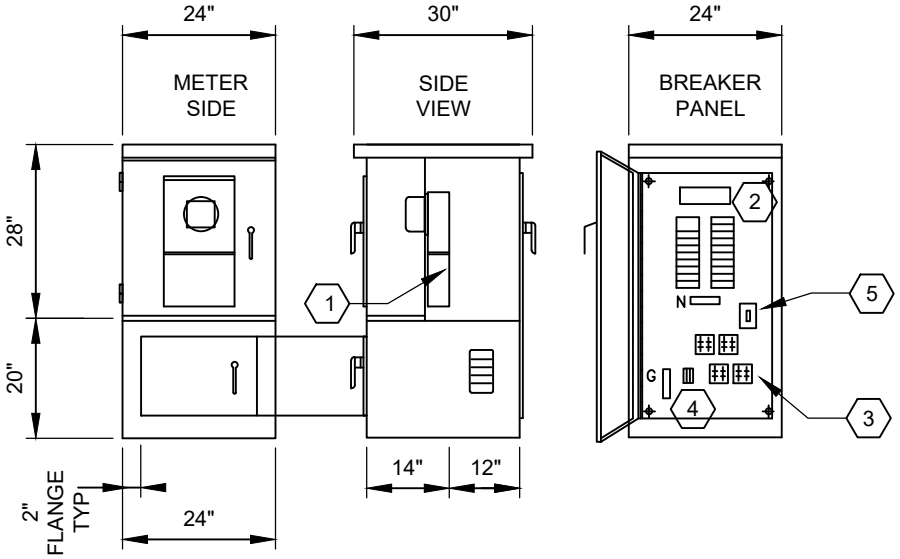
4. TERMINAL BLOCK: FOR FIELD WIRE CONNECTION TO REMOTE PHOTOCELL

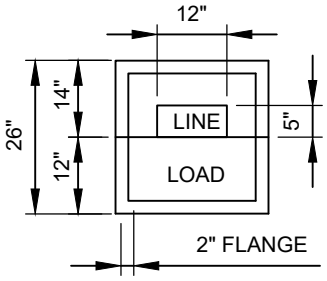
5. PHOTOCELL BYPASS SWITCH: LEVETON 1223–2W, SPDT, 20 AMP, 277 VAC 3–WAY SWITCH

CABINET: NEMA 3R PADMOUNT, 1/8" ALUMINUM 5052–H32 CONSTRUCTION, TWO (2) SCREENED AND GASKETED VENTS

DOORS: HEAVY DUTY HINGES (LIFT–OFF TYPE), WELDED IN PLACE, STAINLESS STEEL VAULT HANDLES, PADLOCKABLE METER DOOR, BEST BRAND MODEL CX LOCK ON DISTRIBUTION DOOR, POLISHED WIRE GLASS WINDOW IN METER DOOR, CLOSED CELL NEOPRENE GASKET, CARD HOLDER

FINISH: OUTSIDE FINISH SHALL BE ANSI 61 GRAY POLYESTER POWDERCOAT OVER ZINC PRIME. INSIDE AND DEADFRONT SHALL BE WHITE.

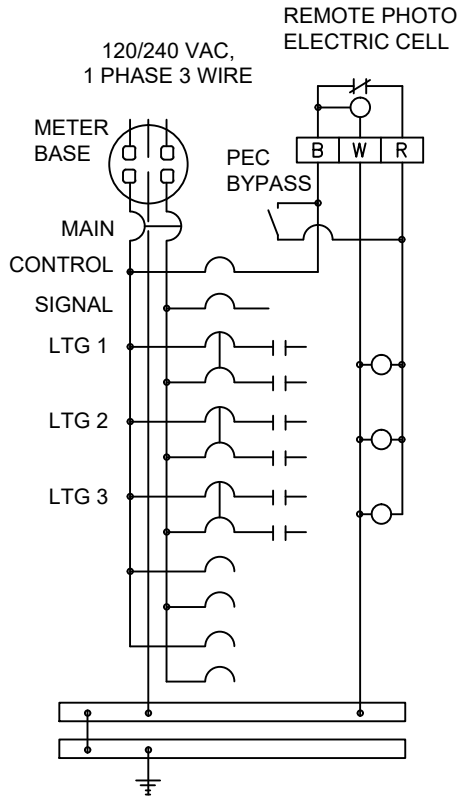




UL LISTED PER STANDARD #508A
SUITABLE FOR USE AS SERVICE ENTRANCE

CITY OF REDMOND SERVICE CABINET SERIES
SKYLINE ELECTRIC AND MFG COMPANY
MODEL NO. 47995–R5
JUNE 7, 2017

SERVICE CABINET
NTS



WIRING SCHEMATIC
NTS

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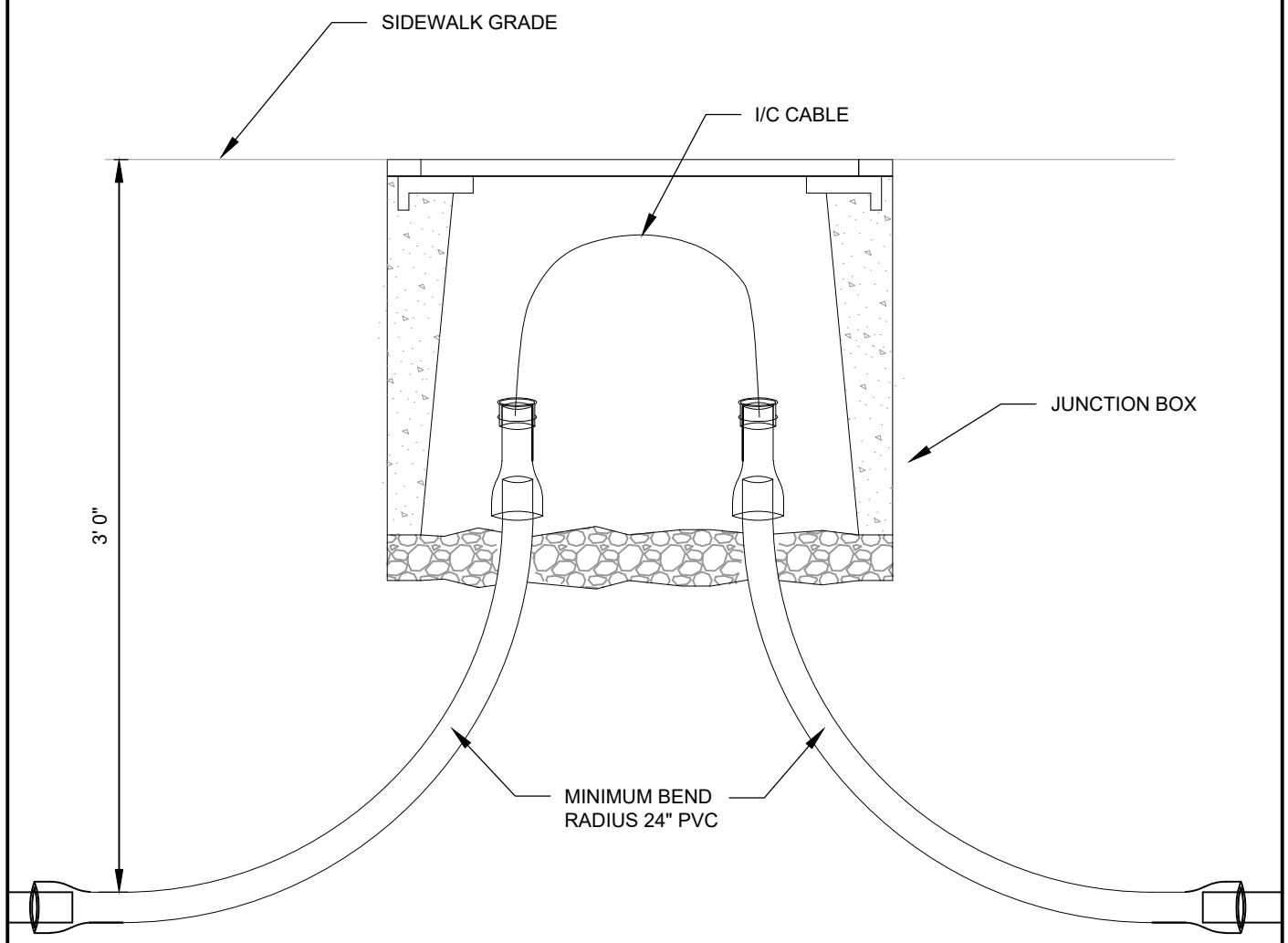
CityofRedmond WASHINGTON

STANDARD DETAILS

SERVICE CABINET

FILE NAME: SD461.DWG | DETAIL NUMBER: **461**

DocuSign Envelope ID: F681597A-CCE8-405B-ACDB-A8564C559739



NOTES:

1. CONDUIT PLACEMENT SHALL FACILITATE 2' - 0" MINIMUM CABLE BEND.
2. STANDARD DETAIL 464 FOR JUNCTION BOX IN SOFT AREAS.
3. ALL EMPTY OR CONDUITS WITH FIBER OPTICS MUST HAVE DETECTABLE MULE TAPE.

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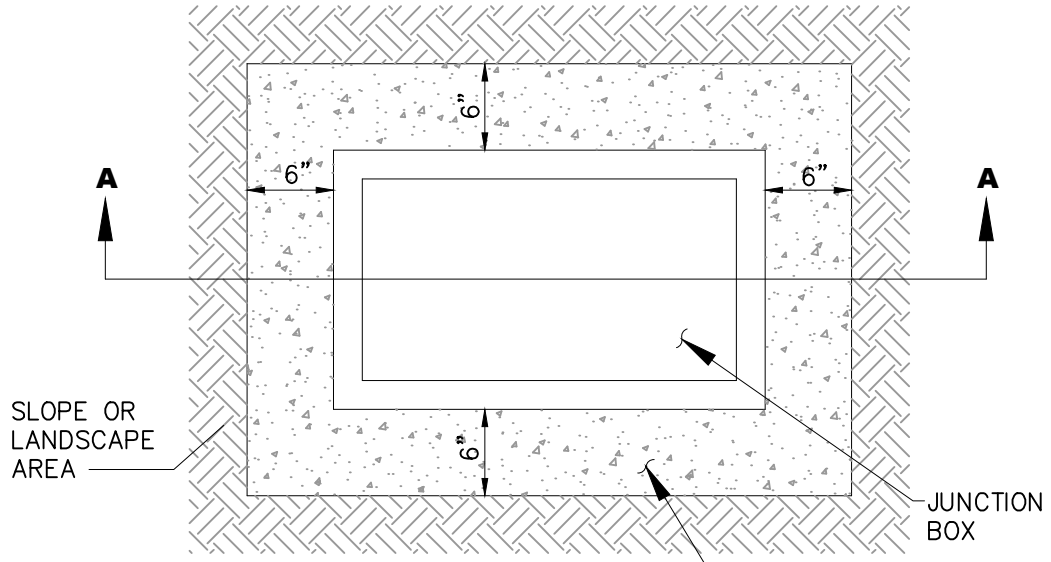
STANDARD DETAILS

INTERCONNECT CABLE AND CONDUIT JUNCTION BOX

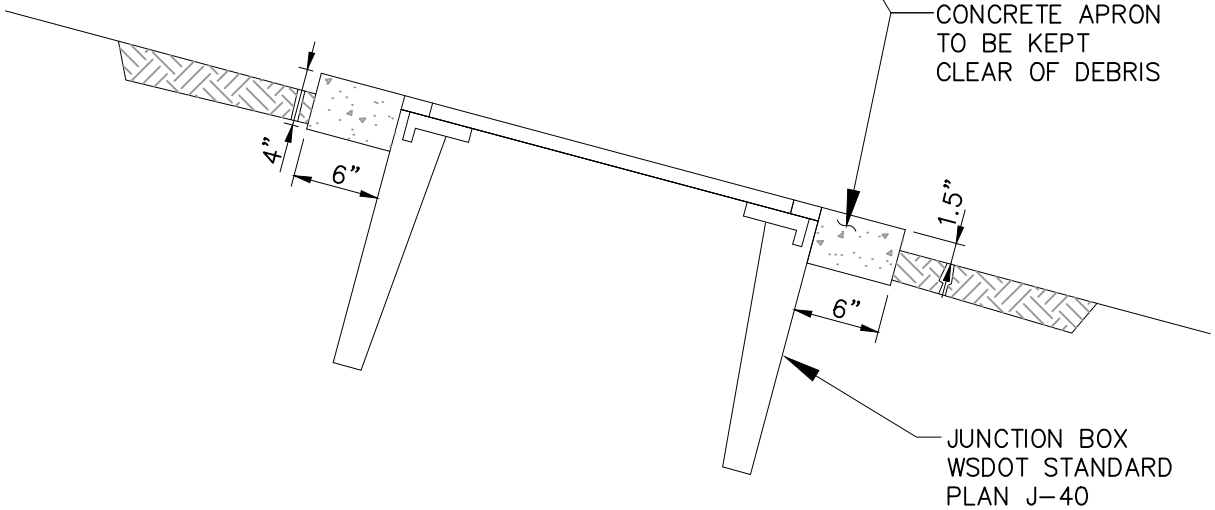
FILE NAME: SD462.DWG | DETAIL NUMBER: **462**

DocuSign Envelope ID: F681597A-CCE8-405B-ACDB-A8564C559739

JUNCTION BOX ON SLOPE OR LANDSCAPE AREAS



PLAN VIEW
NTS



SECTION A-A
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FOR NEW CONSTRUCTION AND MODIFICATION OF EXISTING J-BOX

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TRAFFIC OPERATIONS SAFETY AND ENGINEERING MANAGER

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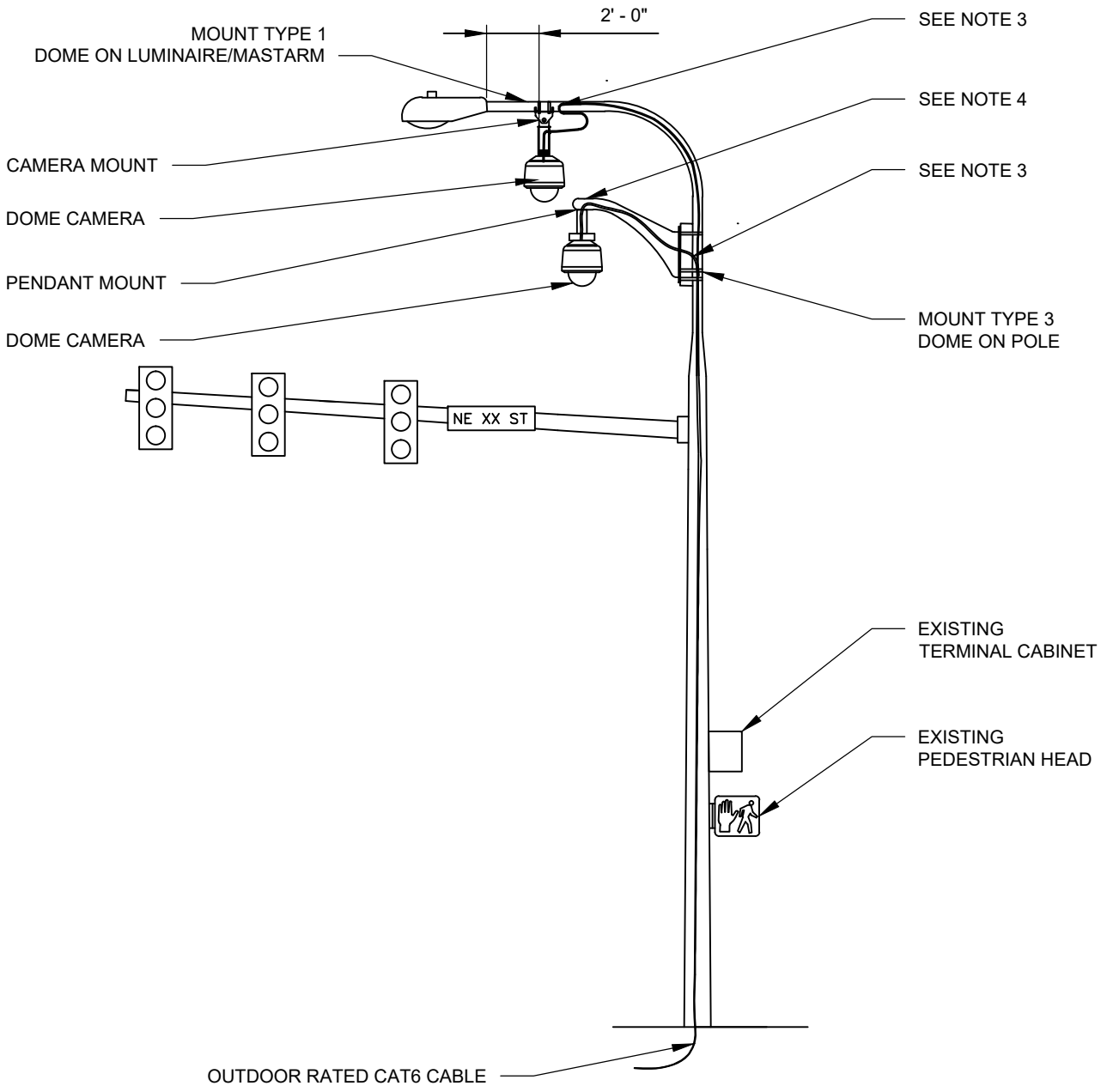
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STANDARD DETAILS

JUNCTION BOX ON SLOPE OR SOFT AREAS

FILE NAME: SD464.DWG | DETAIL NUMBER: **464**

DocuSign Envelope ID: F681597A-CCE8-405B-ACDB-A8564C559739



NOTES:

1. THE CONTRACTOR SHALL CONNECT A RJ45 CONNECTOR TO CAT6 CABLE AND CONNECT RJ45 TO PRE-TERMINATED CONNECTION ON THE CAMERA.
2. ATTACH POLE-MOUNTED CAMERAS DIRECTLY BELOW THE BEND IN THE LUMINAIRE ARM OR BELOW THE LUMINAIRE ARM ATTACHMENT POINT IF ONE EXISTS UNLESS OTHERWISE SPECIFIED ON THE PLANS.
3. DRILL 1.0-INCH TAPPED HOLE IN POLE, MAST ARM, OR LUMINAIRE ARM FOR CAMERA CABLE ENTRANCE. INSERT 1.0-INCH ALUMINUM THREADED STRAIN RELIEF TO PROTECT CABLE ENTERING POLE AND PROVIDE WATERTIGHT FIT.
4. THE WIRE ACCESS PANEL ON THE TOP OF THE PENDANT ARM SHALL BE PACKED WITH DUCT SEAL TO BLOCK MOISTURE PENETRATION.

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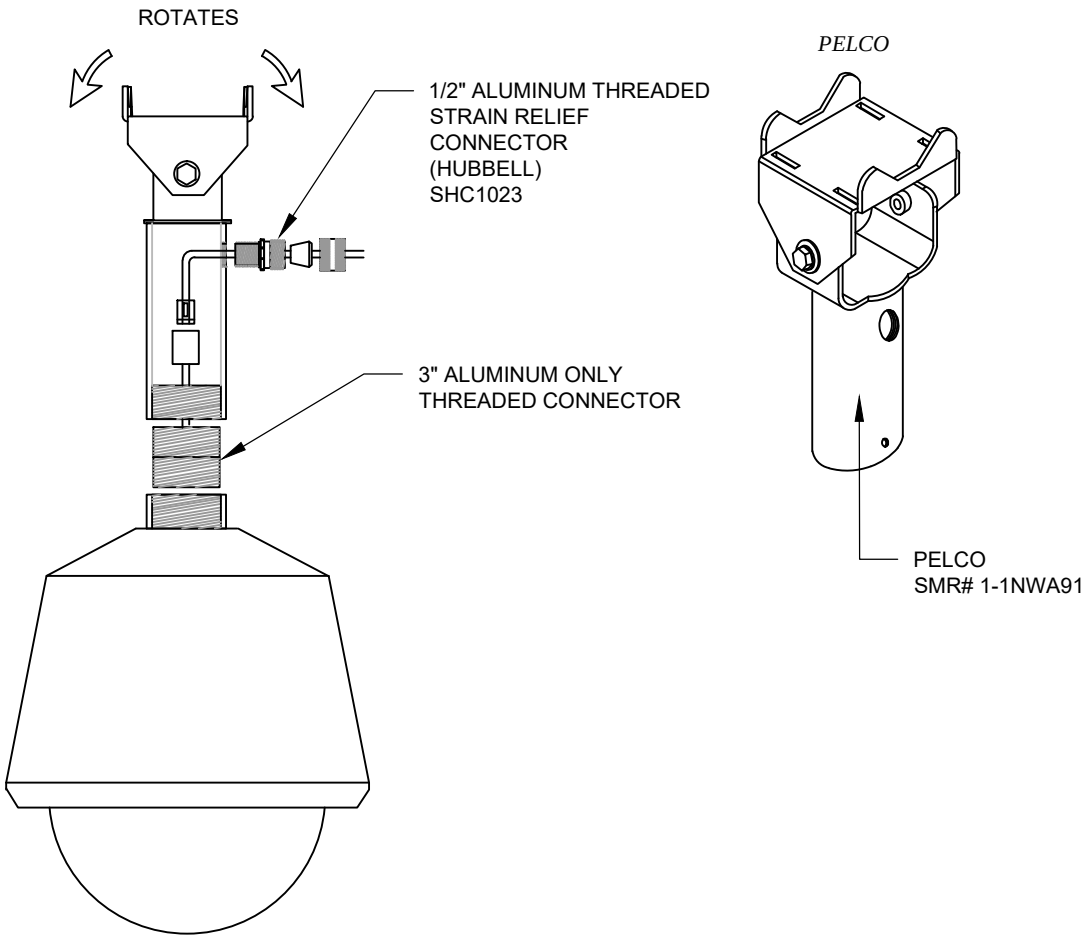
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STANDARD DETAILS

CCTV CAMERA MOUNTING

FILE NAME: SD465.DWG | DETAIL NUMBER: **465**

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CCTV VIDEO CABLE CONNECTION

NTS

NOTES:

INSERT OUTDOOR RATED CAT6 CABLE THROUGH CONNECTOR AND CAMERA HOUSING. LEAVE SUFFICIENT SLACK FOR THE PTZ CONNECTIONS.

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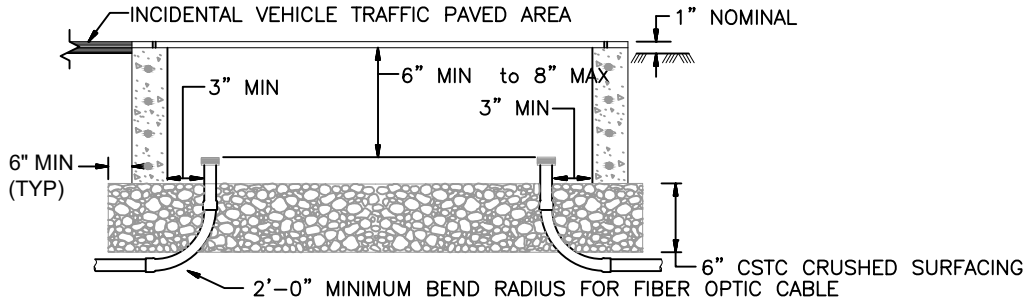
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STANDARD DETAILS

CCTV VIDEO CABLE CONNECTION

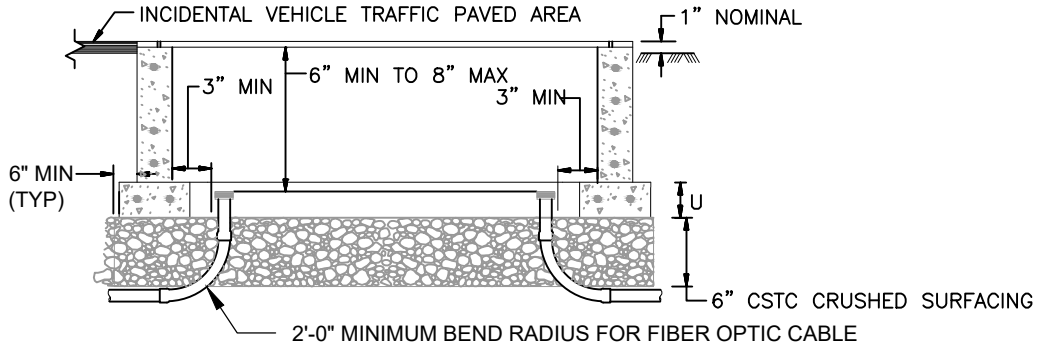
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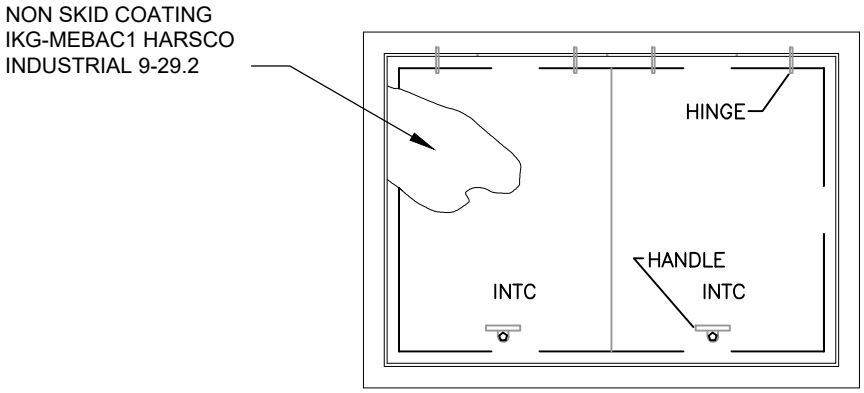
TYPE 1 OR 2 JUNCTION BOX INSTALLATION DETAIL

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TYPE 8 JUNCTION BOX INSTALLATION DETAIL

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DUAL LID DETAIL - TYPE 8

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STANDARD DETAILS

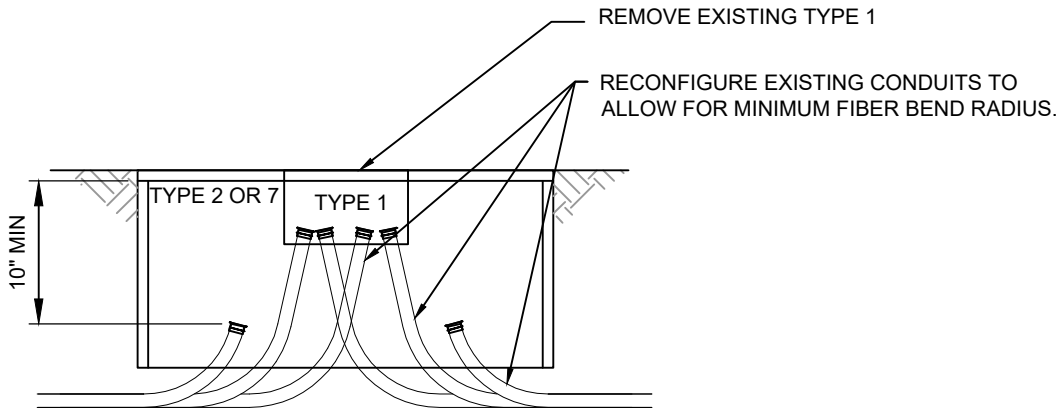
JUNCTION BOX DETAILS 1 OF 2

FILE NAME: SD467A.DWG | DETAIL NUMBER: **467A**

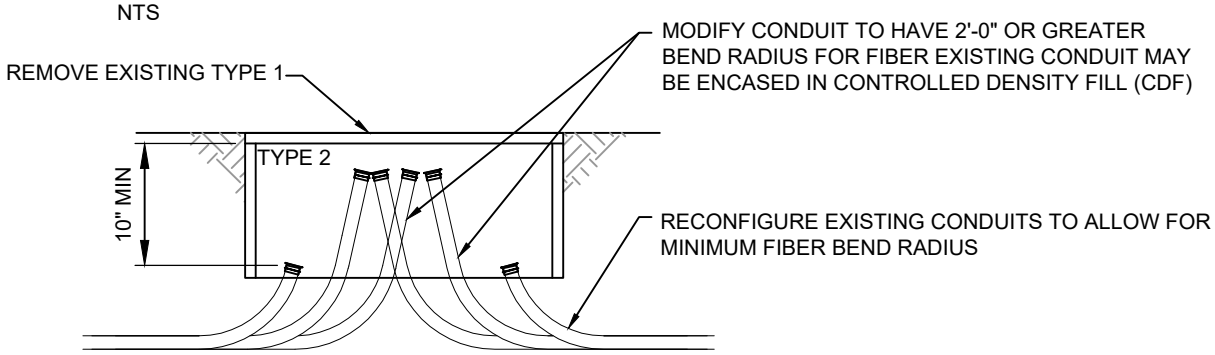
DocuSign Envelope ID: F681597A-CCE8-405B-ACDB-A8564C559739

NOTES:

1. ALL BOX DIMENSIONS ARE NOMINAL. EXACT CONFIGURATIONS VARY AMONG DIFFERENT MANUFACTURERS.
2. THE NOTED LID THICKNESS ARE OVERALL MINIMUMS. THE DIAMOND PATTERN FOR TYPE 1 AND 2 BOXES SHALL BE 28% MINIMUM OF OVERALL THICKNESS. THE DIAMOND PATTERN FOR TYPE 7 BOXES SHALL HAVE A MINIMUM THICKNESS OF $\frac{3}{32}$"
3. LID SUPPORT MEMBERS SHALL BE $\frac{3}{16}$" MIN. THICK STEEL C, L OR T SHAPE WELDED TO THE FRAME.
4. WHEN SPECIFIED IN THE CONTRACT, TYPE 2 AND TYPE 7 BOXES SHALL BE PROVIDED WITH 12" DEEP EXTENSION BOXES.
5. A $\frac{1}{4}$" NC X $\frac{3}{4}$" STAINLESS STEEL GROUND STUD WITH S.S. NUT SHALL BE WELDED TO THE BOTTOM OF THE LID.
6. SEE THE STANDARD SPECIFICATIONS FOR ALTERNATE USE OF REINFORCEMENT.
7. WHEN REPLACING AN EXISTING JUNCTION BOX, THE END OF EACH EXISTING CONDUIT FOR NEW FIBER OPTIC CABLE INSTALLATION SHALL BE CUT BACK AND REPLACED WITH A 45 DEGREE FACTORY BEND WITH A MINIMUM 24" BENDING RADIUS. IF NECESSARY, EXISTING CABLES SHALL BE DISCONNECTED, REMOVED, LABELED, REINSTALLED AND RECONNECTED BY CONTRACTOR. COR SHALL BE NOTIFIED AT LEAST 3 WORKING DAYS PRIOR TO ANY WORK IN A COR CABINET.
8. JUNCTION BOX PLACED IN STREET SHALL BE H-35 TRAFFIC BEARING OR HIGHER.
9. THE TYPE 7 LIDS SHALL BE GALVANIZED AND BOTH LIDS SHALL BE BONDED. HINGES SHALL ALLOW THE LID TO OPEN 180°.
10. ALL CONDUIT SHALL HAVE BELL ENDS.
11. JUNCTION BOXES WITHIN SIDEWALK SHALL HAVE NON-SKID LIDS. IKG-MEBAC1 HARSCO INDUSTRIAL.
12. EXISTING JUNCTION BOXES WITHIN SIDEWALK SHALL BE RETROFITTED WITH NON-SKID LIDS.
13. EXISTING JUNCTION BOXES THAT ARE MODIFIED INCLUDING NEW CONDUCTORS PULLED SHALL MEET CURRENT GROUNDING AND BONDING REQUIREMENTS.



TYPE 1 CONVERSION TO TYPE 2 OR 7
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TYPE 2 RECONFIGURATION
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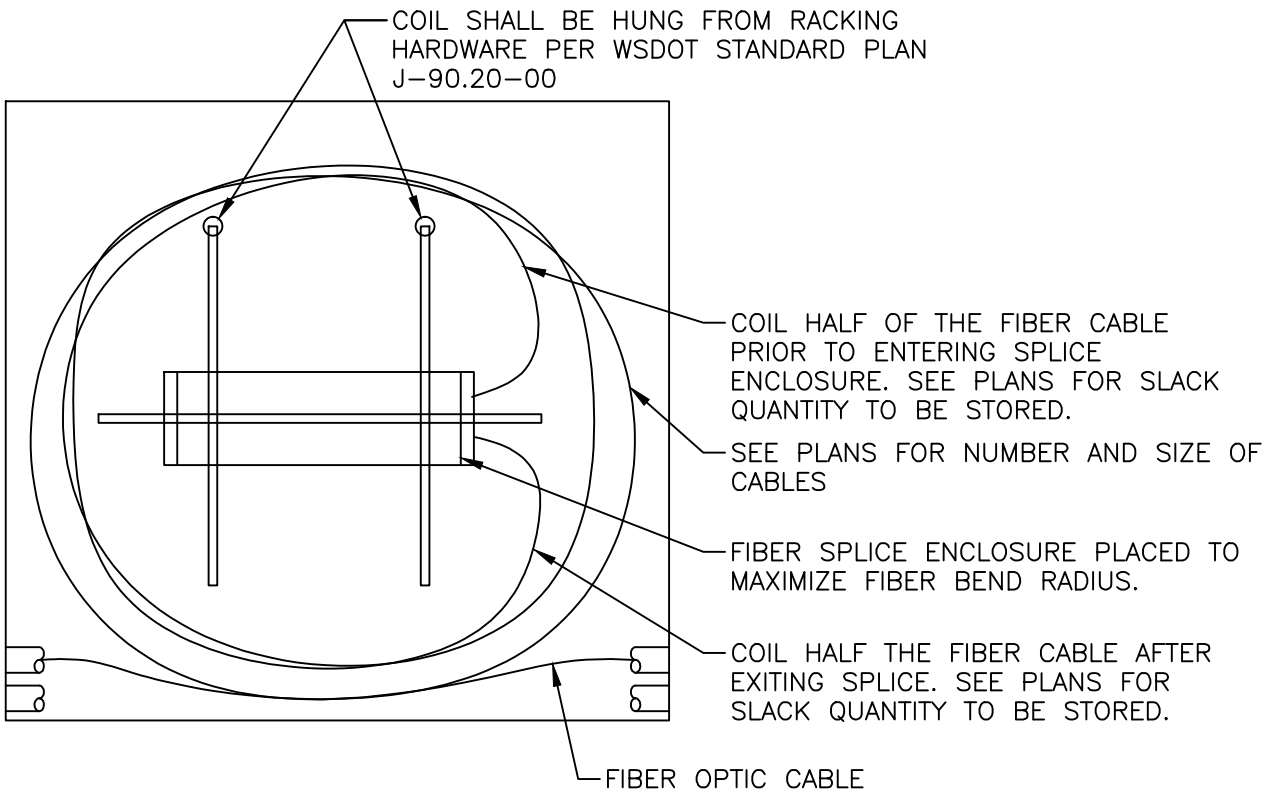
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STANDARD DETAILS

JUNCTION BOX DETAILS 2 OF 2

FILE NAME: 467B.DWG | DETAIL NUMBER: **467B**

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FIBER SPLICE ENCLOSURE AND CABLE STORAGE

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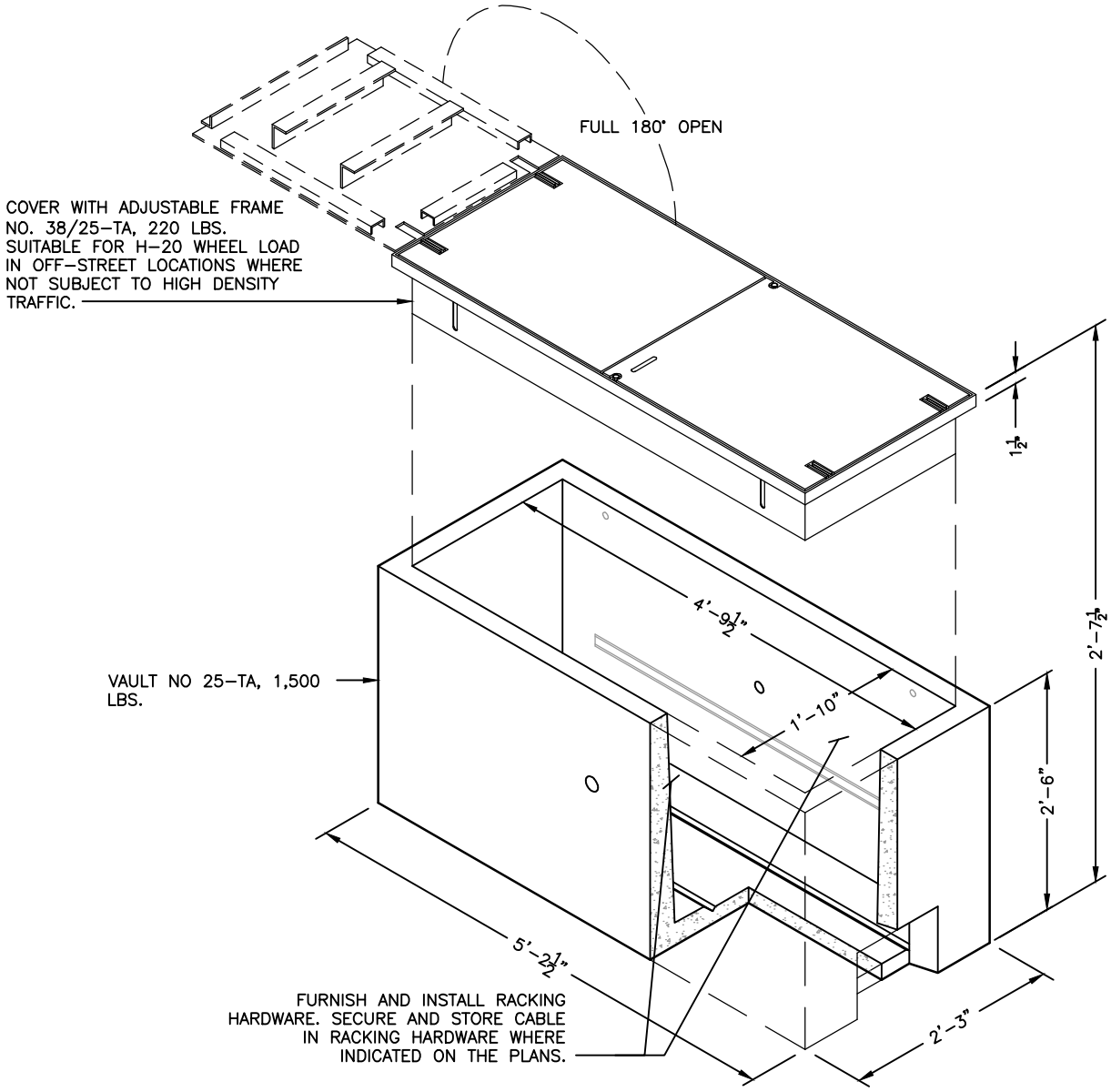
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STANDARD DETAILS

FIBER SPLICE AND STORAGE DETAILS 1 OF 2

FILE NAME: SD468B.DWG | DETAIL NUMBER: **468B**

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25-TA VAULT

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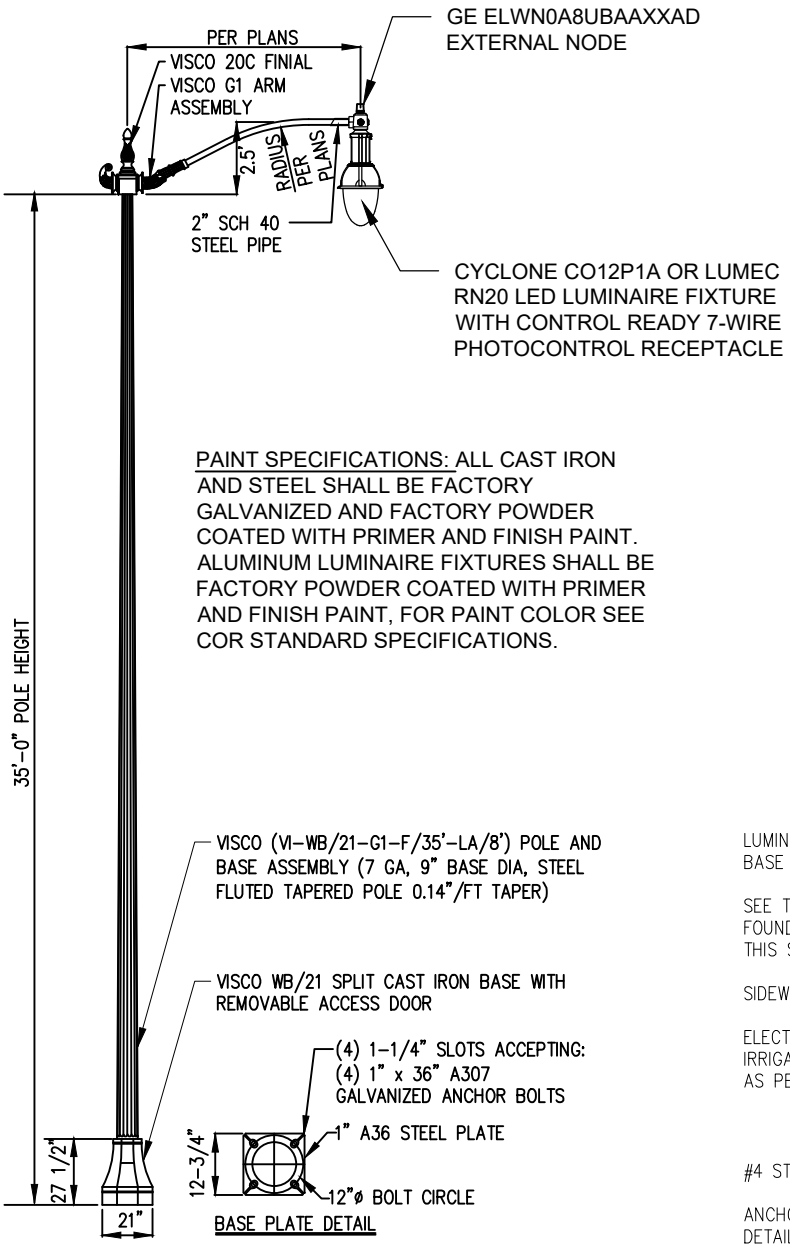
CityofRedmond WASHINGTON

STANDARD DETAILS

FIBER SPLICE AND STORAGE DETAILS 2 OF 2

FILE NAME: SD468C.DWG | DETAIL NUMBER: **468C**

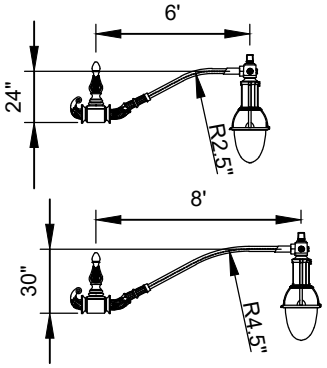
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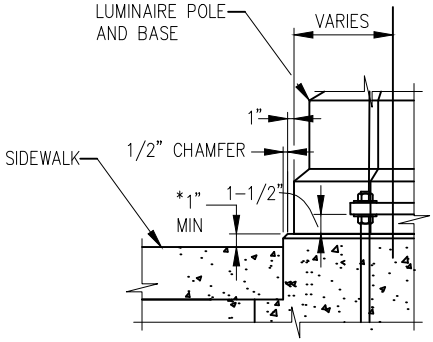


PAINT SPECIFICATIONS: ALL CAST IRON AND STEEL SHALL BE FACTORY GALVANIZED AND FACTORY POWDER COATED WITH PRIMER AND FINISH PAINT. ALUMINUM LUMINAIRE FIXTURES SHALL BE FACTORY POWDER COATED WITH PRIMER AND FINISH PAINT, FOR PAINT COLOR SEE COR STANDARD SPECIFICATIONS.

ROADWAY LUMINARE AND POLE

NTS

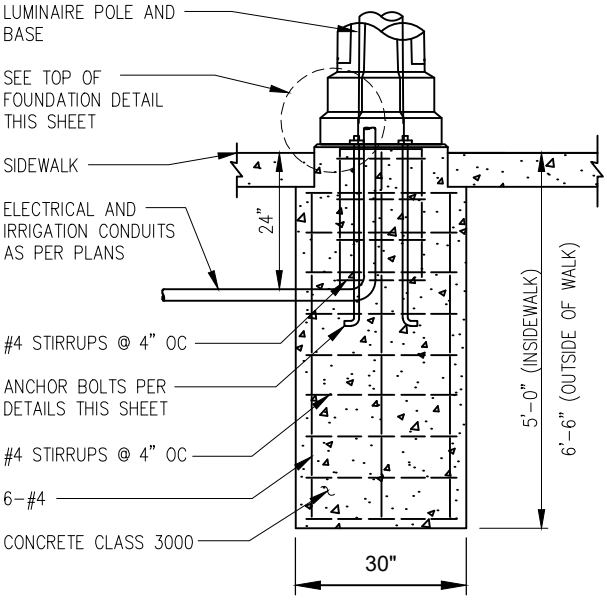




*TOP OF FOUNDATION TO BE LEVEL, 1" MIN HEIGHT ABOVE TOP OF SIDEWALK

TOP OF FOUNDATION DETAIL

NTS



NOTES:

1. HAND HOLE ACCESS DOOR SHALL BE MOUNTED AT 270"
2. HAND HOLE ACCESS DOOR FOR RECEPTACLE SHE BE MOUNTED AT 90*

LUMINAIRE POLE AND FOUNDATION DETAIL

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Paul S. Cho

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TRAFFIC OPERATIONS SAFETY AND ENGINEERING MANAGER

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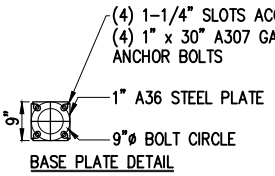
STANDARD DETAILS

ROADWAY LUMINAIRE AND POLE

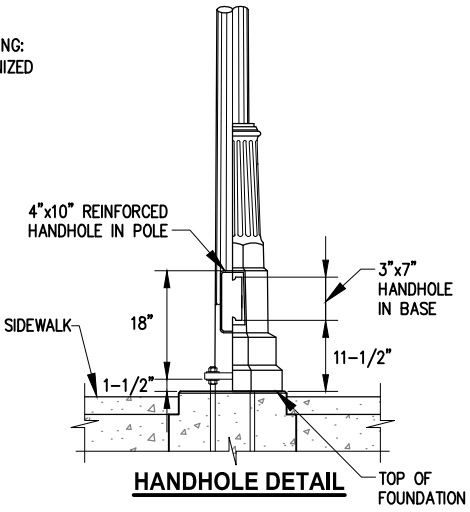
FILE NAME: SD470.DWG | DETAIL NUMBER: **470**

DocuSign Envelope ID: F681597A-CCE8-405B-ACDB-A8564C559739

PAINT SPECIFICATIONS: ALL CAST IRON AND STEEL SHALL BE FACTORY GALVANIZED AND FACTORY POWDER COATED WITH PRIMER AND FINISH PAINT. ALUMINUM LUMINAIRE FIXTURES SHALL BE FACTORY POWDER COATED WITH PRIMER AND FINISH PAINT, FOR PAINT COLOR SEE COR STANDARD SPECIFICATIONS.

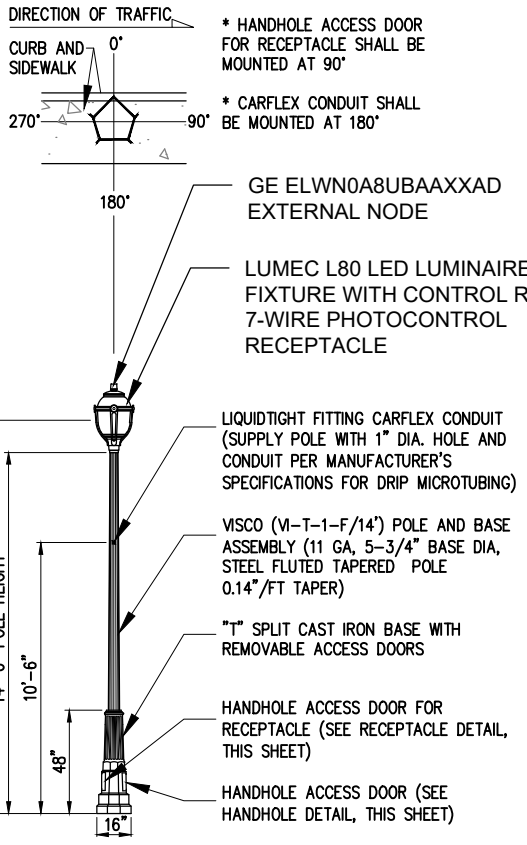


BASE PLATE DETAIL

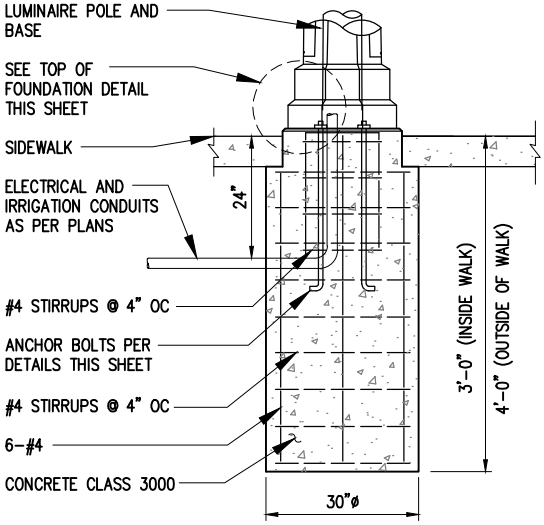


HANDHOLE DETAIL

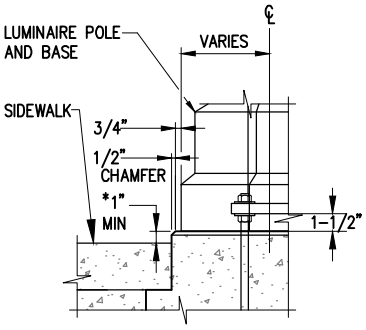
LEGEND:
* HANDHOLE ACCESS DOOR SHALL BE MOUNTED AT 270°
* HANDHOLE ACCESS DOOR FOR RECEPTACLE SHALL BE MOUNTED AT 90°
* CARFLEX CONDUIT SHALL BE MOUNTED AT 180°



PEDESTRIAN LUMINAIRE AND POLE

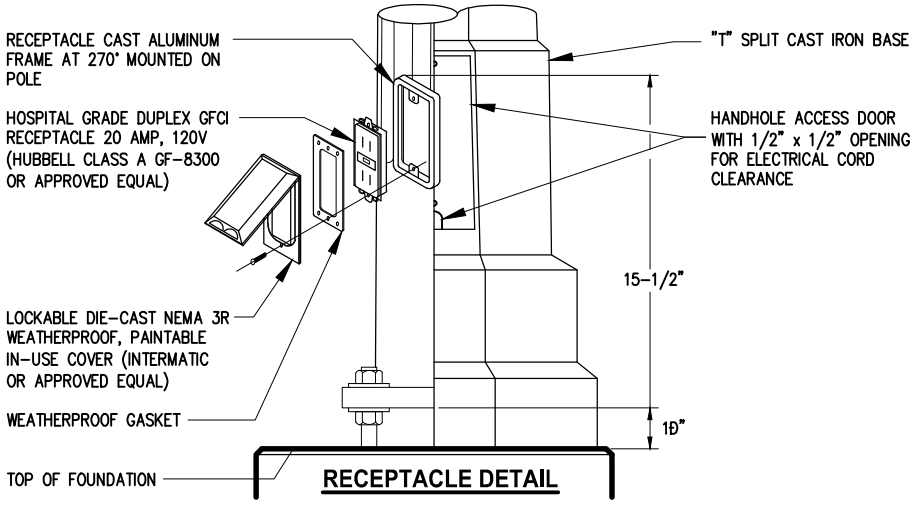


LUMINAIRE POLE FOUNDATION DETAIL



* TOP OF FOUNDATION TO BE LEVEL, 1" MIN HEIGHT ABOVE TOP OF SIDEWALK

TOP OF FOUNDATION DETAIL



RECEPTACLE DETAIL

APPROVED BY: PAUL S. CHO
TRAFFIC OPERATIONS SAFETY AND ENGINEERING MANAGER

REVISION DATE: MARCH 01, 2020

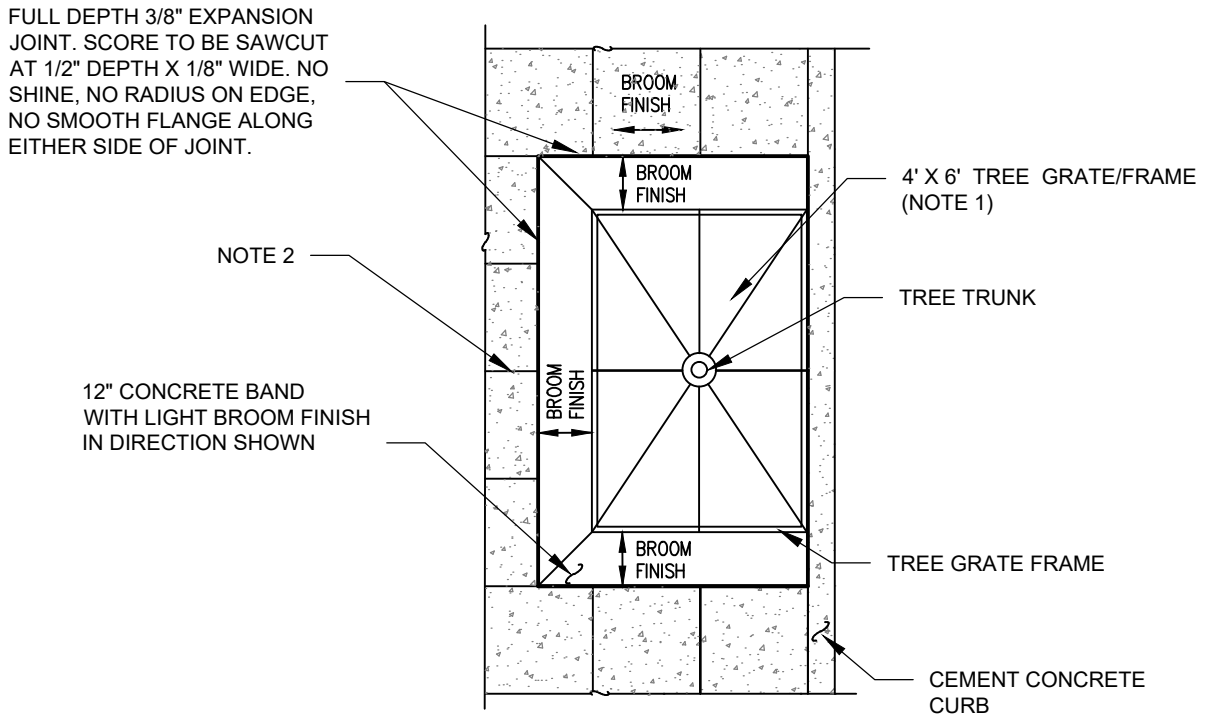
CityofRedmond WASHINGTON

STANDARD DETAILS

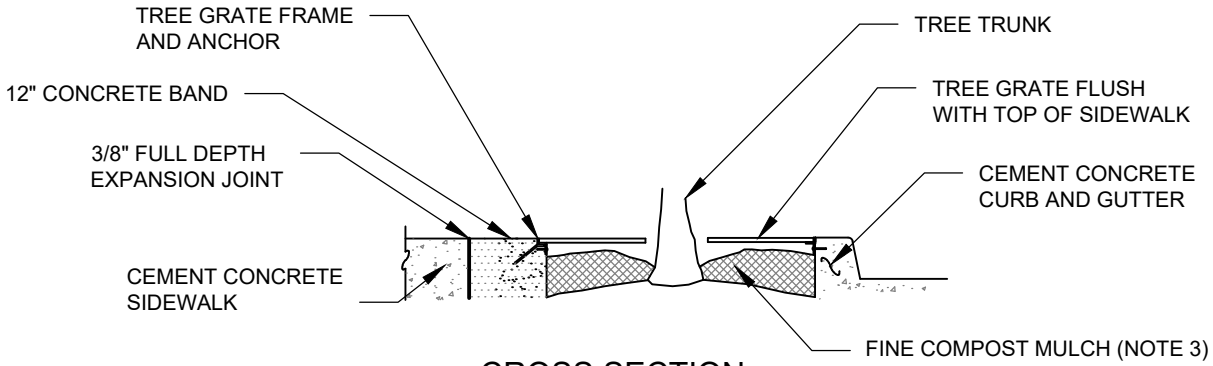
PEDESTRIAN LUMINAIRE AND POLE

FILE NAME: SD471.DWG | DETAIL NUMBER: **471**

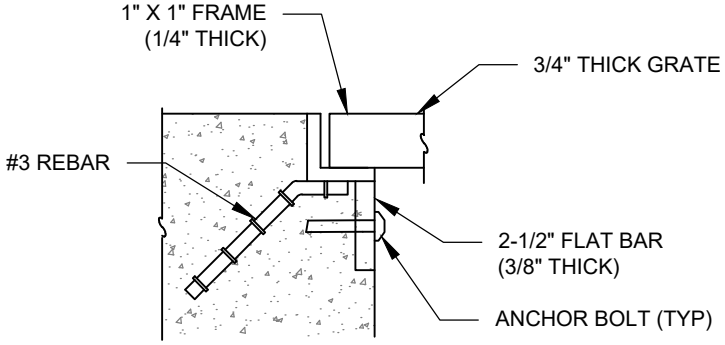
DocuSign Envelope ID: F681597A-CCE8-405B-ACDB-A8564C559739



PLAN VIEW
NTS



CROSS SECTION
NTS



ANCHOR DETAIL
NTS

NOTES:

1. TREE GRATE/FRAME AS APPROVED BY CITY ENGINEER.
2. SEE STANDARD DETAIL 303B FOR SIDEWALK SCORING.
3. SEE STANDARD DETAIL 907 FOR STRUCTURAL SOIL FOR STREET TREES.

APPROVED BY: DONALD CAIRNS
TRANSPORTATION PLANNING AND ENGINEERING MANAGER

REVISION DATE: MARCH 01, 2018

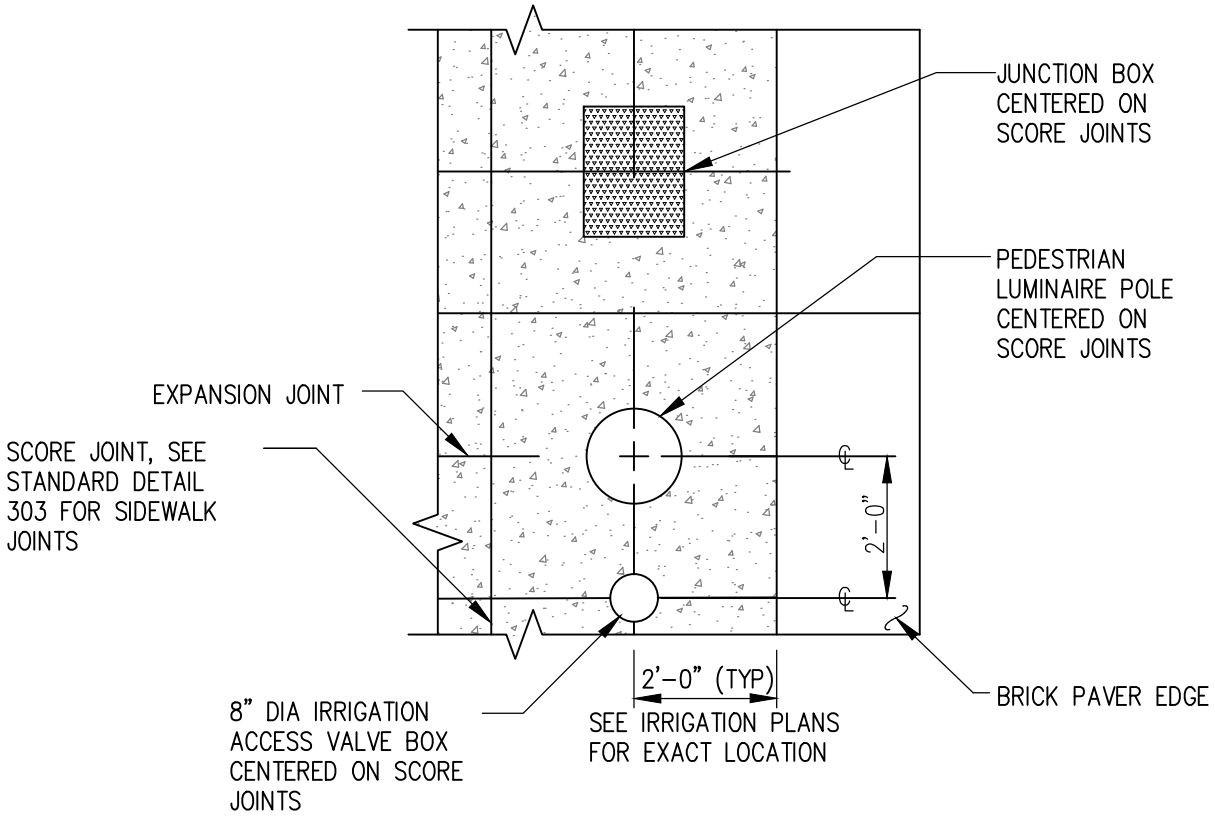
CityofRedmond WASHINGTON

STANDARD DETAILS

DOWNTOWN AND OVERLAKE TREE GRATE DETAIL FOR FURNITURE ZONES

FILE NAME: SD473.DWG | DETAIL NUMBER: **473**

DocuSign Envelope ID: F681597A-CCE8-405B-ACDB-A8564C559739



PEDESTRIAN LUMINAIRE LOCATION AND PAVEMENT SCORING
NTS

Donell Cairns

APPROVED BY: DONALD CAIRNS
TRANSPORTATION PLANNING AND ENGINEERING MANAGER

REVISION DATE: MARCH 01, 2020

CityofRedmond WASHINGTON

STANDARD DETAILS

PEDESTRIAN LUMINAIRE LOCATION AND PAVEMENT SCORING

FILE NAME: SD474.DWG | DETAIL NUMBER: **474**

DocuSign Envelope ID: F681597A-CCE8-405B-ACDB-A8564C559739

NOTES:

1. PLACE RUMBLE STRIP ACROSS ENTIRE ROADWAY WIDTH IF NO CENTERLINE EXISTS.
2. LEGEND MATERIAL USED SHALL BE THERMOPLASTIC, HOT APPLIED OR HEAT FUSED PREFORMED (90 MIL. MIN.), UNLESS APPROVED BY THE ENGINEER.

RUMBLE STRIP
NTS

RUMBLE STRIP WITH
25 MPH LEGEND
NTS

25 MPH LEGEND
NTS

Paul S. Cho

APPROVED BY: PAUL S. CHO
TRAFFIC OPERATIONS SAFETY AND ENGINEERING MANAGER

REVISION DATE: MARCH 01, 2020

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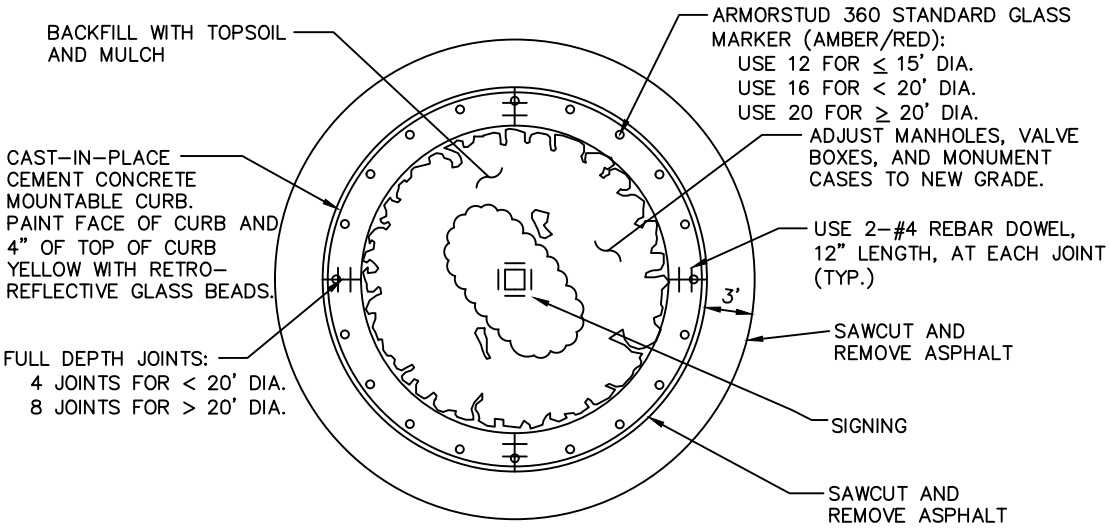
STANDARD DETAILS

RUMBLE STRIP AND 25 MPH LEGEND

FILE NAME: SD476.DWG

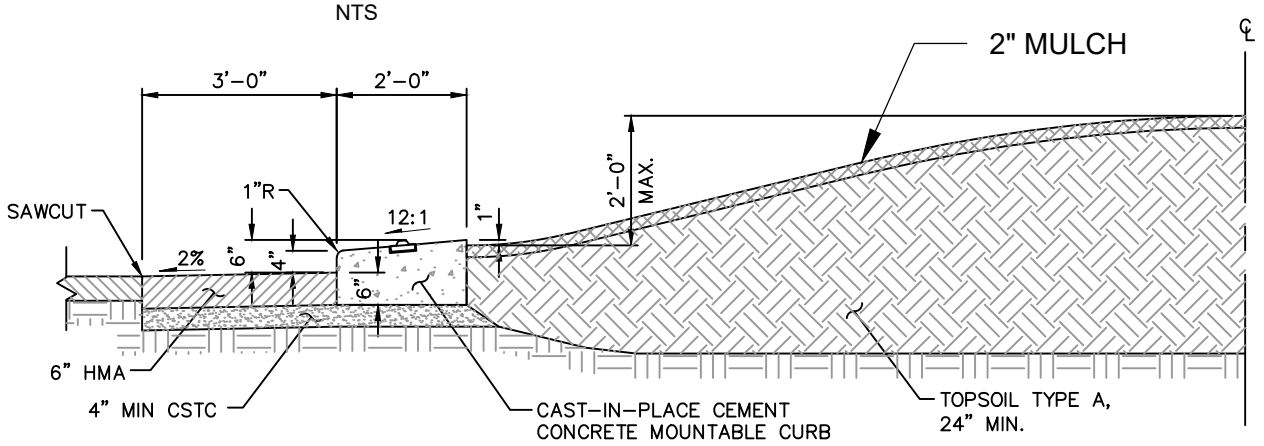
DETAIL NUMBER: **476**

DocuSign Envelope ID: F681597A-CCE8-405B-ACDB-A8564C559739



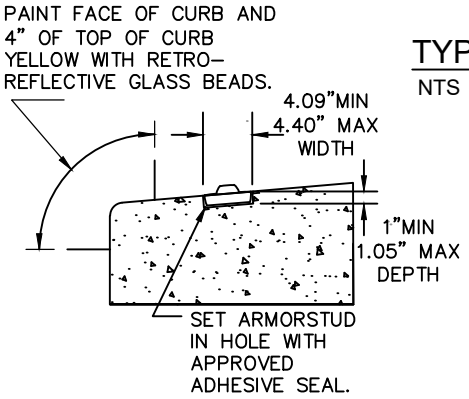
TYPICAL TRAFFIC CIRCLE

NTS



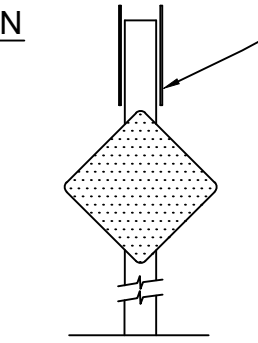
TYPICAL SECTION

NTS



NOTES:

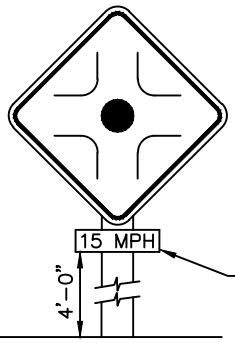
1. LANDSCAPING TO BE DETERMINED BY TRANSPORTATION/PARKS STAFF.
2. MONUMENT PROTECTION/PRESERVATION: NOTIFY CITY ENGINEER PRIOR TO MONUMENT ADJUSTMENT. RAISE MONUMENT TO GRADE IN APPROPRIATE CASING.
3. WHERE OTHER UTILITY PATCHES WILL BE IN CLOSE PROXIMITY, A FULL INTERSECTION ASPHALT REMOVAL AND OVERLAY MAY BE REQUIRED BY ENGINEER



SIGNS INSTALLED BACK TO BACK AND ANOTHER SET AT 90° ON POLE.

18" X 18" (OMI-3) YELLOW HIGH INTENSITY TYPE 1 OBJECT MARKER PLACED IN TRAFFIC CIRCLE FOR EACH APPROACH. ALL SIGNS TO BE MOUNTED ON SINGLE POST. LOCATION TO BE DETERMINED BY ENGINEER. SIGN HEIGHT: 5' FROM BOTTOM OF LOWER SIGN TO STREET SURFACE.

SIGN MATERIAL: 3D DIAMOND GRADE DG^3



30" X 30" BLACK ON YELLOW PLACED 75' TO 100' BACK FROM TRAFFIC CIRCLE ON EACH APPROACH. SEE SD426D FOR POST TYPE AND INSTALLATION.

SIGN MATERIAL: 3M DIAMOND GRADE DG^3

INSTALL W13-1P 15 MPH ADVISORY SPEED. 18"X18"

SIGNING

NTS

Paul S. Cho

APPROVED BY: PAUL S. CHO
TRAFFIC OPERATIONS SAFETY AND ENGINEERING MANAGER

REVISION DATE: MARCH 01, 2020

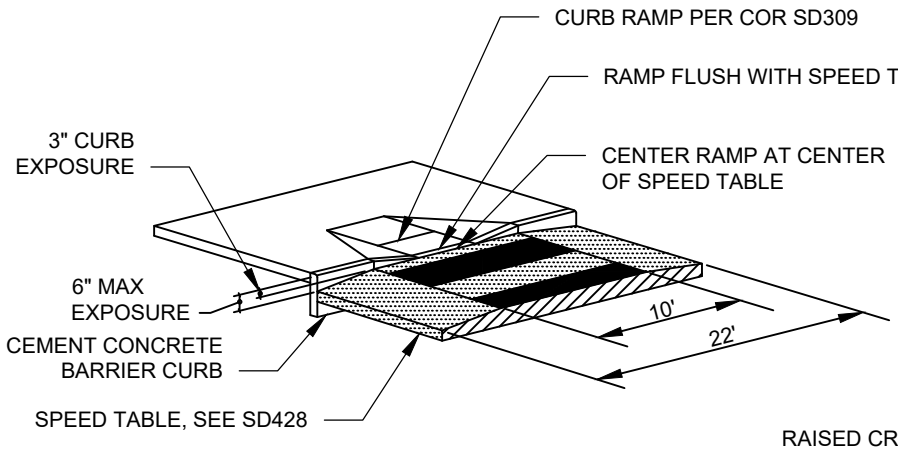
CityofRedmond WASHINGTON

STANDARD DETAILS

TRAFFIC CIRCLE DETAILS

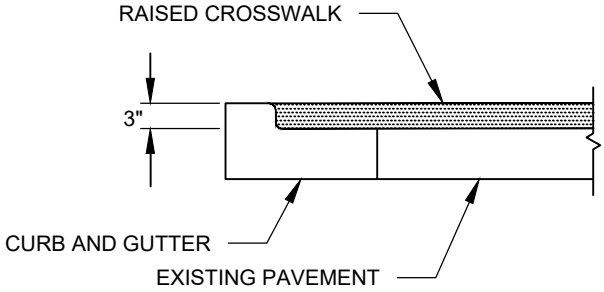
FILE NAME: SD478.DWG | DETAIL NUMBER: **478**

DocuSign Envelope ID: F681597A-CCE8-405B-ACDB-A8564C559739

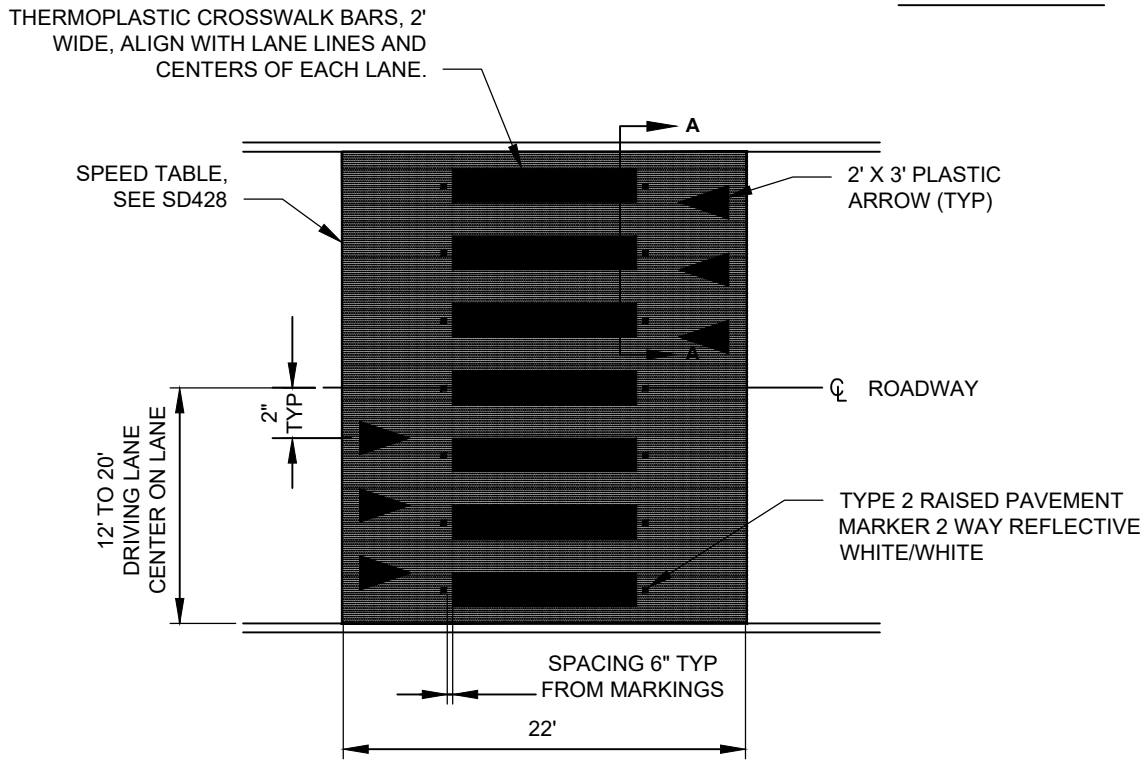


TRANSITION FROM TYPE 1 CURB RAMP TO RAISED CROSSWALK

NTS



SECTION A-A



MARKING DETAIL

Paul S. Cho

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TRAFFIC OPERATIONS SAFETY AND ENGINEERING MANAGER

REVISION DATE: MARCH 01, 2020

CityofRedmond WASHINGTON

STANDARD DETAILS

RAISED CROSSWALK

FILE NAME: SD479.DWG | DETAIL NUMBER: **479**

DocuSign Envelope ID: F681597A-CCE8-405B-ACDB-A8564C559739

NOTES:

1. SIGNS (1), (2), (3), & THE "SCHOOL" LEGEND ON (4) TO HAVE FLUORESCENT YELLOW-GREEN BACKGROUND WITH BLACK LEGEND AND BORDER. SIGN MATERIAL: 3M DIAMOND GRADE DG^3
2. DIAGONAL ARROW POINTING DOWNWARD TO CROSSWALK.
3. SIGN (1): INSTALL TWO SIGNS BACK TO BACK ON SAME POST.
4. SIGNS AND MARKINGS TYPICAL BOTH DIRECTIONS.

SIGN DETAIL
NTS

WITHIN SCHOOL SPEED ZONE
NTS

OUTSIDE SCHOOL SPEED ZONE
NTS

APPROVED BY: PAUL S. CHO
TRAFFIC OPERATIONS SAFETY AND ENGINEERING MANAGER

REVISION DATE: MARCH 01, 2020

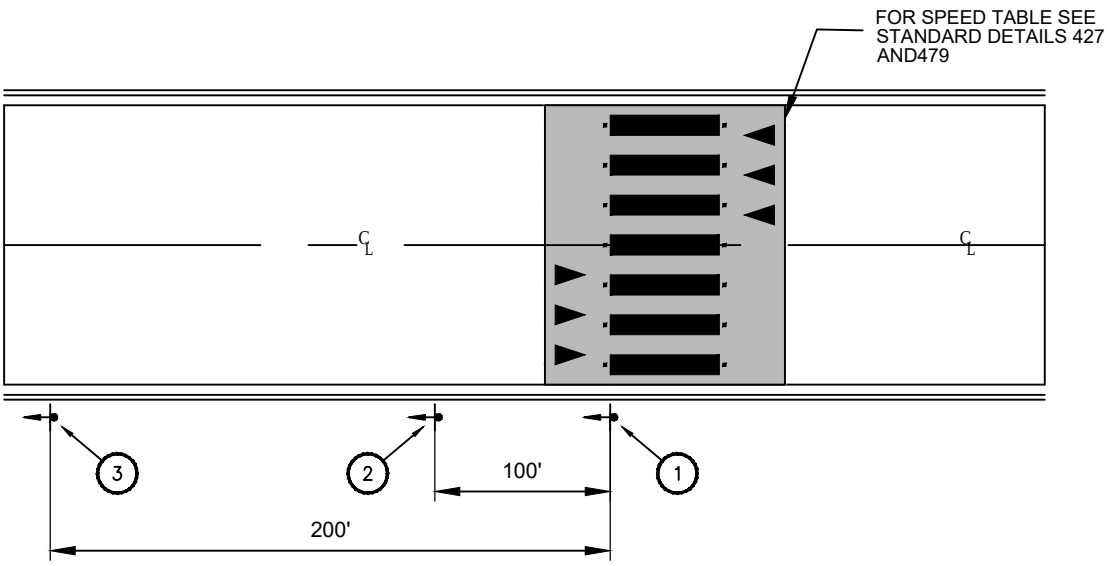
CityofRedmond WASHINGTON

STANDARD DETAILS

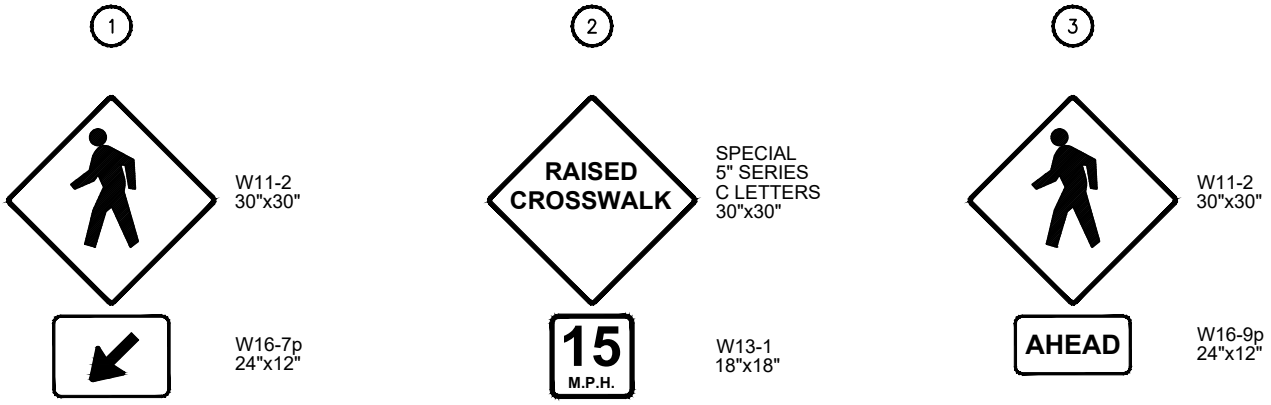
RAISED SCHOOL CROSSWALK SIGNING

FILE NAME: SD480.DWG | DETAIL NUMBER: **480**

DocuSign Envelope ID: F681597A-CCE8-405B-ACDB-A8564C559739



SIGNING PLACEMENT
NTS



SIGNING DETAIL
NTS

NOTES:

1. SIGNS HAVE FLUORESCENT YELLOW GREEN BACKGROUND WITH BLACK LEGEND AND BORDER. SIGN MATERIAL: 3M DIAMOND GRADE DG³
2. DIAGONAL ARROW POINTING DOWNWARD TOWARD CROSSWALK.
3. SIGN (1): INSTALL 2 SIGNS BACK TO BACK ON SAME POST.
4. SIGNS AND MARKINGS TYPICAL BOTH TYPICAL DIRECTIONS.

Paul S. Cho

APPROVED BY: PAUL S. CHO
TRAFFIC OPERATIONS SAFETY AND ENGINEERING MANAGER

REVISION DATE: MARCH 01, 2020

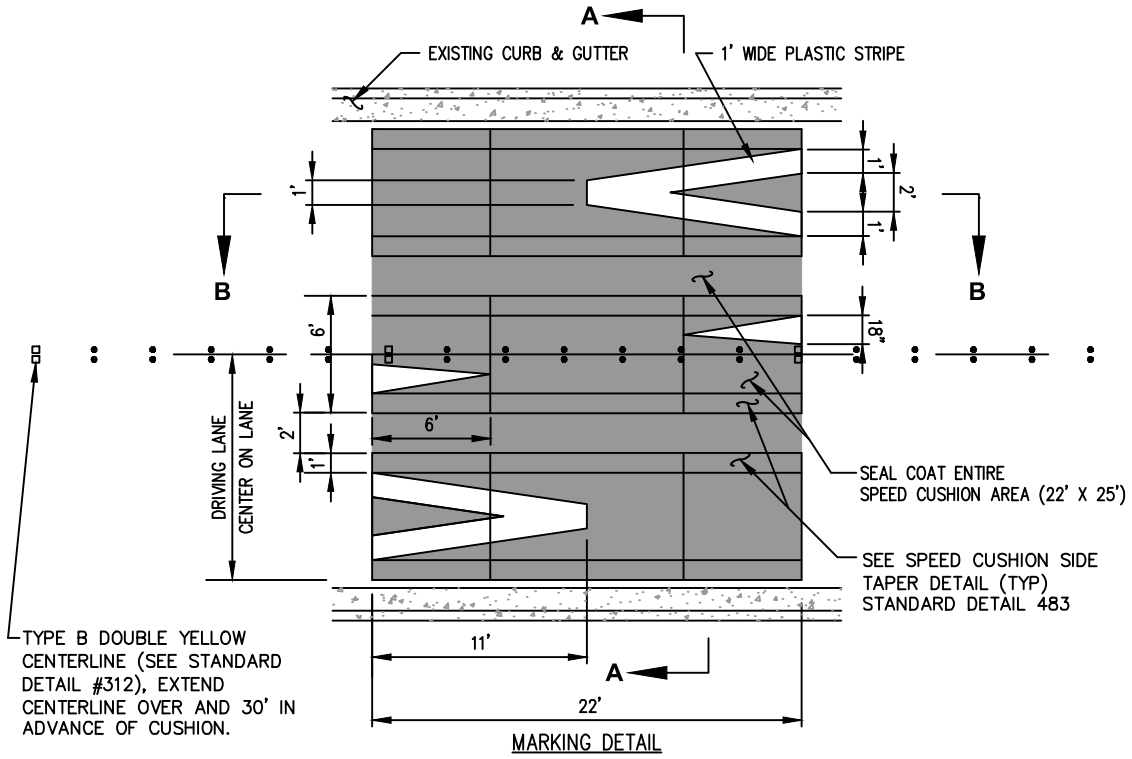
CityofRedmond
WASHINGTON

STANDARD DETAILS

RAISED CROSSWALK SIGNING

FILE NAME: SD481.DWG | DETAIL NUMBER: **481**

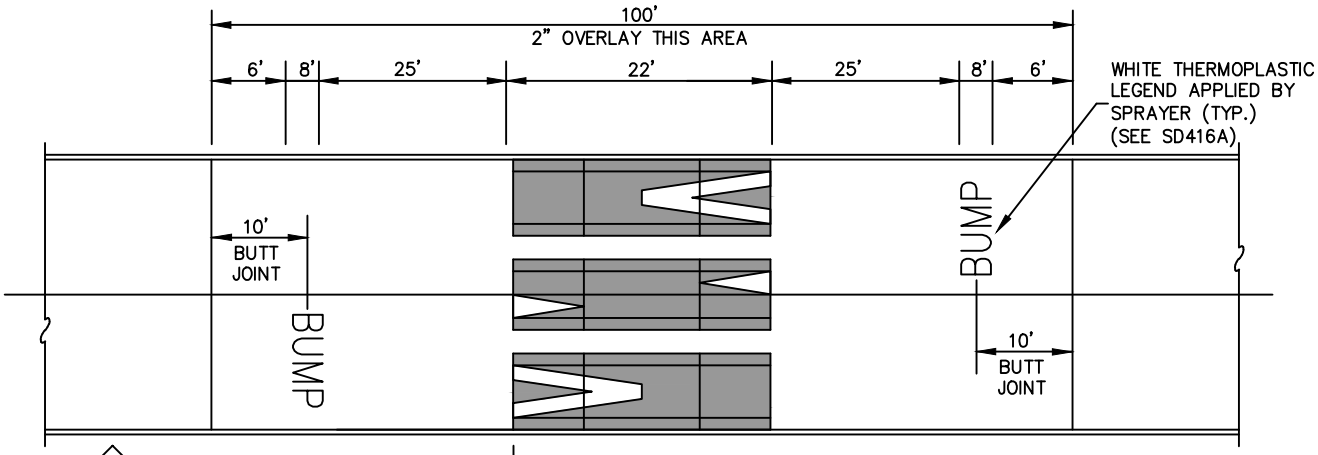
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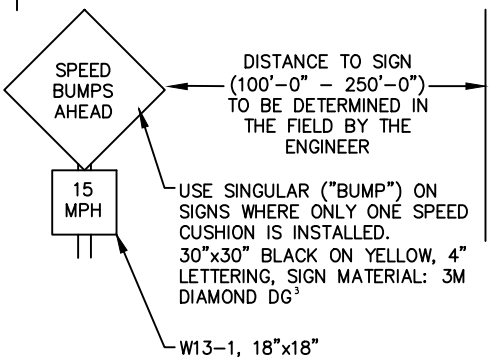


MARKING DETAIL

SPEED CUSHION

NTS





NOTES:

1. SIGNS & MARKINGS TYPICAL BOTH DIRECTIONS.
2. SEE "POST MOUNTED SIGN" STANDARD DRAWING 426(C) OR (D).
3. A TEMPLATE MUST BE USED IN SHAPING SPEED TABLE.
4. SPEED TABLE MUST BE MADE IN TWO LIFTS.
5. 2" OVERLAY NOT REQUIRED FOR NEW PAVEMENT OR EXISTING PAVEMENT DETERMINED TO BE IN GOOD CONDITION BY THE ENGINEER.

Paul S. Cho

APPROVED BY: PAUL S. CHO
TRAFFIC OPERATIONS SAFETY AND ENGINEERING MANAGER

REVISION DATE: MARCH 01, 2020

CityofRedmond
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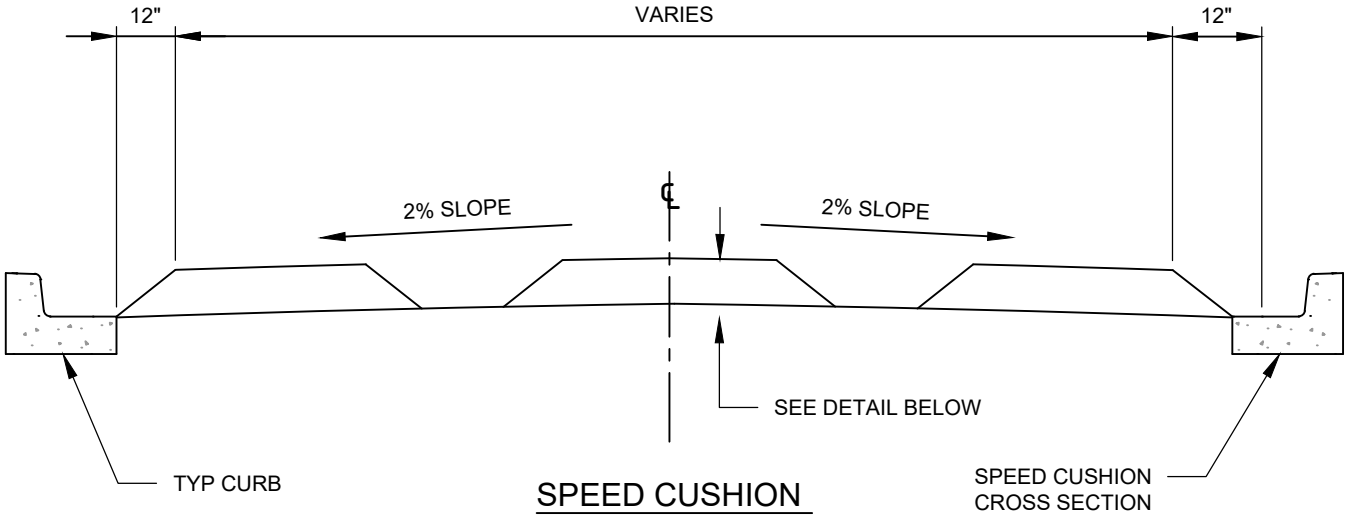
STANDARD DETAILS

SPEED CUSHION (1 OF 2)

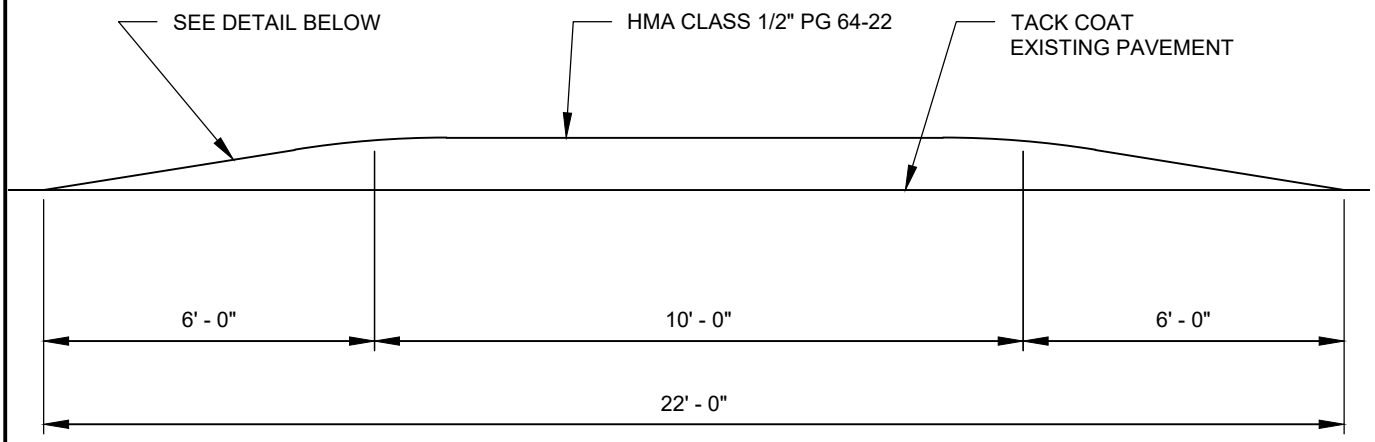
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DETAIL NUMBER: **482**

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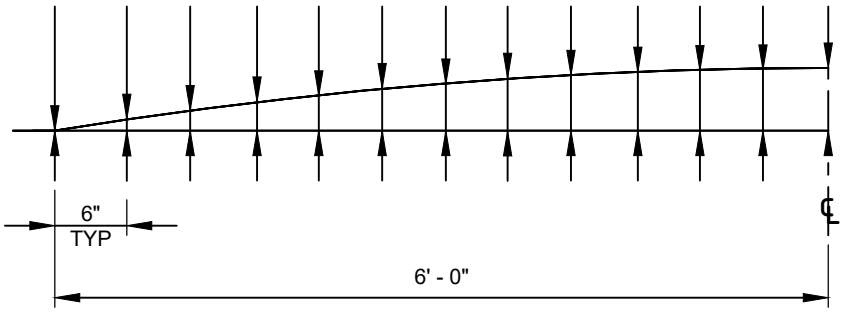


SPEED CUSHION
NTS



CENTERLINE PROFILE
NTS

0	0.64	1.22	1.75	2.22	2.64	3.00	3.31	3.56	3.75	3.89	3.97	4.00"	← 4" SPEED CUSHION
0	0.56	1.07	1.53	1.94	2.31	2.63	2.89	3.11	3.28	3.40	3.48	3.50"	← 3.5" SPEED CUSHION
0	0.48	0.92	1.31	1.67	1.98	2.25	2.48	2.67	2.81	2.92	2.96	3.00"	← 3" SPEED CUSHION



SPEED CUSHION EDGE (TYP)
COMPACTED DEPTHS
NTS

Paul S. Cho

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TRAFFIC OPERATIONS SAFETY AND ENGINEERING MANAGER

REVISION DATE: MARCH 01, 2020

CityofRedmond
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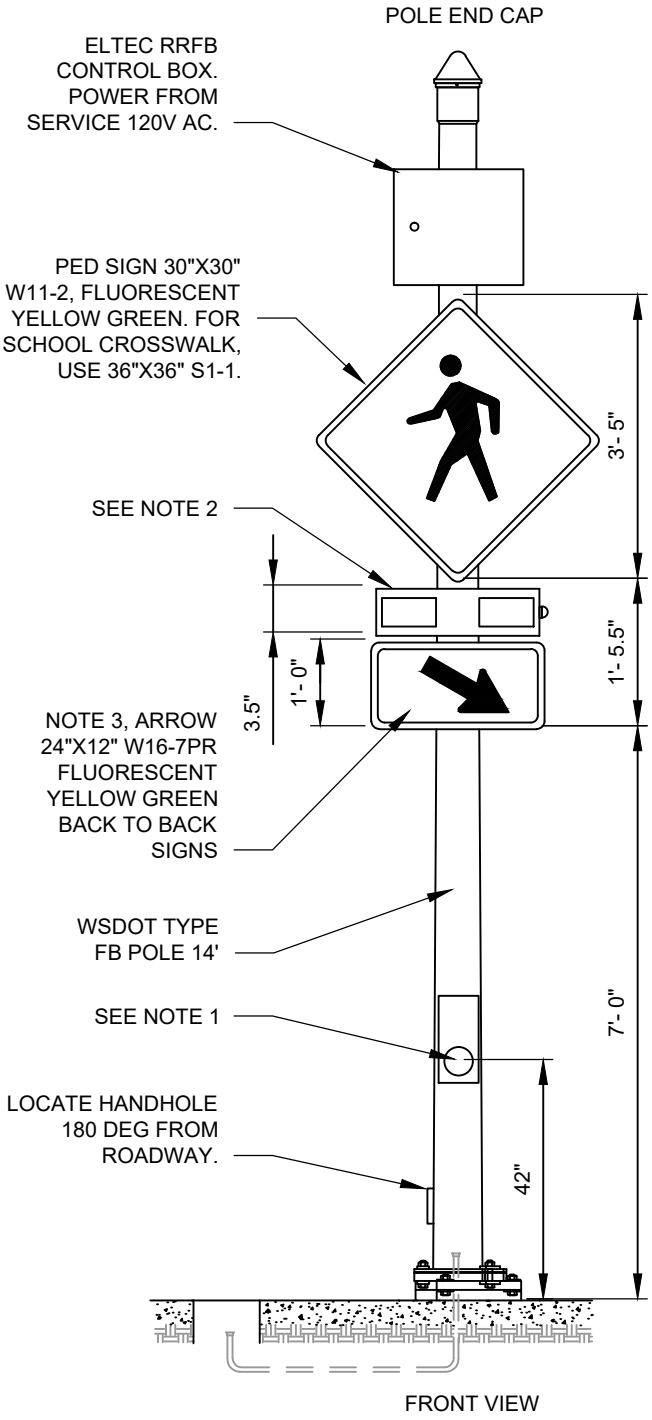
STANDARD DETAILS

SPEED CUSHION
(2 OF 2)

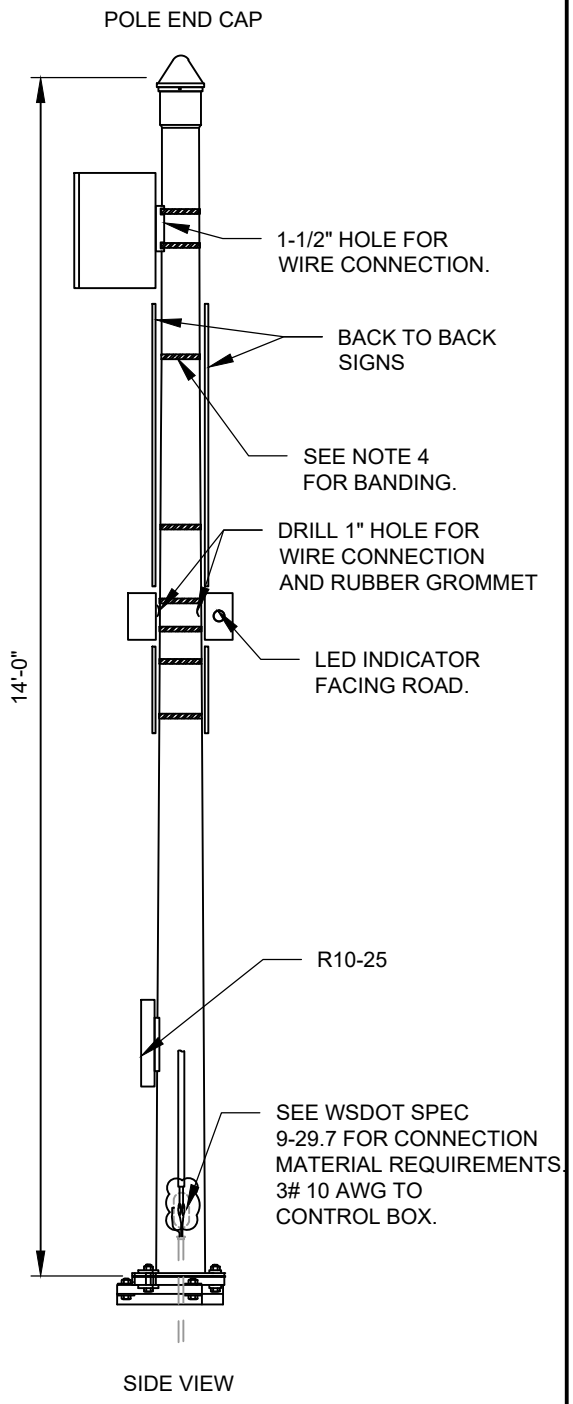
FILE NAME: SD483.DWG

DETAIL NUMBER: **483**

DocuSign Envelope ID: F681597A-CCE8-405B-ACDB-A8564C559739



FRONT VIEW



SIDE VIEW

NOTES:

1. USE MODEL POLARA, PLAQUE, AND FRAME BDSP-014-B FOR PED PUSH BUTTON.
2. TWO W11-2 OR S1-1 CROSSING WARNING SIGNS (EACH WITH RRFB AND W16-7P PLAQUE) SHALL BE INSTALLED AT THE CROSSING, ONE ON THE RIGHT-HAND SIDE OF THE ROADWAY AND ONE ON THE LEFT-HAND SIDE OF EACH APPROACHING DRIVER. IF A MEDIAN EXISTS, THE LEFT-HAND SIDE ASSEMBLY SHOULD BE INSTALLED ON THE MEDIAN.
3. INSTALL RRFB WITH LED INDICATOR FOR PEDESTRIAN ON SIDE OF TRAVEL LANE.
4. SEE STANDARD DETAIL 417 FOR BANDING SPEC AND INSTALLATION.

Paul S. Cho

APPROVED BY: PAUL S. CHO
TRAFFIC OPERATIONS SAFETY AND ENGINEERING MANAGER

REVISION DATE: MARCH 01, 2020

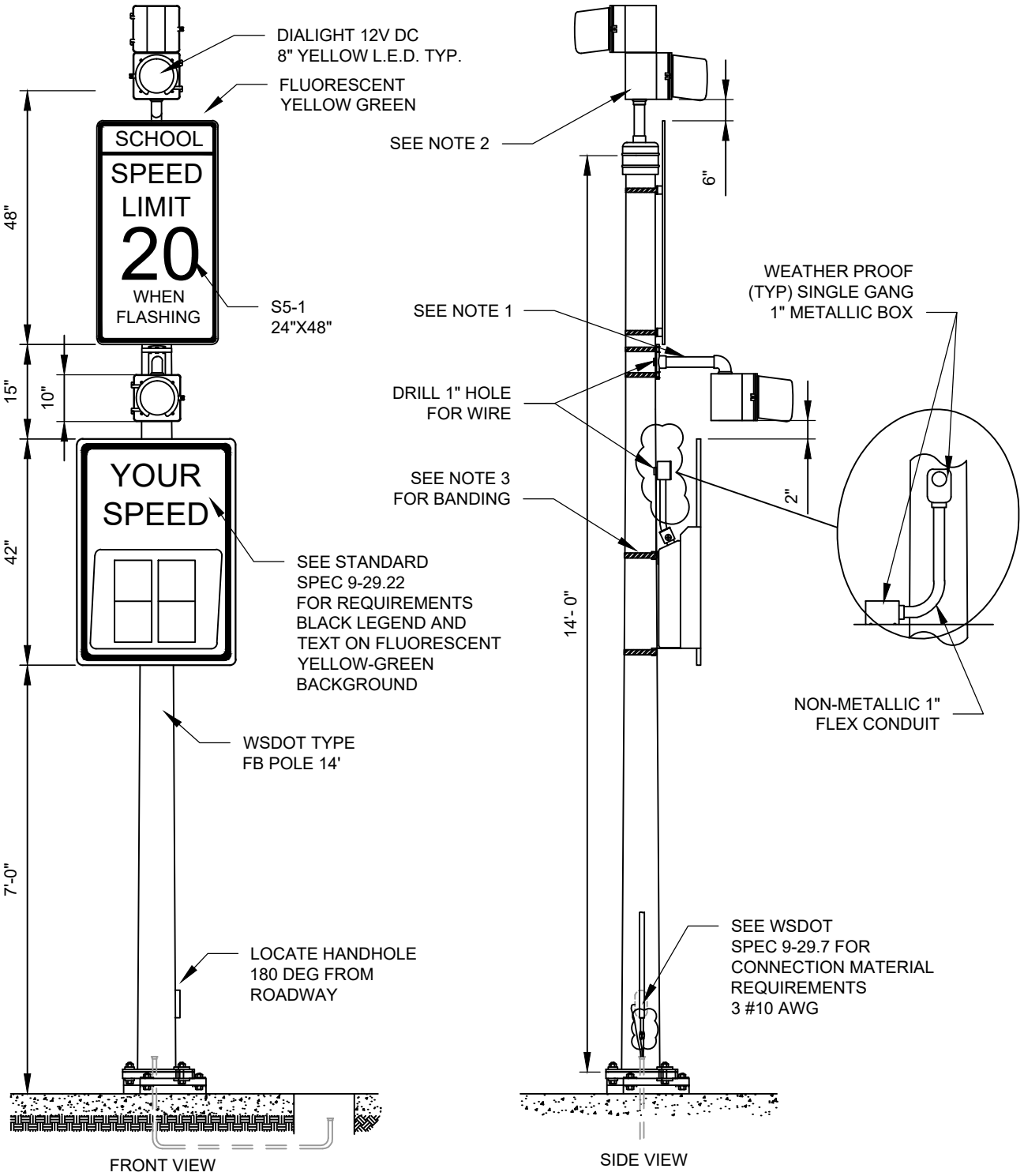
CityofRedmond WASHINGTON

STANDARD DETAILS

RECTANGULAR RAPID FLASHING BEACON

FILE NAME: SD484.DWG | DETAIL NUMBER: **484**

DocuSign Envelope ID: F681597A-CCE8-405B-ACDB-A8564C559739



NOTES:

1. SIDE POLE MOUNT, POLE PLATE WITHOUT CABLE GUIDE (M31251 GREEN), ELBOW SERRATED ONE PORT WITH LOCK NIPPLE, 10" TREADED PIPE (TOE, TOE) GREEN WITH 8" HEAD (GREEN).
2. TOP OF POLE MOUNT WITH 12" TREADED PIPE, 8" SIGNAL HEADS WITH VISORS.
3. SEE STANDARD DETAIL 417 FOR BANDING SPEC AND INSTALLATION.
4. POWER TO SIGN MUST BE 120V AC.

Paul S. Cho

APPROVED BY: PAUL S. CHO
TRAFFIC OPERATIONS SAFETY AND ENGINEERING MANAGER

REVISION DATE: MARCH 01, 2020

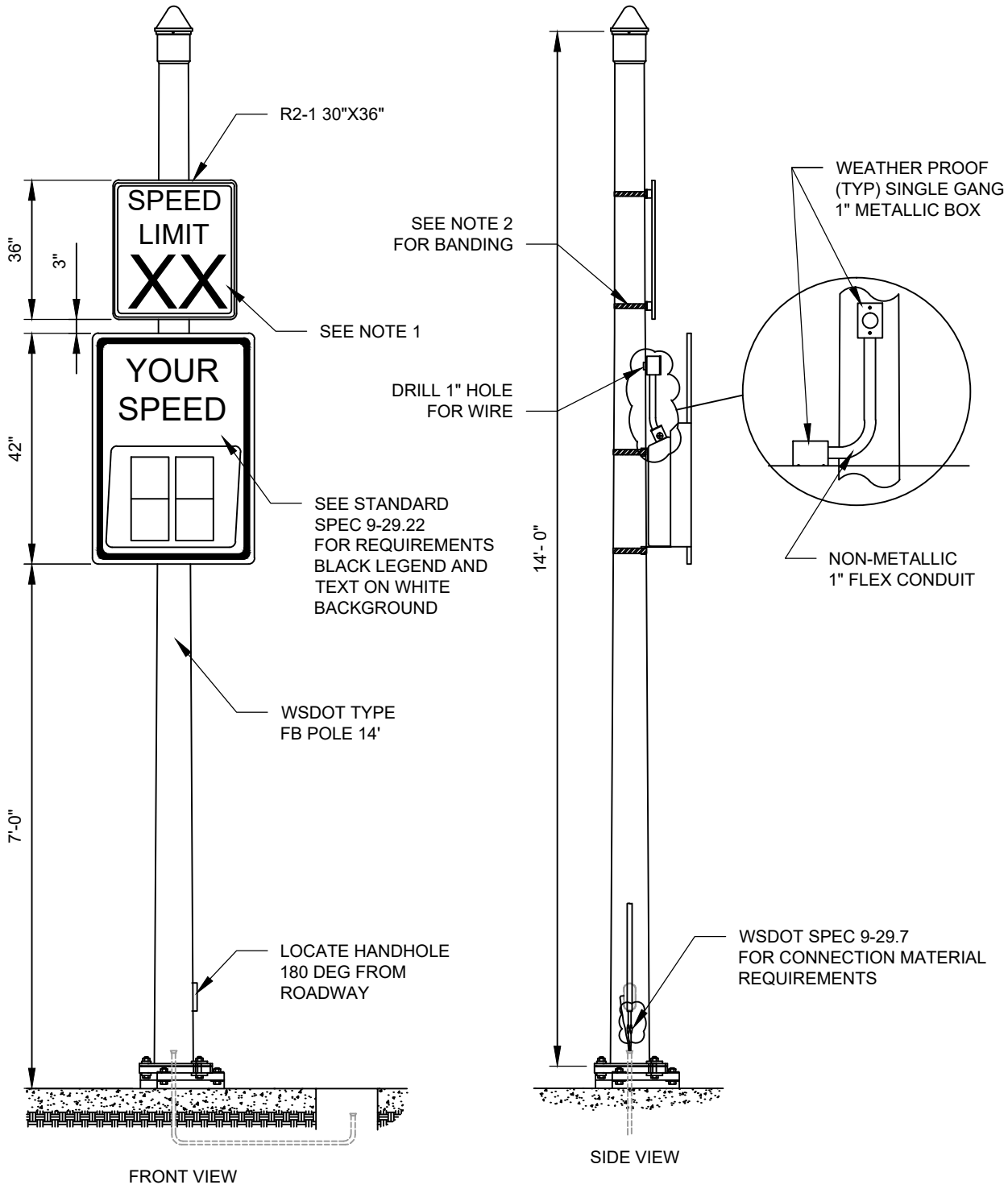
CityofRedmond
WASHINGTON

STANDARD DETAILS

SCHOOL ZONE SPEED RADAR SIGN

FILE NAME: SD485.DWG | DETAIL NUMBER: **485**

DocuSign Envelope ID: F681597A-CCE8-405B-ACDB-A8564C559739



NOTES:

1. ACTUAL SPEED LIMIT PROVIDED BY TRAFFIC ENGINEER.
2. SEE STANDARD DETAIL 417 FOR BANDING SPEC AND INSTALLATION
3. POWER TO SIGN MUST BE 120V AC.

Paul S. Cho

APPROVED BY: PAUL S. CHO
TRAFFIC OPERATIONS SAFETY AND ENGINEERING MANAGER

REVISION DATE: MARCH 01, 2020

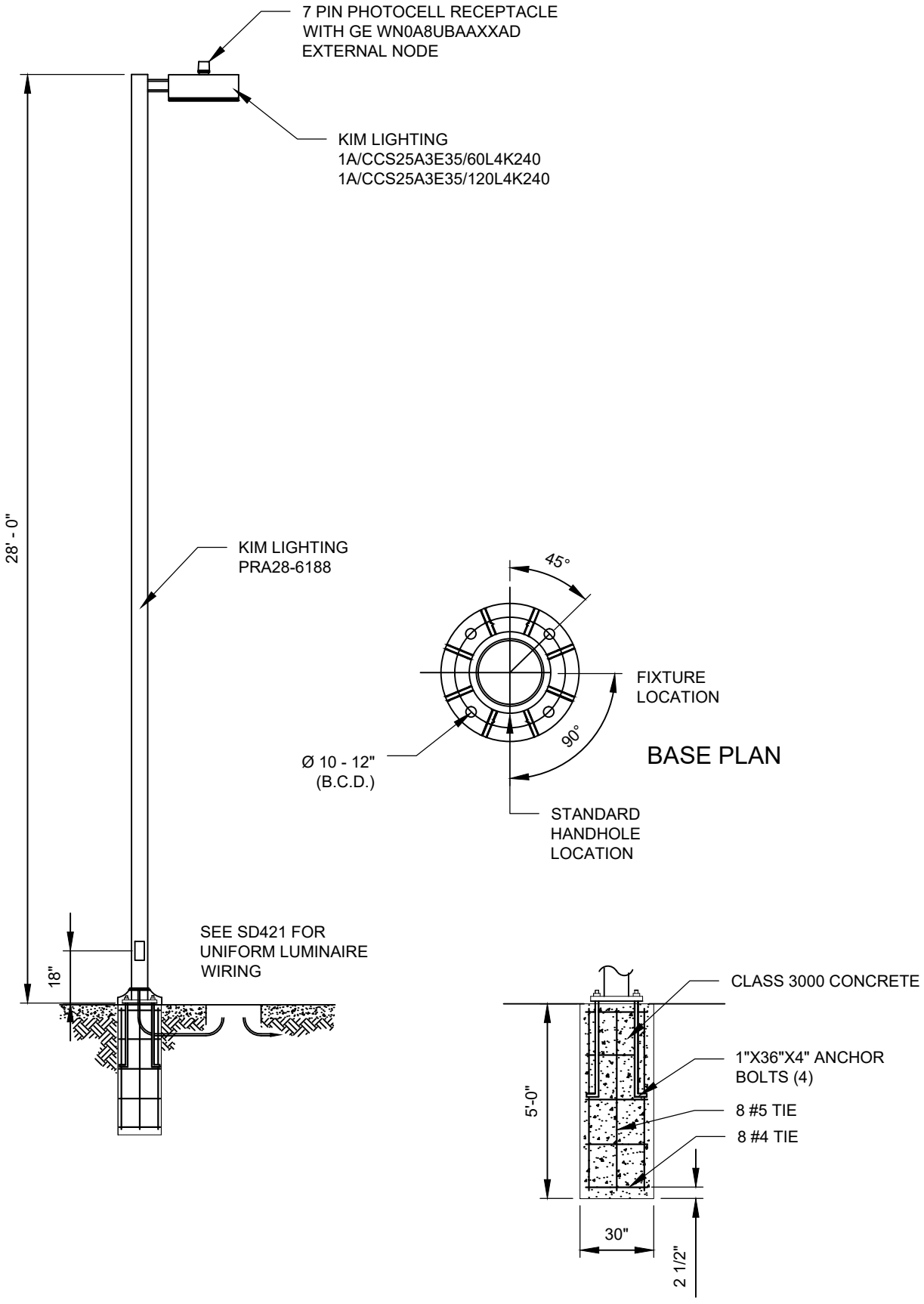
CityofRedmond
WASHINGTON

STANDARD DETAILS

SPEED CHECK RADAR SIGN

FILE NAME: SD486.DWG | DETAIL NUMBER: **486**

DocuSign Envelope ID: F681597A-CCE8-405B-ACDB-A8564C559739



Paul S. Cho

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TRAFFIC OPERATIONS SAFETY AND ENGINEERING MANAGER

REVISION DATE: MARCH 01, 2020

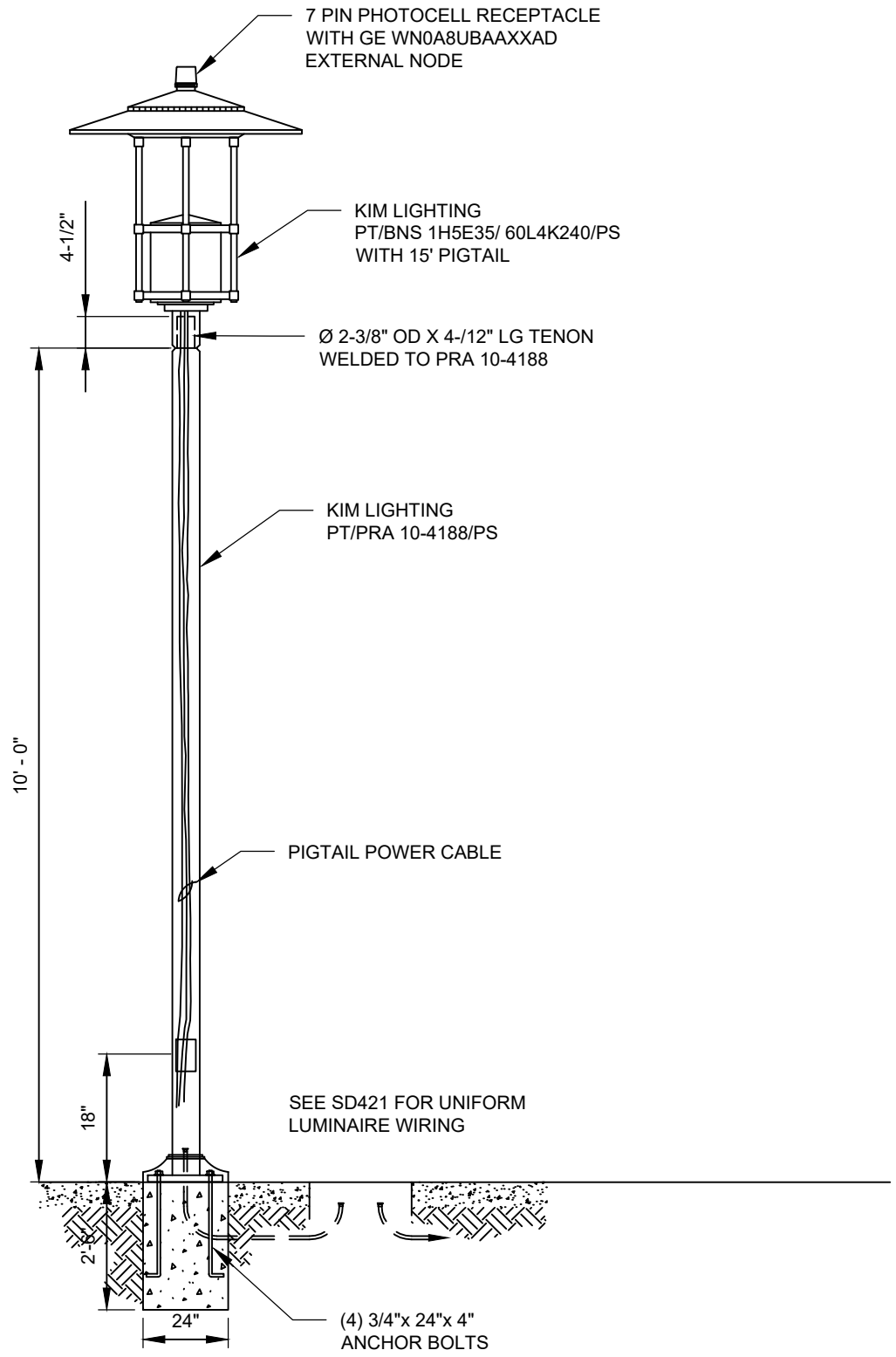
CityofRedmond
WASHINGTON

STANDARD DETAILS

OVERLAKE VILLAGE STREET LIGHT

FILE NAME: SD487.DWG | DETAIL NUMBER: **487**

DocuSign Envelope ID: F681597A-CCE8-405B-ACDB-A8564C559739



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REVISION DATE: MARCH 01, 2020

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STANDARD DETAILS

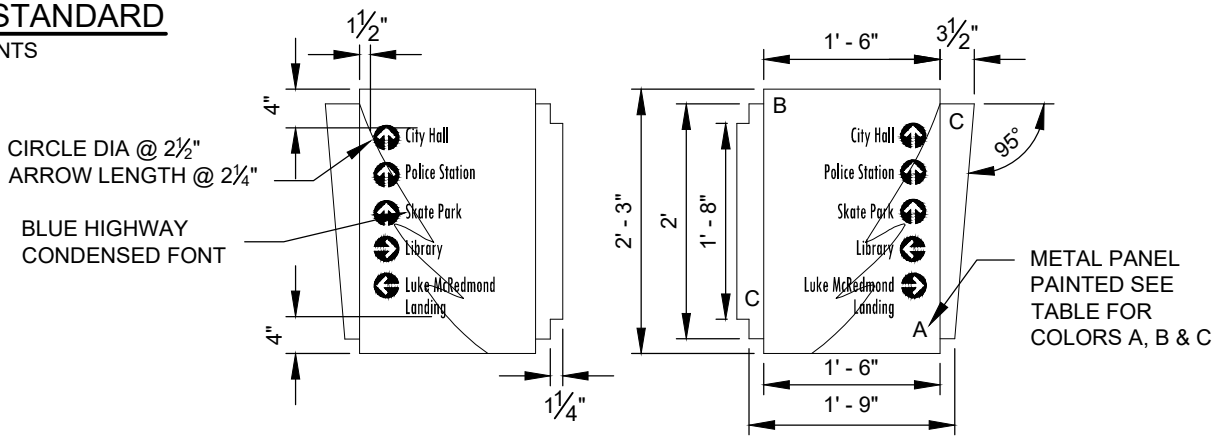
OVERLAKE VILLAGE
PED LIGHT

FILE NAME: SD488.DWG | DETAIL NUMBER: **488**

DocuSign Envelope ID: F681597A-CCE8-405B-ACDB-A8564C559739

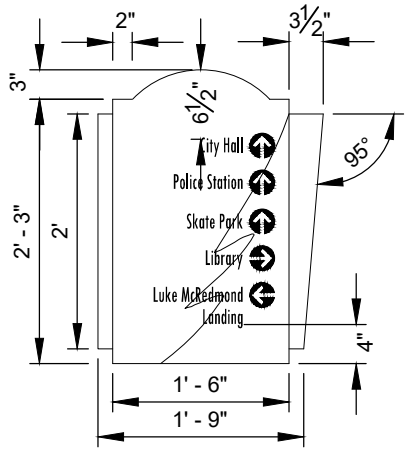
STANDARD

NTS



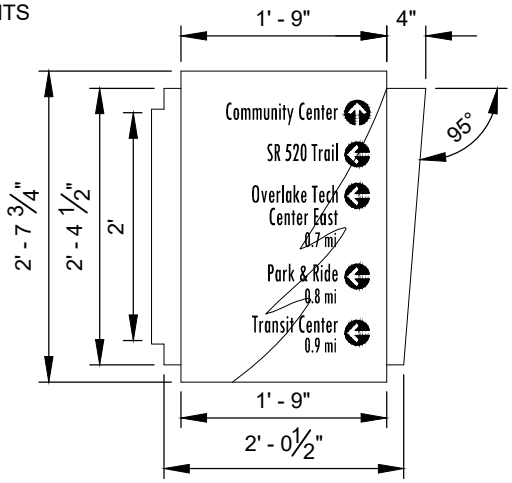
OLD TOWN OPTION

NTS



OVERLAKE OPTION

NTS



PARAMETER	STANDARD	OLD TOWN OPTION	OVERLAKE OPTION
PLATE THICKNESS	0.100	0.100	0.125
DESTINATION FONT SIZE	1 1/2"	1 1/2"	1 3/4"
MILEAGE FONT SIZE	1 1/4"	1 1/4"	1 1/2"
DESTINATION SPACING	7/16"	5/8"	3/4"
SIGN GRAPHIC COLOR A	PANTONE 370C	PANTONE 7512C	PANTONE 370C
SIGN GRAPHIC COLOR B	PANTONE 371C	PANTONE 730C	PANTONE 380C
SIGN GRAPHIC COLOR C	PANTONE 728C	PANTONE 7503C	PANTONE 728C

NOTES:

1. ALUMINUM SIGN PLATE, THREE COLORS PER WAYFINDING SIGN TYPE, DOUBLE-SIDED. LOGO BACKGROUND DESIGN PROVIDED BY CITY. SEE TABLE FOR SIGN PLATE THICKNESS AND COLOR BACKGROUND GRAPHIC DETAIL OR APPROVED EQUAL.

2. LETTER GRAPHICS SHALL BE BLUE HIGHWAY CONDENSED FONT WITH WHITE NON-REFLECTIVE BACK VINYL FILM, 7-YEAR A7 ENGINEERING GRADE REFLECTIVITY BY AVERY GRAPHICS OR APPROVED EQUAL. SEE TABLE FOR FONT SIZE AND DESTINATION SPACING. ACTUAL DESTINATION TEXT PROVIDED BY TRAFFIC ENGINEER.

3. POST AND MOUNTING PER DETAIL 490 OR 491 BASED ON WAYFINDING SIGN TYPE.

Donell Cairns

APPROVED BY: DONALD CAIRNS
TRANSPORTATION PLANNING AND ENGINEERING MANAGER

REVISION DATE: MARCH 01, 2017

CityofRedmond WASHINGTON

STANDARD DETAILS

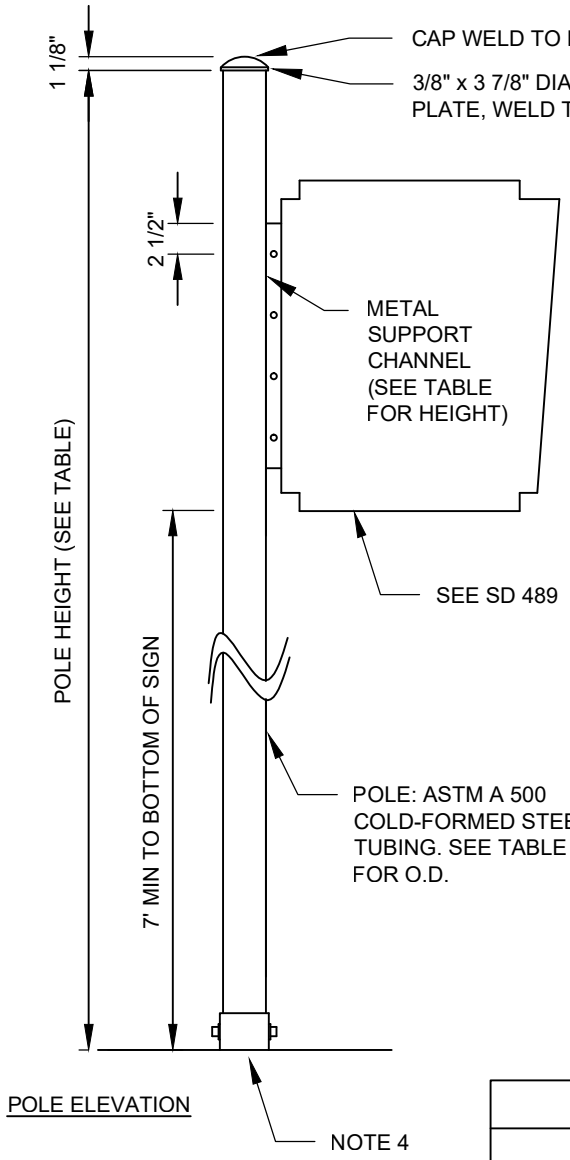
PEDESTRIAN WAYFINDING SIGN DETAIL

FILE NAME: SD489.DWG | DETAIL NUMBER: **489**

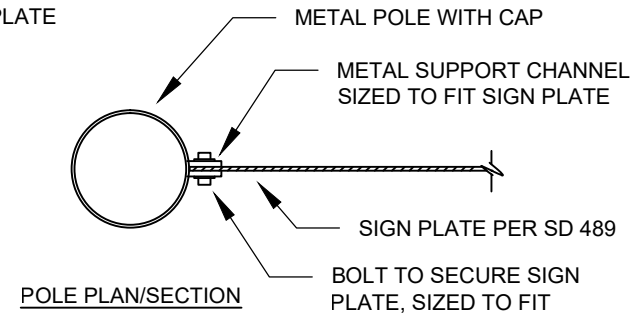
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STANDARD AND OVERLAKE POLE ASSEMBLY AND DETAILS

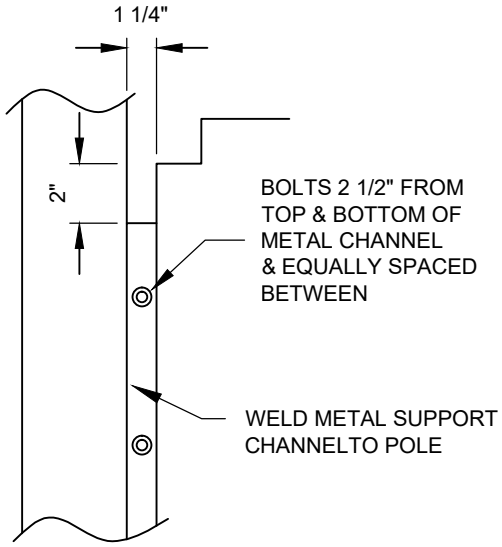
NTS



POLE ELEVATION



POLE PLAN/SECTION



POLE SIGN ATTACHMENT

PARAMETER	STANDARD	OVERLAKE OPTION
POLE HEIGHT	10'	11'
POLE OUTER DIAMETER	3 1/2"	4"
SUPPORT CHANNEL HEIGHT	1'-8"	2'

NOTES:

1. POLE ASSEMBLY AND DETAIL PARAMETERS SHALL MATCH SIGN TYPE. SIGN PER DETAIL 489.
2. PAINT FINISH OF PANTONE 432C (OR APPROVED EQUAL) FOR POLE, METAL SUPPORT CHANNEL, CAP AND FINIAL SHALL MATCH.
3. STEEL PLATES, SHAPES AND BARS: ASTM A 36/A36N. STAINLESS STEEL BARS AND SHAPES: ASTM A 276, TYPE 304. FASTENERS: TYPE 316 STAINLESS STEEL, ZINC-PLATED FASTENERS COMPLIANT WITH ASTM B 633, CLASS FE/ZN 5.
4. FOUNDATION PER SD 426C OR SD 426D.

Donell Cairns

APPROVED BY: DONALD CAIRNS
TRANSPORTATION PLANNING AND ENGINEERING MANAGER

REVISION DATE: MARCH 01, 2020

CityofRedmond WASHINGTON

STANDARD DETAILS

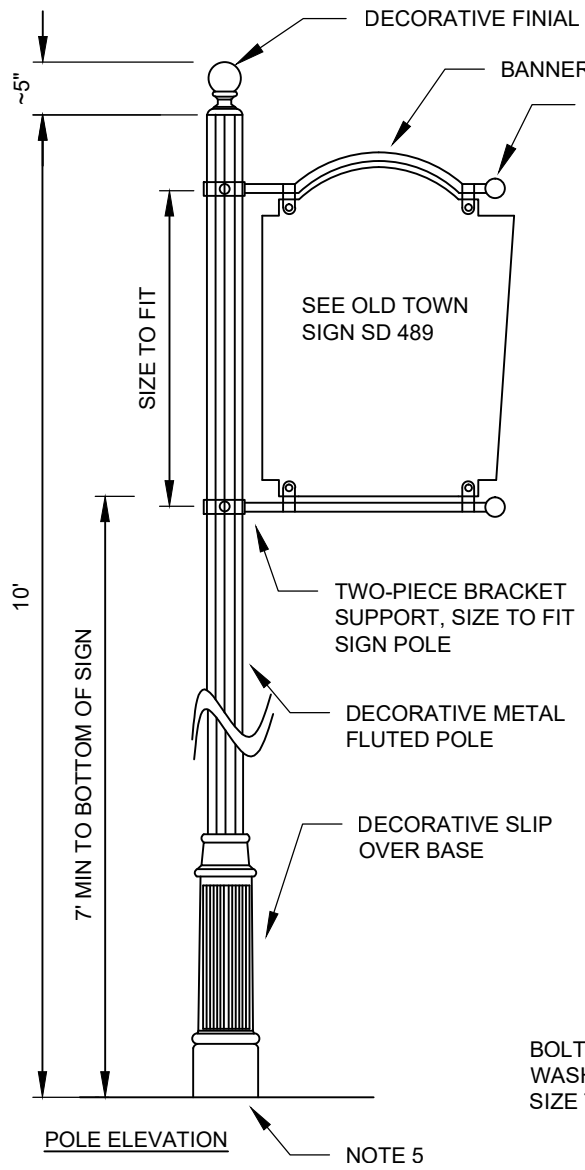
STANDARD AND OVERLAKE WAYFINDING SIGN POLE DETAILS

FILE NAME: SD490.DWG | DETAIL NUMBER: **490**

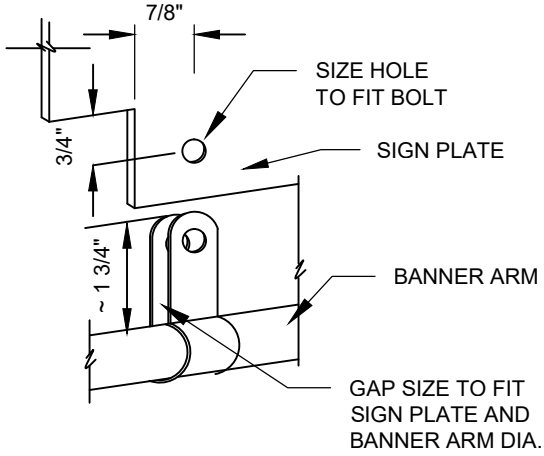
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OLD TOWN POLE ASSEMBLY AND DETAILS

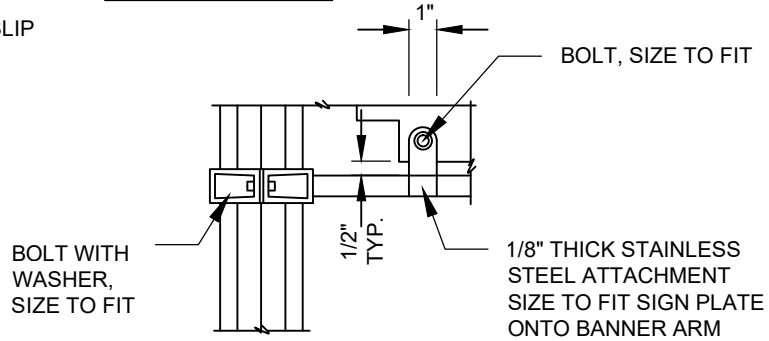
NTS



BOLT AND SIGN ATTACHMENT DETAIL



TWO-PIECE BRACKET AND SIGN ATTACHMENT DETAIL



NOTES:

1. METAL POLE: MODEL #SP3x10, 10' TALL, 3" DIA. FLUTED, STRAIGHT POLE, DECORATIVE SLIP OVER BASE: MODEL #SB-33, FOR 3" OD POLE, 24" TALL BY 7" WIDE, AND FINIAL CAP: MODEL #FIN-B3 BY BRANDON INDUSTRIES, (972) 542-3000, OR APPROVED EQUAL.
2. BANNER ARM WITH FINIAL: MODEL #BR23AP BY CYCLONE LIGHTING INC., DISTRIBUTED BY NORTHWEST LIGHTING (206) 298-9000 OR APPROVED EQUAL. BRACKET SIZED TO FIT 3" OD POLE.
3. PAINT FINISH OF PANTONE 432C (OR APPROVED EQUAL) FOR POLE, METAL SUPPORT CHANNEL, CAP AND FINIAL SHALL MATCH.
4. STEEL PLATES, SHAPES AND BARS: ASTM A 36/A36N. STAINLESS STEEL BARS AND SHAPES: ASTM A 276, TYPE 304. FASTENERS: TYPE 316 STAINLESS STEEL, ZINC-PLATED FASTENERS COMPLIANT WITH ASTM B 633, CLASS FE/ZN 5.
5. FOUNDATION PER SD 426C OR SD 426D.

Donell Cairns

APPROVED BY: DONALD CAIRNS
TRANSPORTATION PLANNING AND ENGINEERING MANAGER

REVISION DATE: MARCH 01, 2020

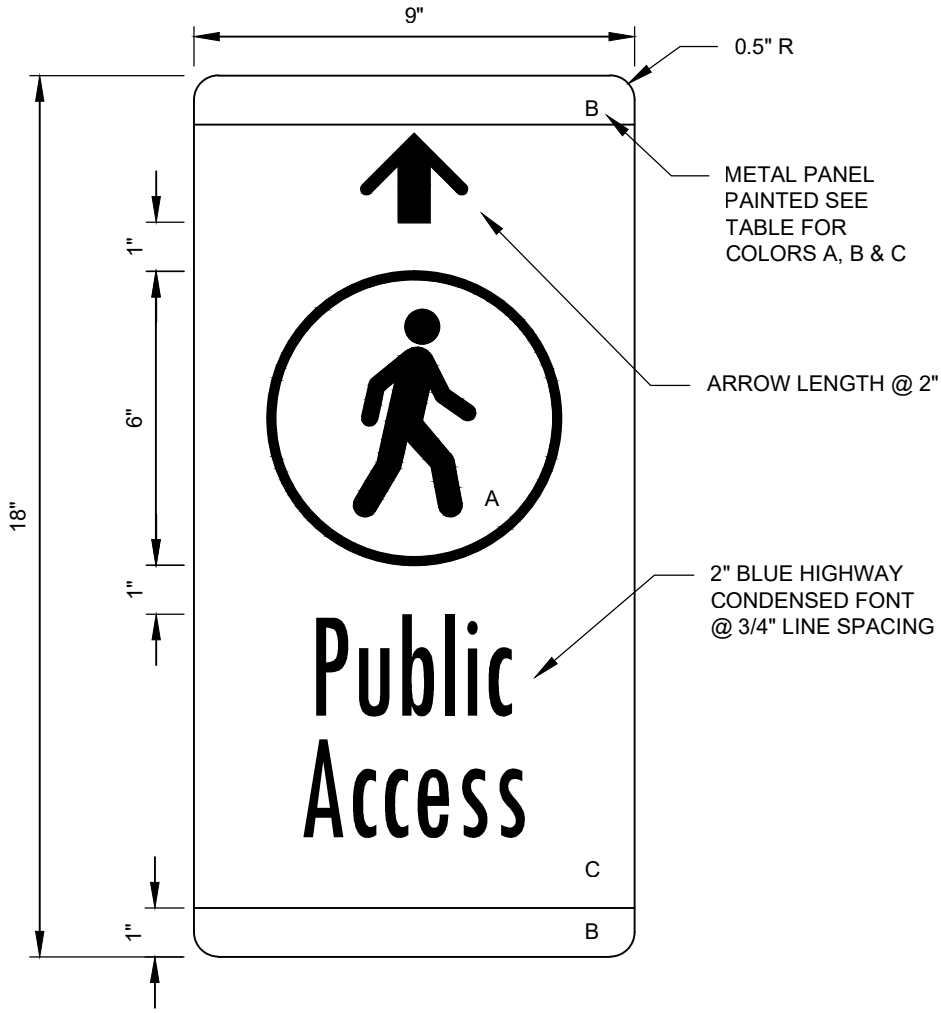
CityofRedmond WASHINGTON

STANDARD DETAILS

OLD TOWN WAYFINDING SIGN POLE DETAILS

FILE NAME: SD491.DWG | DETAIL NUMBER: **491**

DocuSign Envelope ID: F681597A-CCE8-405B-ACDB-A8564C559739



SIGN DETAIL

NTS

COLOR A	COLOR B	COLOR C
PANTONE 7495C	PANTONE 315C	PANTONE 3035C

NOTES:

1. LETTER GRAPHICS SHALL BE 2" BLUE HIGHWAY CONDENSED FONT WITH WHITE NON-REFLECTIVE BACK VINYL FILM, 7-YEAR A7 ENGINEERING GRADE REFLECTIVITY BY AVERY GRAPHICS OR APPROVED EQUAL. LINE SPACING SHALL BE 3/4". ARROW LENGTH SHALL BE 2" AND ORIENTED TOWARD DESIGNATION.
2. SIGN CORNERS SHALL BE ROUNDED.
3. SIGN MATERIAL SHALL BE 0.080 THICK STOCK ALUMINUM SIGN PLATE WITH THREE COLORS , DOUBLE-SIDED. SEE TABLE FOR COLOR DETAIL.
4. POST AND MOUNTING HEIGHT PER SD 426C OR SD 426D.

Donell Cairns

APPROVED BY: DONALD CAIRNS
TRANSPORTATION PLANNING AND ENGINEERING MANAGER

REVISION DATE: MARCH 01, 2020

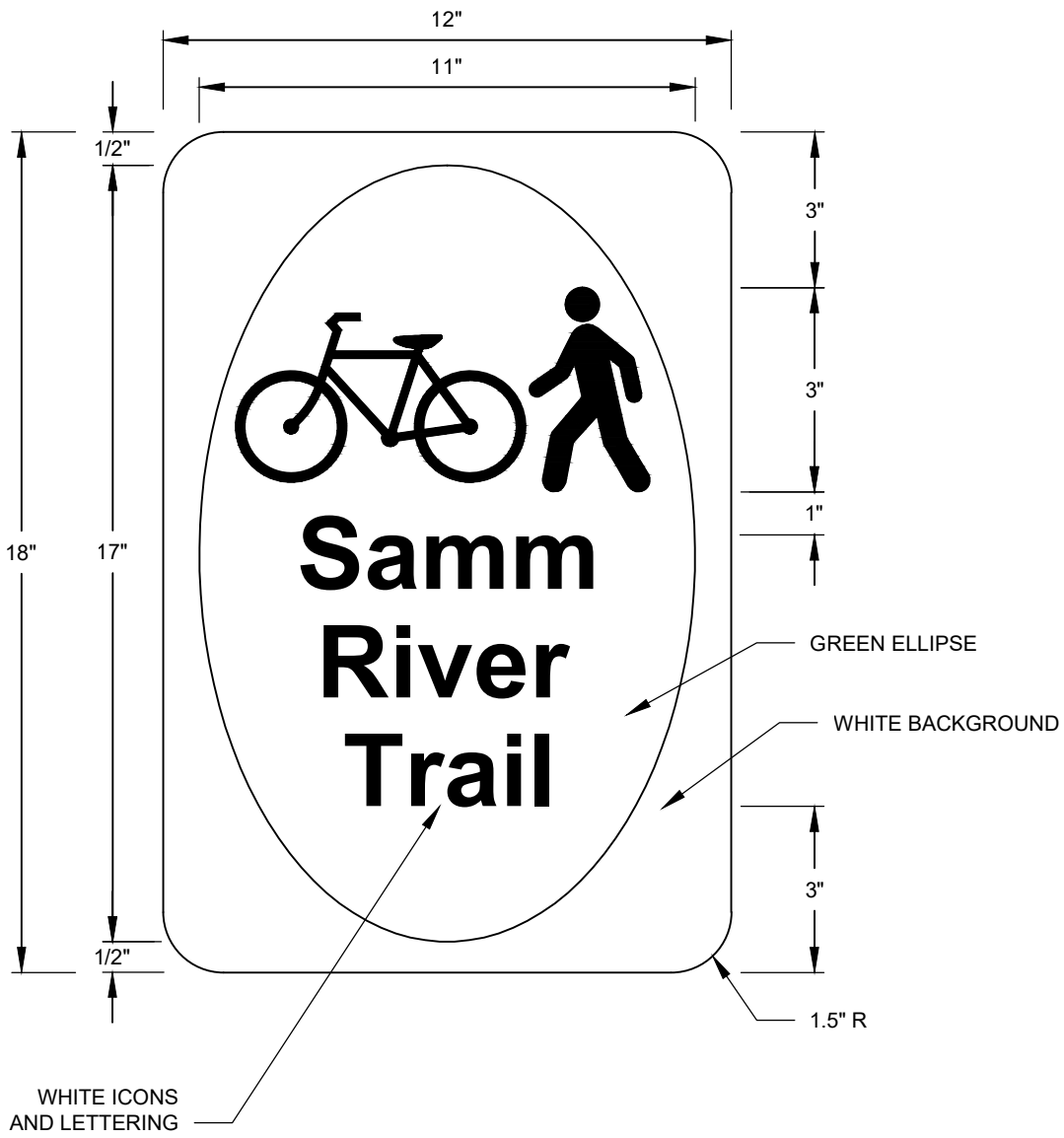
CityofRedmond
WASHINGTON

STANDARD DETAILS

PUBLIC ACCESS SIGN DETAIL

FILE NAME: SD492.DWG | DETAIL NUMBER: **492**

DocuSign Envelope ID: F681597A-CCE8-405B-ACDB-A8564C559739



SIGN DETAIL

NTS

NOTES:

1. LETTER GRAPHICS SHALL BE HIGHWAY B SERIES FONT OF 2" HEIGHT WITH LINE SPACING OF 1". ACTUAL TEXT PROVIDED BY CITY ENGINEER.
2. SIGN CORNERS SHALL BE ROUNDED.
3. SIGN MATERIAL SHALL BE 0.080 THICK STOCK ALUMINUM SIGN PLATE WITH WHITE SIGN LETTERS ON GREEN ELLIPSE ON WHITE BACKGROUND PER MUTCD COLOR SPECIFICATIONS. ALL SIGN SHEETING SHALL BE RETROREFLECTIVE 3M DIAMOND GRADE DG3 OR EQUIVALENT.
4. POST AND MOUNTING HEIGHT PER SD 426C OR SD 426D.

APPROVED BY: DONALD CAIRNS
TRANSPORTATION PLANNING AND ENGINEERING MANAGER

REVISION DATE: MARCH 01, 2020

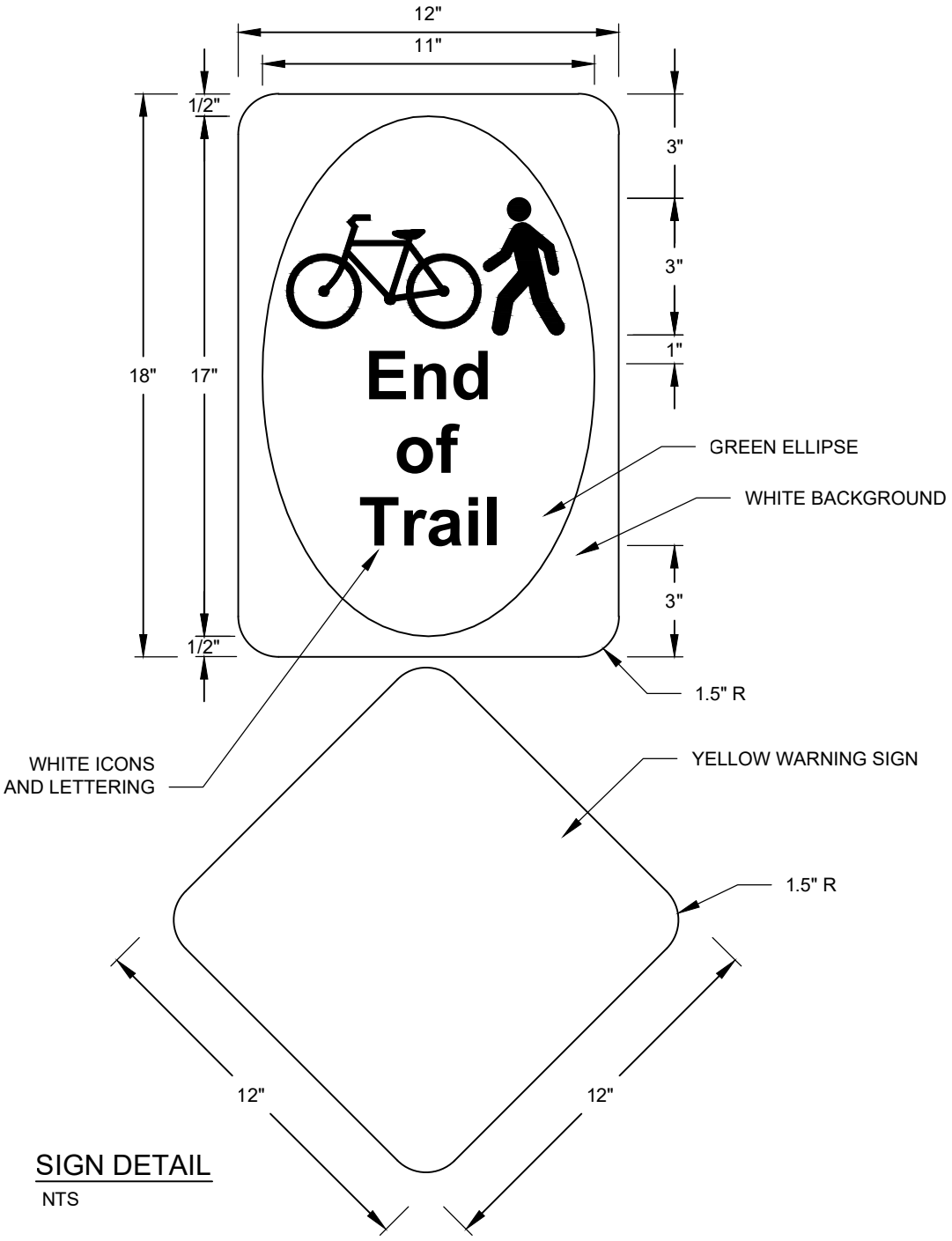
CityofRedmond
WASHINGTON

STANDARD DETAILS

SHARED USE PATH WAYFINDING SIGN

FILE NAME: SD493.DWG | DETAIL NUMBER: **493**

DocuSign Envelope ID: F681597A-CCE8-405B-ACDB-A8564C559739



SIGN DETAIL

NTS

NOTES:

1. LETTER GRAPHICS SHALL BE HIGHWAY B SERIES FONT OF 2" HEIGHT WITH LINE SPACING OF 1".
2. SIGN CORNERS SHALL BE ROUNDED.
3. SIGN MATERIAL SHALL BE 0.080 THICK STOCK ALUMINUM SIGN PLATES. COLORS PER MUTCD COLOR SPECIFICATIONS. ALL SIGN SHEETING SHALL BE RETROREFLECTIVE 3M DIAMOND GRADE DG3 OR EQUIVALENT.
4. POST AND MOUNTING HEIGHT PER SD 426C OR SD 426D.

Donell Cairns

APPROVED BY: DONALD CAIRNS
TRANSPORTATION PLANNING AND ENGINEERING MANAGER

REVISION DATE: MARCH 01, 2020

CityofRedmond
WASHINGTON

STANDARD DETAILS

END OF TRAIL SIGN

FILE NAME: SD494.DWG | DETAIL NUMBER: **494**

DocuSign Envelope ID: F681597A-CCE8-405B-ACDB-A8564C559739



NOTES:

1. POST INSTALLED PER DETAIL 425C (OR 426D).
2. TEXT AND ARROW OPTIONS PROVIDED BY THE CITY TRAFFIC ENGINEER.
3. LETTER GRAPHICS SHALL BE GREEN LETTERS ON WHITE RETROREFLECTIVE BACKGROUND AS SHOWN ABOVE IN HIGHWAY GOTHIC.
4. SIGN MATERIAL: 3M DIAMOND GRADE DG³.

Donell Cairns

APPROVED BY: DONALD CAIRNS
TRANSPORTATION PLANNING AND ENGINEERING MANAGER

REVISION DATE: MARCH 01, 2019

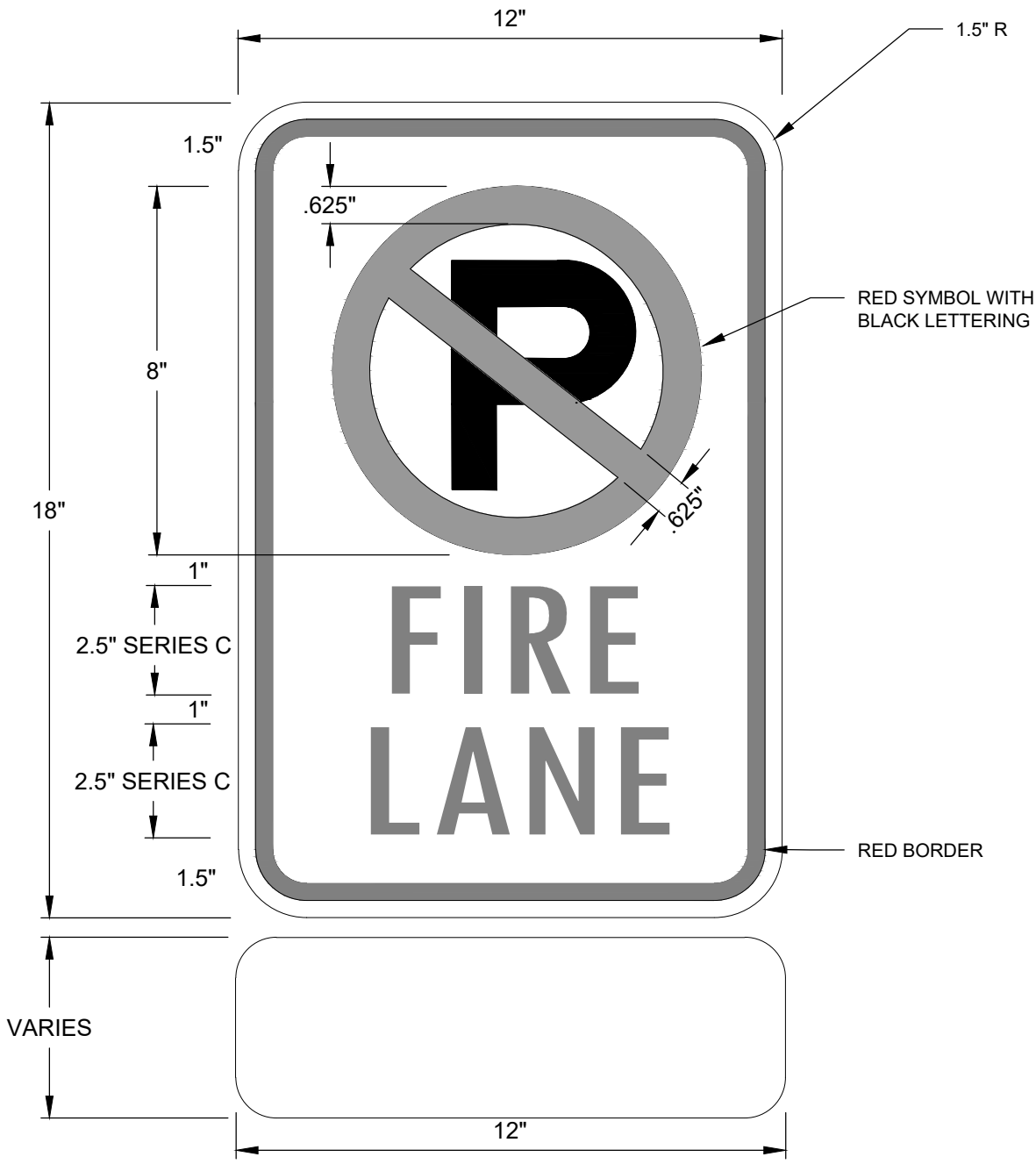
CityofRedmond
WASHINGTON

STANDARD DETAILS

TIME RESTRICTED PARKING SIGN

FILE NAME: SD499.DWG | DETAIL NUMBER: **498**

DocuSign Envelope ID: F681597A-CCE8-405B-ACDB-A8564C559739



OPTIONAL PLACARD FOR THE FOLLOWING:
"THIS SIDE OF STREET"
"BETWEEN SIGNS"
"NORTH OF HERE"
"BOTH SIDES OF STREET"
DIRECTIONAL ARROW SIGNS

NOTES:

1. POST INSTALLED PER DETAIL 425C (OR 426D).
2. PLACARD AND TEXT OPTIONS PROVIDED BY THE CITY TRAFFIC ENGINEER OR FIRE CODE OFFICIAL.
3. LETTER GRAPHICS SHALL BE RED LETTERS ON WHITE RETROREFLECTIVE BACKGROUND IN HIGHWAY GOTHIC FONT, EXCEPT SYMBOL SHALL BE RED SYMBOL WITH BLACK LETTERING.
4. SIGN MATERIAL: 3M DIAMOND GRADE DG³.
5. FIRE LANE SIGNS SHALL BE PLACED MAXIMUM OF 75' ON CENTER UNLESS APPROVED BY FIRE MARSHAL.

APPROVED BY: TODD SHORT
FIRE MARSHAL

REVISION DATE: MARCH 01, 2020

CityofRedmond
WASHINGTON

STANDARD DETAILS

FIRE LANE SIGN

FILE NAME: SD499.DWG | DETAIL NUMBER: **499**

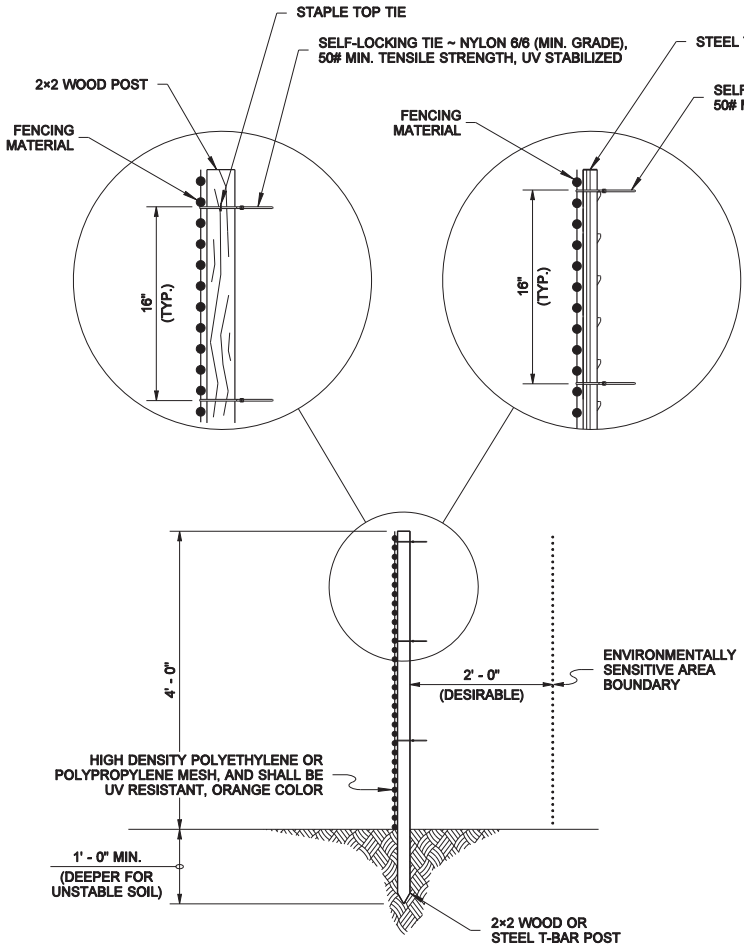
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SECTION 5

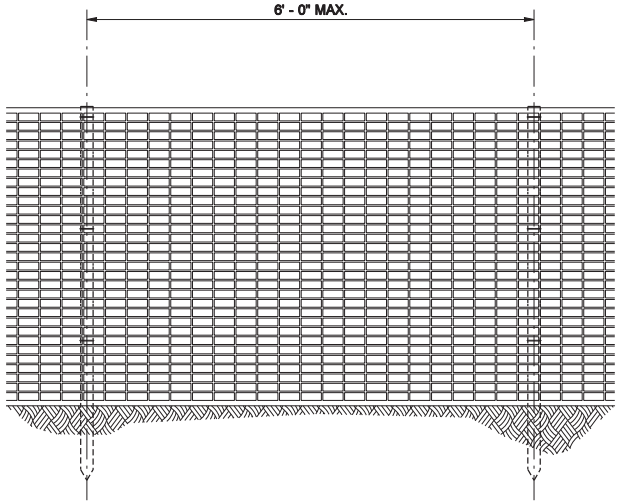
CLEARING, GRADING, AND TEMPORARY EROSION CONTROL

DocuSign Envelope ID: F681597A-CCE8-405B-ACDB-A8564C559739

DRAWN BY: BILL BERENS



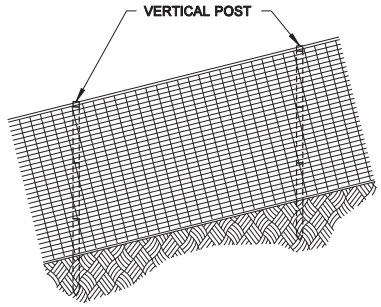
TYPICAL SECTION



ELEVATION

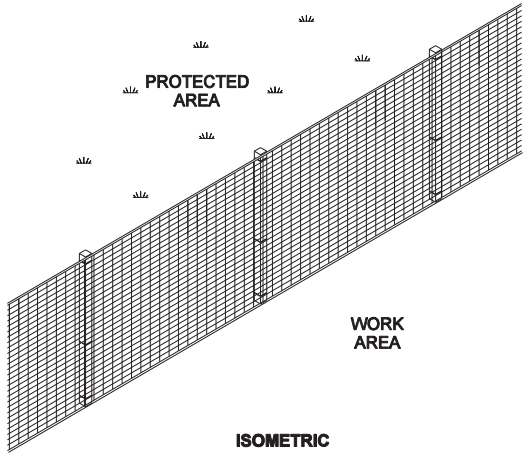
NOTE

1. Post shall have sufficient strength and durability to support the fence through the life of the project.



ELEVATION

FENCE ON SLOPE



ISOMETRIC

STATE OF WASHINGTON
REGISTERED
LANDSCAPE ARCHITECT

MARK W. MAURER
CERTIFICATE NO. 000598

NOTE: THIS PLAN IS NOT A LEGAL ENGINEERING DOCUMENT BUT AN ELECTRONIC DUPLICATE. THE ORIGINAL, SIGNED BY THE ENGINEER AND APPROVED FOR PUBLICATION, IS KEPT ON FILE AT THE WASHINGTON STATE DEPARTMENT OF TRANSPORTATION. A COPY MAY BE OBTAINED UPON REQUEST.

HIGH VISIBILITY FENCE

STANDARD PLAN I-10.10-01

SHEET 1 OF 1 SHEET

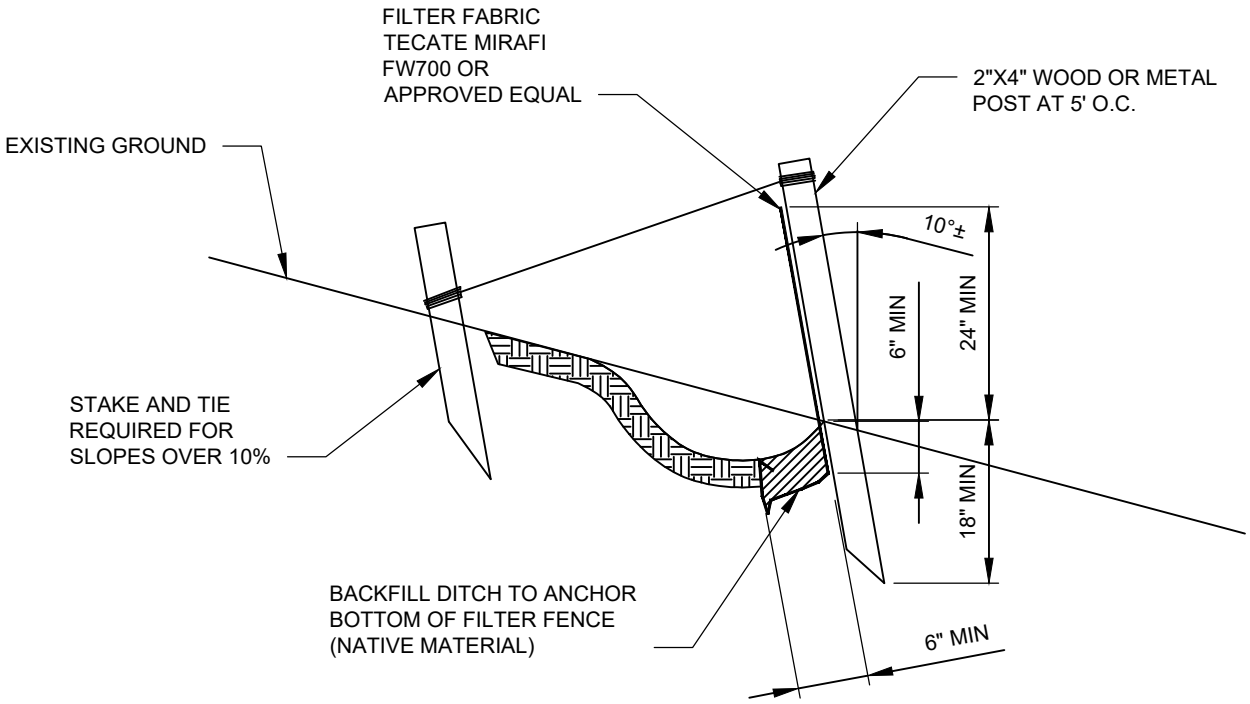
APPROVED FOR PUBLICATION

Pasco Bakotich III — STATE DESIGN ENGINEER

08-11-09 — DATE

Washington State Department of Transportation

DocuSign Envelope ID: F681597A-CCE8-405B-ACDB-A8564C559739



FILTER FABRIC FENCE

NTS

Gary M. Schimek

APPROVED BY: GARY M. SCHIMEK
ENVIRONMENTAL AND UTILITY SERVICES DIVISION MANAGER

REVISION DATE: MARCH 01, 2019

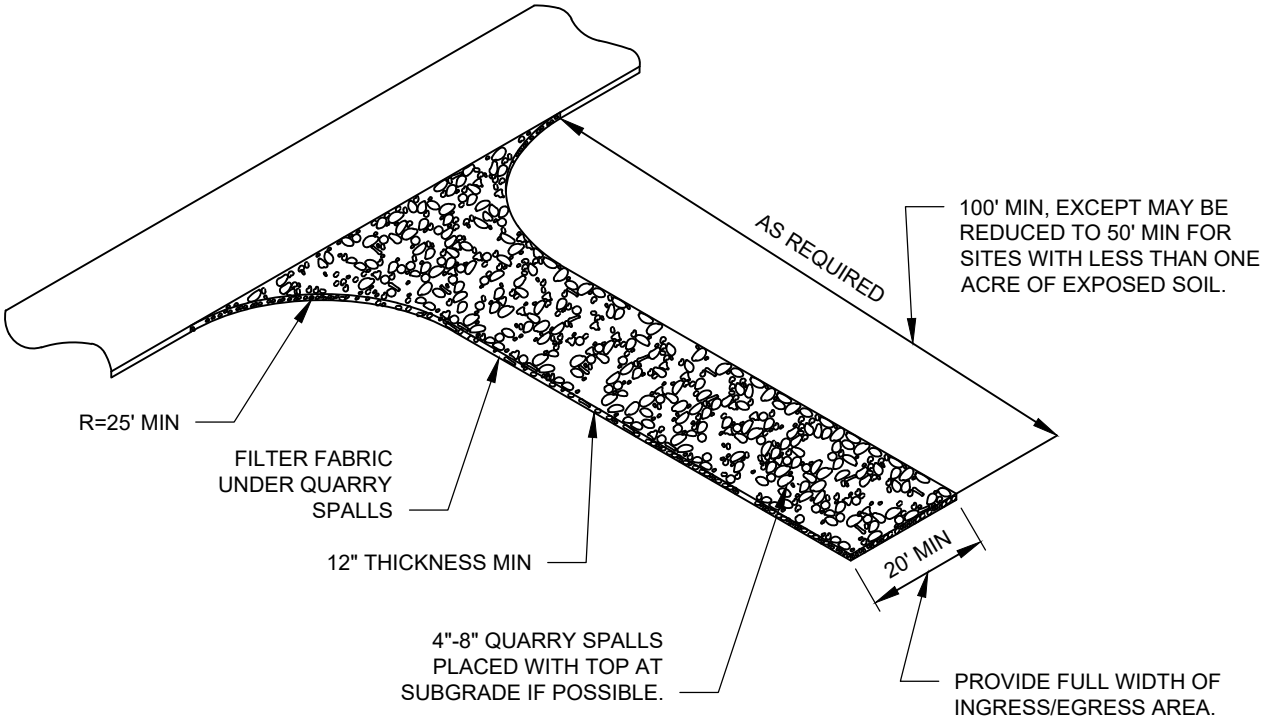
CityofRedmond
WASHINGTON

STANDARD DETAILS

FILTER FABRIC FENCE

FILE NAME: SD502.DWG | DETAIL NUMBER: **502**

DocuSign Envelope ID: F681597A-CCE8-405B-ACDB-A8564C559739



STABILIZED CONSTRUCTION ENTRANCE

NTS

NOTES:

1. STONE SIZE- USE 4" STONE OR RECLAIMED OR RECYCLED CONCRETE EQUIVALENT.
2. LENGTH - AS REQUIRED BUT NOT LESS THAN 50' (EXCEPT ON SINGLE RESIDENCE LOT WHERE A 30' MINIMUM LENGTH WOULD APPLY).
3. THICKNESS - NOT LESS THAN 12"
4. WIDTH - 20' MINIMUM BUT NOT LESS THAN THE FULL WIDTH AT POINTS WHERE INGRESS OR EGRESS OCCURS.
5. "FILTER FABRIC SHALL BE WOVEN STABILIZATION FABRIC WITH A MINIMUM PERMITTIVITY OF 0.9(SEC-1). PLACE FILTER FABRIC OVER THE ENTIRE AREA PRIOR TO PLACING OF STONE. FILTER FABRIC IS NOT REQUIRED FOR A SINGLE FAMILY RESIDENCE LOT"
6. MAINTENANCE - THE ENTRANCE SHALL BE MAINTAINED IN A CONDITION WHICH WILL PREVENT TRACKING OR FLOWING OF SEDIMENT ONTO PUBLIC RIGHT-OF-WAY. THIS MAY REQUIRE PERIODIC TOP DRESSING WITH ADDITIONAL STONE AS CONDITIONS DEMAND AND REPAIR AND/OR CLEAN OUT OF ANY MEASURES USED TO TRAP SEDIMENT. ALL SEDIMENT SPILLED, DROPPED, WASHED OR TRACKED ONTO PUBLIC RIGHT-OF-WAY MUST BE REMOVED IMMEDIATELY.
7. WHEEL WASHING - WHEELS SHALL BE CLEANED TO REMOVE SEDIMENT PRIOR TO ENTRANCE ONTO PUBLIC RIGHT-OF-WAY. WHEN WASHING IS REQUIRED, IT SHALL BE DONE ON AN AREA STABILIZED WITH STONE AND WHICH DRAINS INTO AN APPROVED SEDIMENT TRAPPING DEVICE.
8. PERIODIC INSPECTION AND NEEDED MAINTENANCE SHALL BE PROVIDED AFTER EACH RAIN.
9. IT IS RECOMMENDED THAT THE CONSTRUCTION ENTRANCE SHALL BE CONSTRUCTED SO THAT THE RUNOFF DRAINS OFF THE PAD AND IS CONTAINED WITHIN THE PROJECT SITE, PER THE 2014 DOE MANUALS.

Gary M. Schimek

APPROVED BY: GARY M. SCHIMEK
ENVIRONMENTAL AND UTILITY SERVICES DIVISION MANAGER

REVISION DATE: MARCH 01, 2020

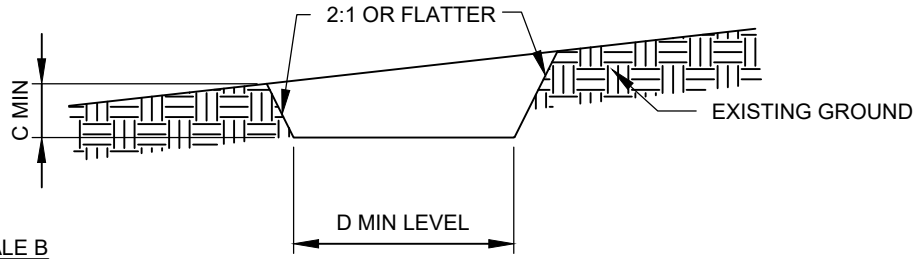
CityofRedmond WASHINGTON

STANDARD DETAILS

STABILIZED CONSTRUCTION ENTRANCE

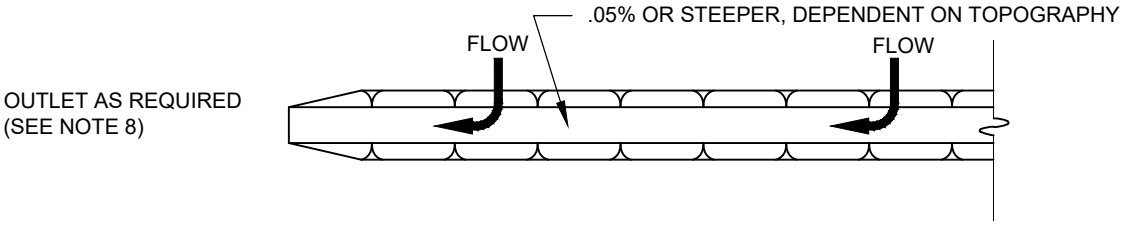
FILE NAME: SD503.DWG | DETAIL NUMBER: **503**

DocuSign Envelope ID: F681597A-CCE8-405B-ACDB-A8564C559739



	SWALE A	SWALE B
C	1'	1'
D	4'	6'

CROSS SECTION
NTS



PLAN VIEW
NTS

STANDARD SYMBOL
A-2 / B-3

NOTES:

1. ALL TEMPORARY SWALES SHALL HAVE UNINTERRUPTED POSITIVE GRADE TO AN OUTLET.
2. DIVERTED RUNOFF FROM A DISTURBED AREA SHALL BE CONVEYED TO A SEDIMENT TRAPPING DEVICE.
3. DIVERTED RUNOFF FROM AN UNDISTURBED AREA SHALL OUTLET DIRECTLY INTO AN UNDISTURBED STABILIZED AREA AT NON-EROSIVE VELOCITIES.
4. ALL TREES, BRUSH, STUMPS, OBSTRUCTIONS, AND OTHER OBJECTIONABLE MATERIAL SHALL BE REMOVED AND DISPOSED OF SO AS NOT TO INTERFERE WITH THE PROPER FUNCTIONING OF THE SWALE.
5. THE SWALE SHALL BE EXCAVATED OR SHAPED TO LINE, GRADE AND CROSS SECTION AS REQUIRED TO MEET THE CRITERIA SPECIFIED HEREIN AND BE FREE OF BANK PROJECTIONS OR OTHER IRREGULARITIES WHICH WILL IMPEDE NORMAL FLOW.
6. FILLS SHALL BE COMPACTED BY EARTH MOVING EQUIPMENT.
7. ALL EARTH REMOVED AND NOT NEEDED ON CONSTRUCTION SHALL BE PLACED SO THAT IT WILL NOT INTERFERE WITH THE SWALE.
8. STABILIZATION SHALL BE AS PER THE CHART BELOW:

FLOW CHANNEL STABILIZATION

TYPE OF TREATMENT	CHANNEL GRADE	A (5 AC OR LESS)	B (5 AC - 10 AC)
1	0.5% - 3.0%	SEED AND STRAW MULCH	SEED AND STRAW MULCH
2	3.1% - 5.0%	SEED AND STRAW MULCH	SEED USING JUTE OR EXCELSIOR
3	3.1% - 5.0%	SEED USING JUTE OR EXCELSIOR; SOD	LINED RIP-RAP 4"-8" RECYCLED CONCRETE EQUIVALENT
4	3.1% - 5.0%	LINED 4"-8" RIP-RAP	ENGINEERED DESIGN

9. PERIODIC INSPECTION AND REQUIRED MAINTENANCE MUST BE PROVIDED AFTER EACH RAIN EVENT.

Gary M. Schimek

APPROVED BY: GARY M. SCHIMEK
ENVIRONMENTAL AND UTILITY SERVICES DIVISION MANAGER

REVISION DATE: MARCH 01, 2019

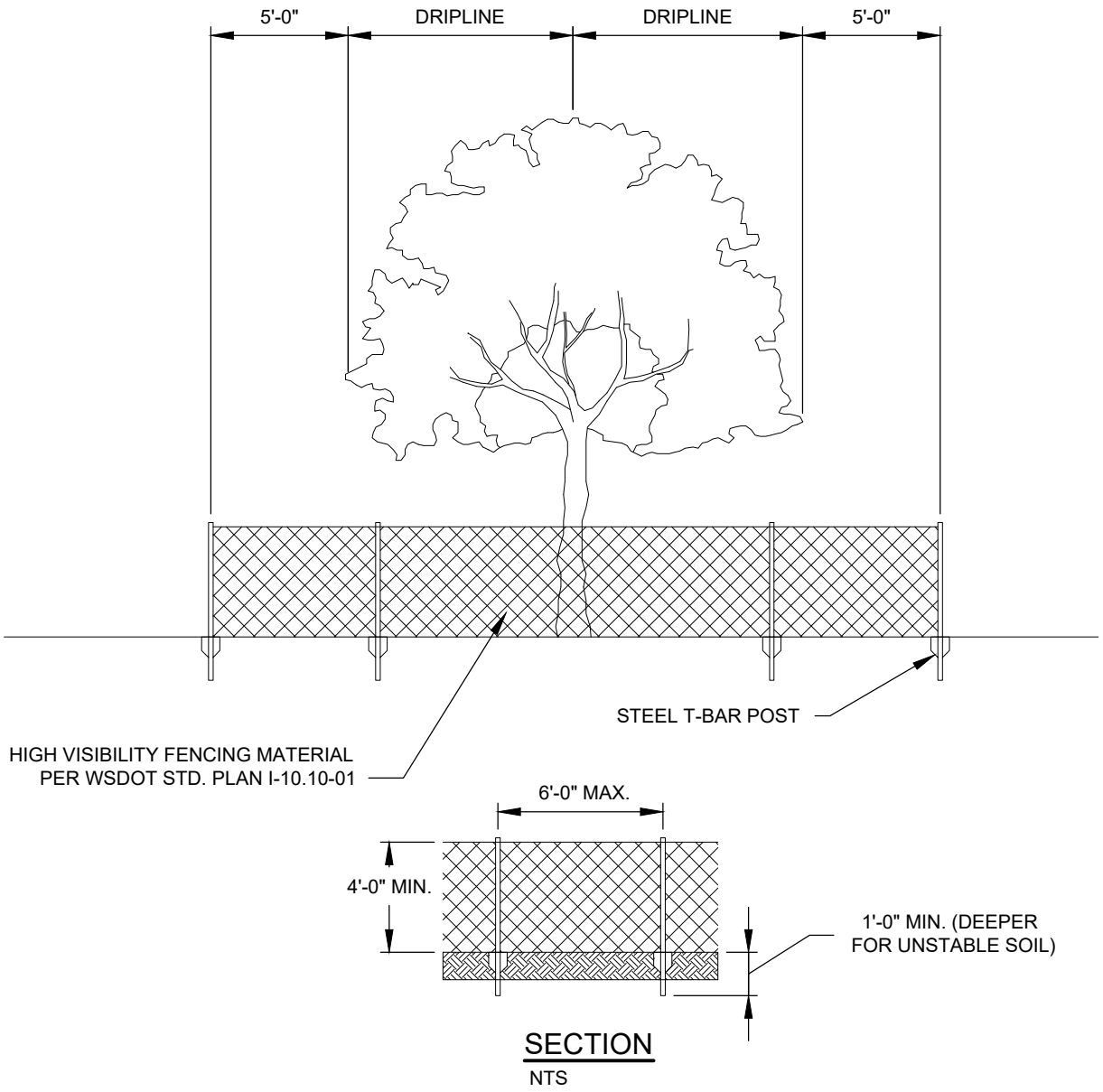
CityofRedmond WASHINGTON

STANDARD DETAILS

TEMPORARY SWALE

FILE NAME: SD504.DWG | DETAIL NUMBER: **504**

DocuSign Envelope ID: F681597A-CCE8-405B-ACDB-A8564C559739



SECTION

NTS

NOTES:

1. WIRE FENCE TO FENCE POST WITH SELF-LOCKING TIE-NYLON $\frac{6}{6}$ (MIN. GRADE), 50# MIN. TENSILE STRENGTH, UV STABILIZED AT 16" O.C. ON EACH POST.
2. MAY USE CHAIN LINK FENCING.
3. ALL CONSTRUCTION ACTIVITIES, INCLUDING STAGING AND TRAFFIC AREAS, SHALL BE PROHIBITED WITHIN FENCED AREA.
4. SEE REDMOND ZONING CODE 21.72.070 FOR TREE PROTECTION MEASURES.
5. FENCING LIMITS FOR STREET TREES TO BE ADJUSTED PER THE INSPECTOR.

Lisa W. Rigg

APPROVED BY: LISA W. RIGG
DEVELOPMENT ENGINEERING MANAGER

REVISION DATE: MARCH 01, 2019

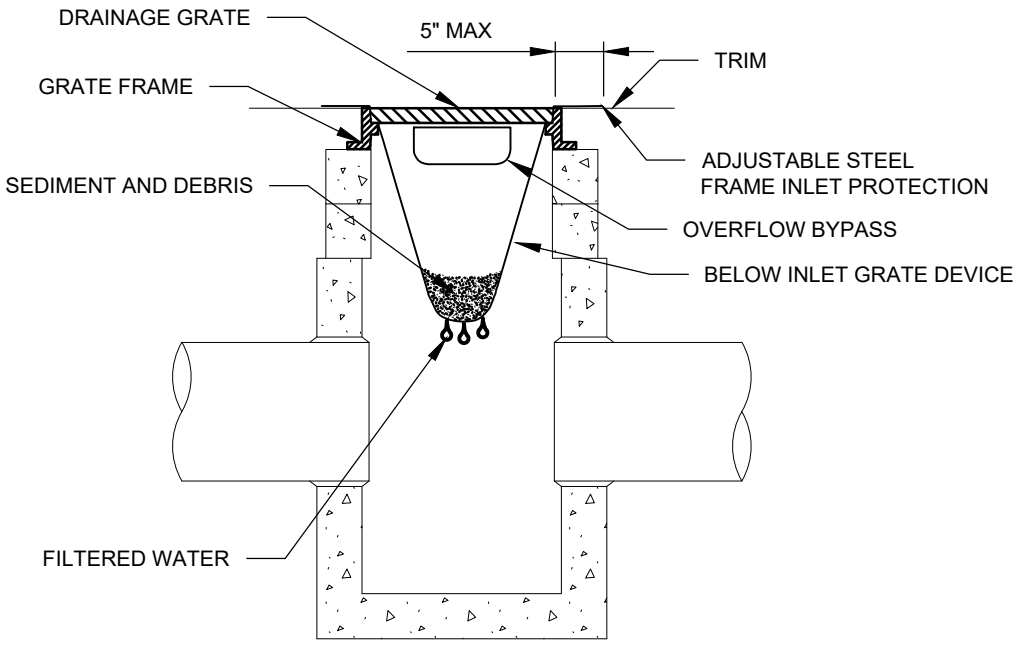
CityofRedmond
WASHINGTON

STANDARD DETAILS

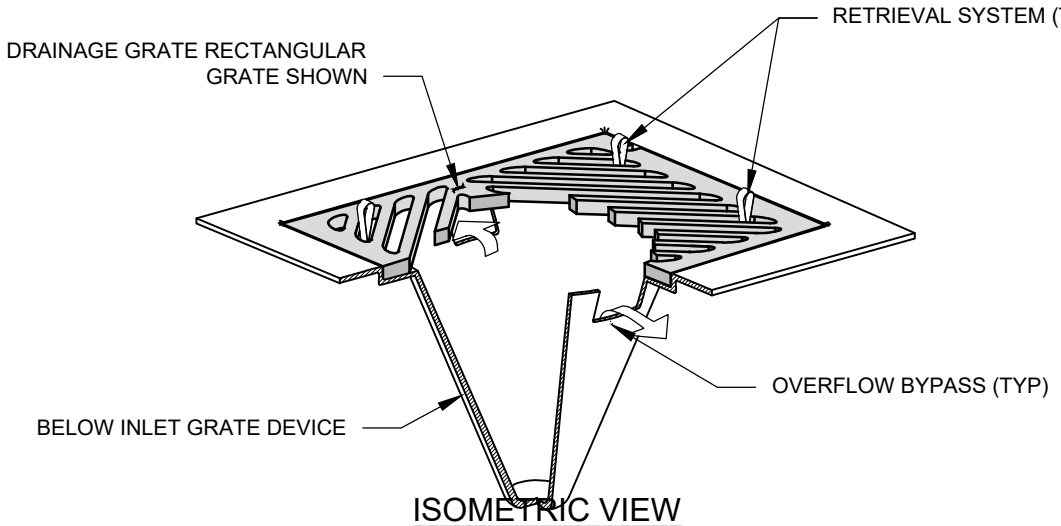
TREE PROTECTION FENCE DETAIL

FILE NAME: DS507.DWG | DETAIL NUMBER: **507**

DocuSign Envelope ID: F681597A-CCE8-405B-ACDB-A8564C559739



SECTION VIEW
NTS



ISOMETRIC VIEW
NTS

NOTES:

1. SIZE THE BELOW INLET GRATE DEVICE (BIGD) FOR THE STORMWATER STRUCTURE IT WILL SERVICE
2. THE BIGD SHALL HAVE A BUILT-IN HIGH-FLOW RELIEF SYSTEM (OVERFLOW BYPASS)
3. THE RETRIEVAL SYSTEM MUST ALLOW REMOVAL OF THE BIGD WITHOUT SPILLING THE COLLECTED MATERIAL
4. PERFORM MAINTENANCE IN ACCORDANCE WITH STANDARD SPECIFICATION 8-01.3(15)

Gary M. Schimek

APPROVED BY: GARY M. SCHIMEK
ENVIRONMENTAL AND UTILITY SERVICES DIVISION MANAGER

REVISION DATE: MARCH 01, 2020

CityofRedmond
WASHINGTON

STANDARD DETAILS

STORM DRAIN INLET PROTECTION

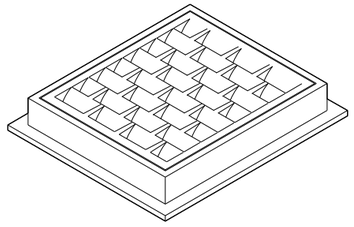
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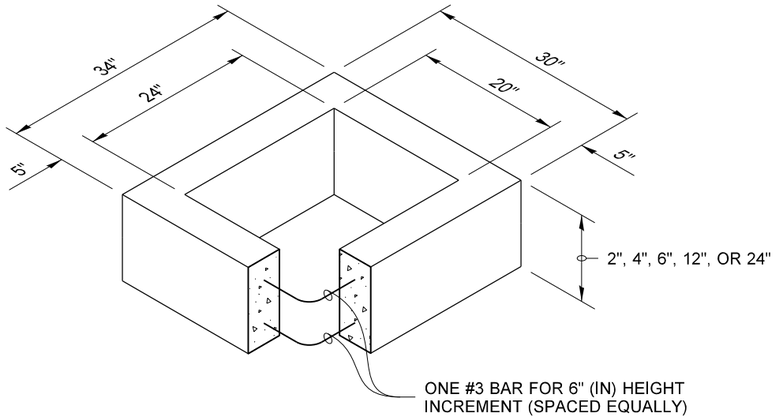
SECTION 6

STORMWATER

DRAWN BY: LISA CYFORD



FRAME AND VANED GRATE



RECTANGULAR ADJUSTMENT SECTION

PIPE ALLOWANCES

PIPE MATERIAL	MAXIMUM INSIDE DIAMETER (INCHES)
REINFORCED OR PLAIN CONCRETE	12"
ALL METAL PIPE	15"
CPSSP * **(STD. SPEC. SECT. 9-05.20)**	12"
SOLID WALL PVC **(STD. SPEC. SECT. 9-05.12(1))**	15"
PROFILE WALL PVC **(STD. SPEC. SECT. 9-05.12(2))**	15"

* CORRUGATED POLYETHYLENE STORM SEWER PIPE

NOTES

1. As acceptable alternatives to the rebar shown in the **PRECAST BASE SECTION**, fibers (placed according to the Standard Specifications), or wire mesh having a minimum area of 0.12 square inches per foot shall be used with the minimum required rebar shown in the ALTERNATIVE **PRECAST BASE SECTION**. Wire mesh shall not be placed in the knockouts.

2. The knockout diameter shall not be greater than 20" (in). Knockouts shall have a wall thickness of 2" (in) minimum to 2.5" (in) maximum. Provide a 1.5" (in) minimum gap between the knockout wall and the outside of the pipe. After the pipe is installed, fill the gap with joint mortar in accordance with **Standard Specification Section 9-04.3**.

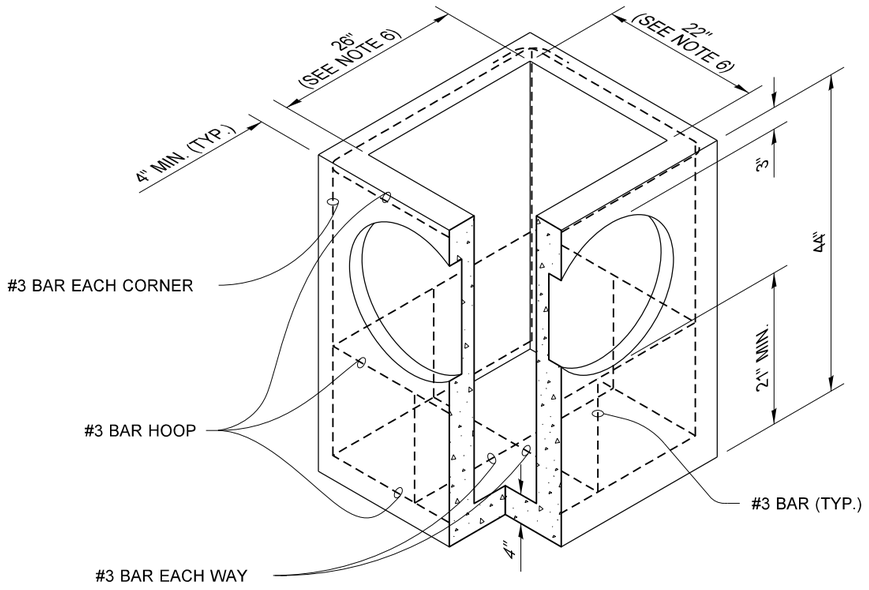
3. The maximum depth from the finished grade to the lowest pipe invert shall be 5' (ft).

4. The frame and grate may be installed with the flange down, or integrally cast into the adjustment section with flange up.

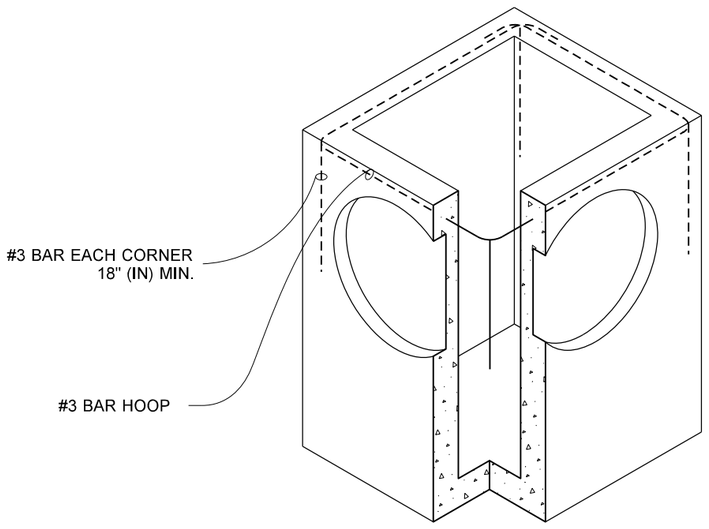
5. The Precast Base Section may have a rounded floor, and the walls may be sloped at a rate of 1 : 24 or steeper.

6. The opening shall be measured at the top of the **Precast Base Section**.

7. All pickup holes shall be grouted full after the basin has been placed.



PRECAST BASE SECTION



(SEE NOTE 1)

ALTERNATIVE PRECAST BASE SECTION

JULIE HEILMAN
STATE OF WASHINGTON
41819
REGISTERED
PROFESSIONAL ENGINEER

CATCH BASIN TYPE 1

STANDARD PLAN B-5.20-02

SHEET 1 OF 1 SHEET

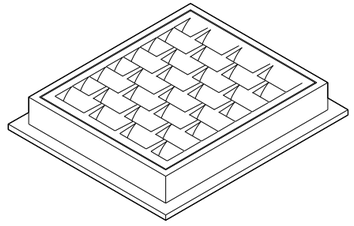
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STATE DESIGN ENGINEER

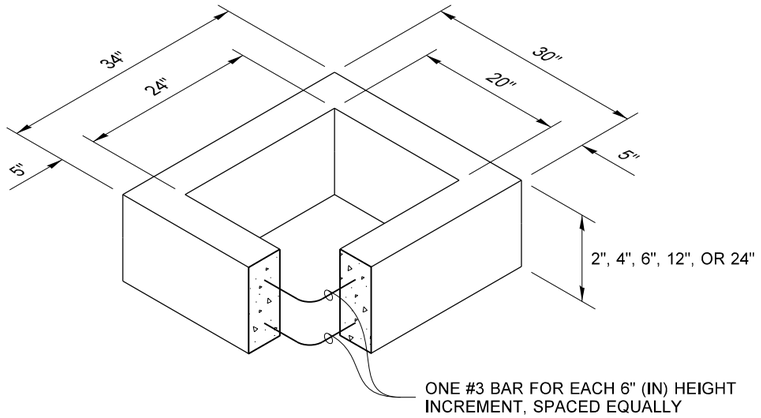
Washington State Department of Transportation

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FRAME AND VANED GRATE



RECTANGULAR ADJUSTMENT SECTION

PIPE ALLOWANCES	
PIPE MATERIAL	**MAXIMUM INSIDE DIAMETER (INCHES)**
REINFORCED OR PLAIN CONCRETE	18"
ALL METAL PIPE	21"
CPSSP * **(STD. SPEC. SECT. 9-05.20)**	18"
SOLID WALL PVC **(STD. SPEC. SECT. 9-05.12(1))**	21"
PROFILE WALL PVC **(STD. SPEC. SECT. 9-05.12(2))**	21"

* CORRUGATED POLYETHYLENE STORM SEWER PIPE

NOTES

1. As acceptable alternatives to the rebar shown in the **PRECAST BASE SECTION**, fibers (placed according to the Standard Specifications), or wire mesh having a minimum area of 0.12 square inches per foot, shall be used with the minimum required rebar shown in the ALTERNATIVE **PRECAST BASE SECTION**. Wire mesh shall not be placed in the knockouts.

2. The knockout shall not be greater than 26" (in), in any direction. Knockouts shall have a wall thickness of 2" (in) minimum to 2.5" (in) maximum. Provide a 1.5" (in) minimum gap between the knockout wall and the outside of the pipe. After the pipe is installed, fill the gap with joint mortar in accordance with **Standard Specification Section 9-04.3**.

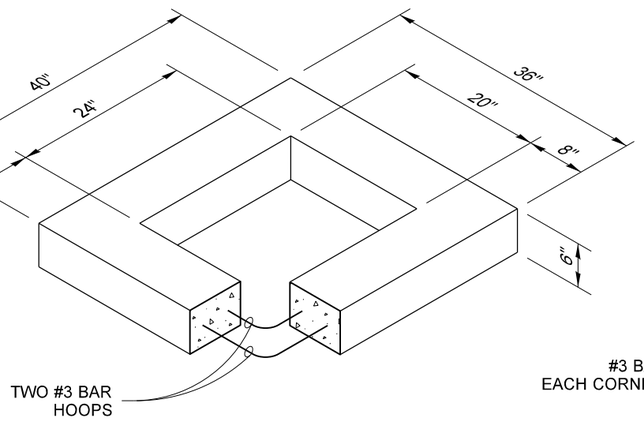
3. The maximum depth from the finished grade to the lowest pipe invert shall be 5' (ft).

4. The frame and grate may be installed with the flange down or integrally cast into the adjustment section with flange up.

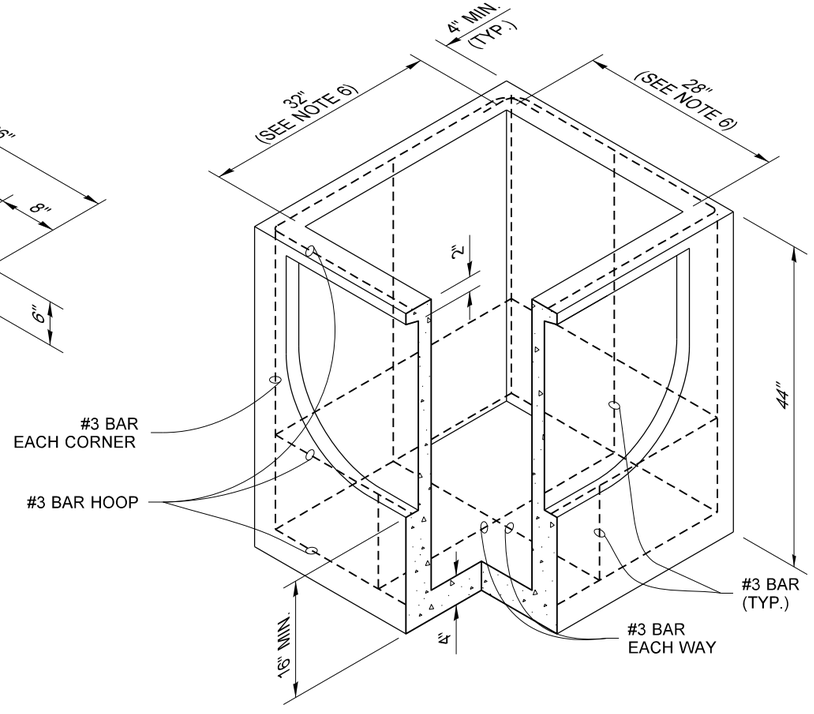
5. The Precast Base Section may have a rounded floor, and the walls may be sloped at a rate of 1 : 24 or steeper.

6. The opening shall be measured at the top of the Precast Base Section.

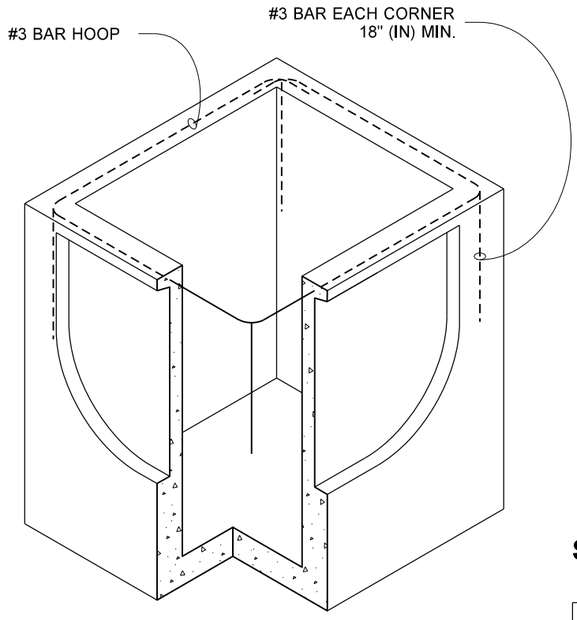
7. All pickup holes shall be grouted full after the basin has been placed.



REDUCING SECTION



PRECAST BASE SECTION



(SEE NOTE 1)

ALTERNATIVE PRECAST BASE SECTION

JULIE HEILMAN
STATE OF WASHINGTON
41819
REGISTERED
PROFESSIONAL ENGINEER

CATCH BASIN TYPE 1L

STANDARD PLAN B-5.40-02

SHEET 1 OF 1 SHEET

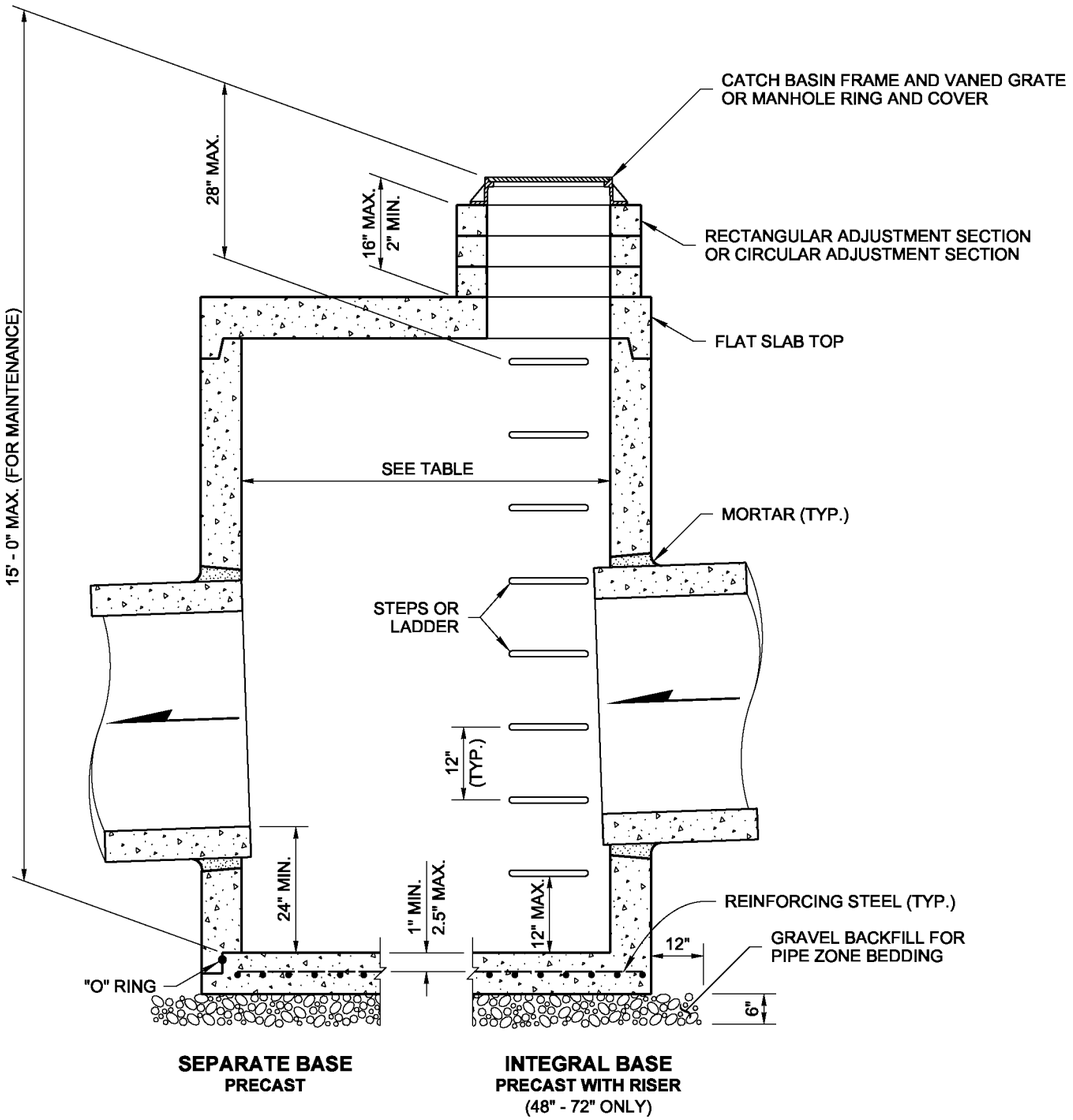
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Washington State Department of Transportation

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NOTES

1. No steps are required when height is 4' or less.
2. The bottom of the precast catch basin may be sloped to facilitate cleaning.
3. The rectangular frame and grate may be installed with the flange up or down. The frame may be cast into the adjustment section.
4. Knockouts shall have a wall thickness of 2" minimum to 2.5" maximum. Provide a 1.5" minimum gap between the knockout wall and the outside of the pipe. After the pipe is installed, fill the gap with joint mortar in accordance with **Standard Specification 9-04.3.**

CATCH BASIN DIMENSIONS

CATCH BASIN DIAMETER	MIN. WALL THICKNESS	MIN. BASE THICKNESS	MAXIMUM KNOCKOUT SIZE	MINIMUM DISTANCE BETWEEN KNOCKOUTS
48"	4"	6"	36"	8"
54"	4.5"	8"	42"	8"
60"	5"	8"	48"	8"
72"	6"	8"	60"	12"
84"	8"	12"	72"	12"
96"	8"	12"	84"	12"
120"	10"	12"	96"	12"
144"	12"	12"	108"	12"

PIPE ALLOWANCES

CATCH BASIN DIAMETER	PIPE MATERIAL WITH MAXIMUM INSIDE DIAMETER				
	CONCRETE	ALL METAL	CPSSP ①	SOLID WALL PVC ②	PROFILE WALL PVC ③
48"	24"	30"	24"	30"	30"
54"	30"	36"	30"	36"	36"
60"	36"	42"	36"	42"	42"
72"	42"	54"	42"	48"	48"
84"	54"	60"	54"	48"	48"
96"	60"	72"	60"	48"	48"
120"	66"	84"	60"	48"	48"
144"	78"	96"	60"	48"	48"

① Corrugated Polyethylene Storm Sewer Pipe **(Standard Specification 9-05.20)**
② **(Standard Specification 9-05.12(1))**
③ **(Standard Specification 9-05.12(2))**

CASEY M. KRAMER
STATE OF WASHINGTON
44535
REGISTERED
PROFESSIONAL ENGINEER

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CATCH BASIN TYPE 2

STANDARD PLAN B-10.20-01

SHEET 1 OF 1 SHEET

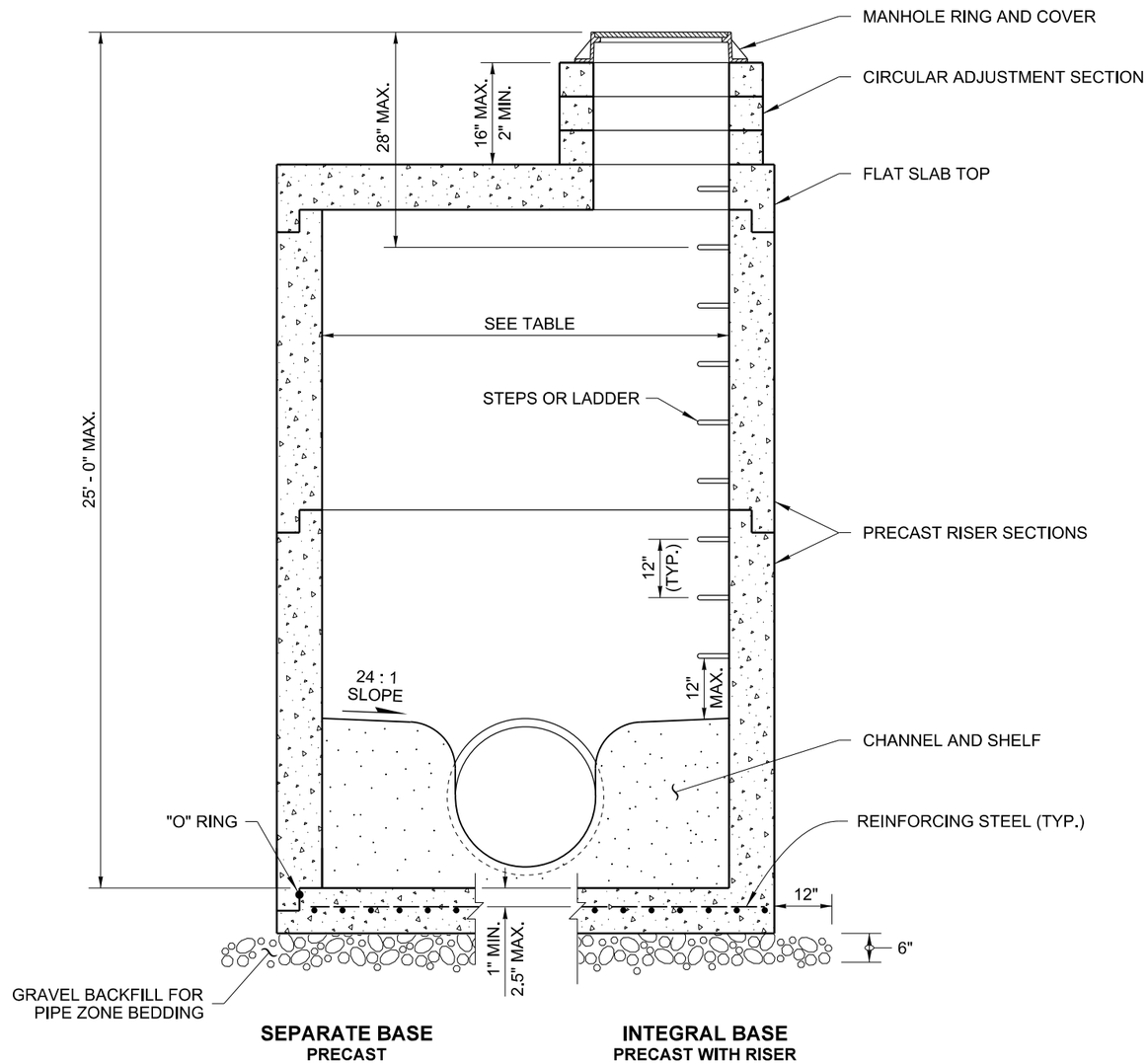
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Pasco Bakotich III — STATE DESIGN ENGINEER
02-07-12 — DATE

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DRAWN BY: LISA CYFORD



NOTES

1. Knockouts shall have a wall thickness of 2" (in) minimum to 2.5" (in) maximum.
2. For pipe allowances, see **Standard Plan B-10.20.**
3. No steps are required when height is 4' (ft) or less.

MANHOLE DIMENSION TABLE				
DIAM.	MIN. WALL THICKNESS	MIN. BASE THICKNESS	MAXIMUM KNOCKOUT SIZE	MINIMUM DISTANCE BETWEEN KNOCKOUTS
48"	4"	6"	36"	8"
54"	4.5"	8"	42"	8"
60"	5"	8"	48"	8"
72"	6"	8"	60"	12"
84"	8"	12"	72"	12"
96"	8"	12"	84"	12"
120"	10"	12"	96"	12"
144"	12"	12"	108"	12"

JULIE HEILMAN
STATE OF WASHINGTON
41819
REGISTERED
PROFESSIONAL ENGINEER

MANHOLE TYPE 3

STANDARD PLAN B-15.60-02

SHEET 1 OF 1 SHEET

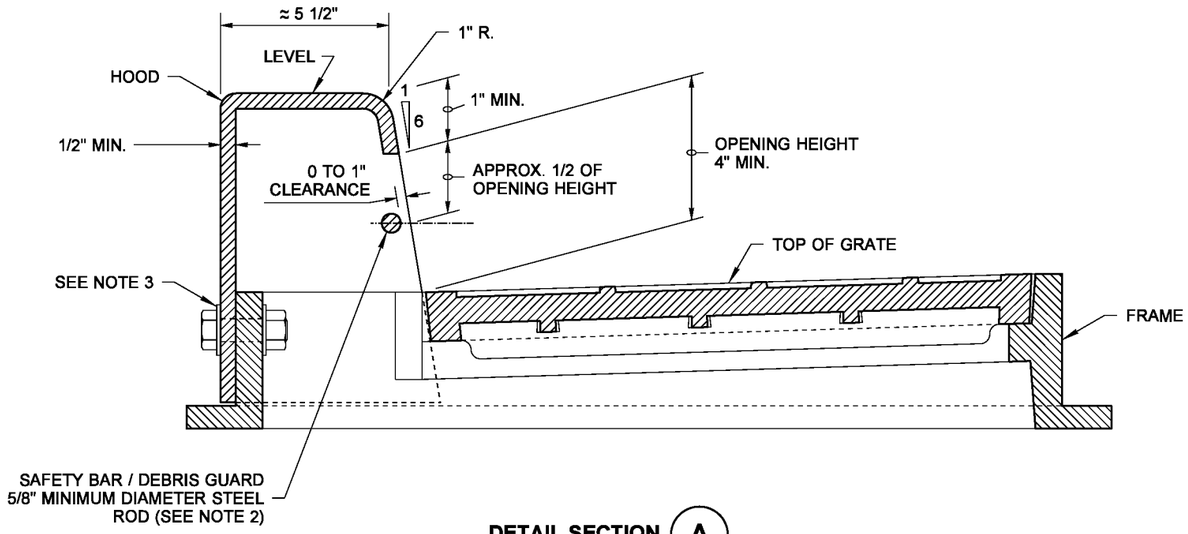
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STATE DESIGN ENGINEER

Washington State Department of Transportation

January 21, 2026

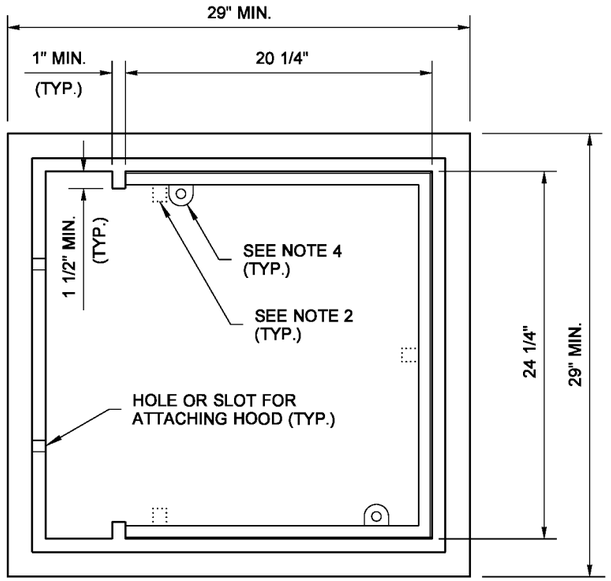
DRAWN BY: FERN LIDDELL



DETAIL SECTION (A)

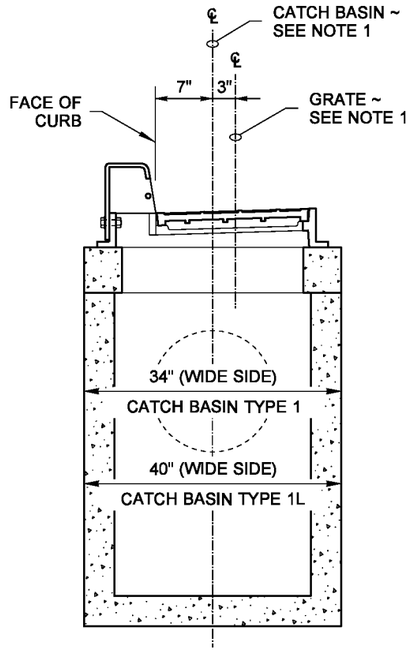
NOTES

1. This inlet requires the precast catch basin unit to be rotated 90 degrees so that the narrow side is parallel to the curb line. When calculating offsets from curb to CL of the precast catch basin, please note that the CL of the grate is not the CL of the precast catch basin. See **Section A**
2. The dimensions of the frame and hood may vary slightly among different manufacturers. The Frame may have cast features intended to support a debris guard. Hood units may be mounted inside or outside of the frame. The methods for fastening the safety bar / debris guard rod to the hood may vary. The hood may include casting lugs. The top of the hood may be cast with a pattern.
3. Attach the hood to the frame with two 3/4" × 2" hex head bolts, nuts, and oversize washers. The washers shall have diameters adequate to ensure full bearing across the slots.
4. Bolt-down capability is required on all frames, grates and covers, unless specified in the Contract. Provide two holes in the Frame that are vertically aligned with the grate slots. The frame shall accept the 5/8" × 11 NC × 2" allen head cap screw by being tapped, or other approved mechanism. The location of bolt-down holes varies among manufacturers. See BOLT-DOWN DETAIL, **Standard Plan B-30.10.**
5. Only ductile iron Vaned Grates shall be used. See **Standard Plans B-30.30 and B-30.40** for grate details. Refer to **Standard Specification 9-05.15(2)** for additional requirements.
6. This plan is intended to show the installation details of a manufactured product. This plan is not intended to show the specific details necessary to fabricate the castings depicted in this drawing.

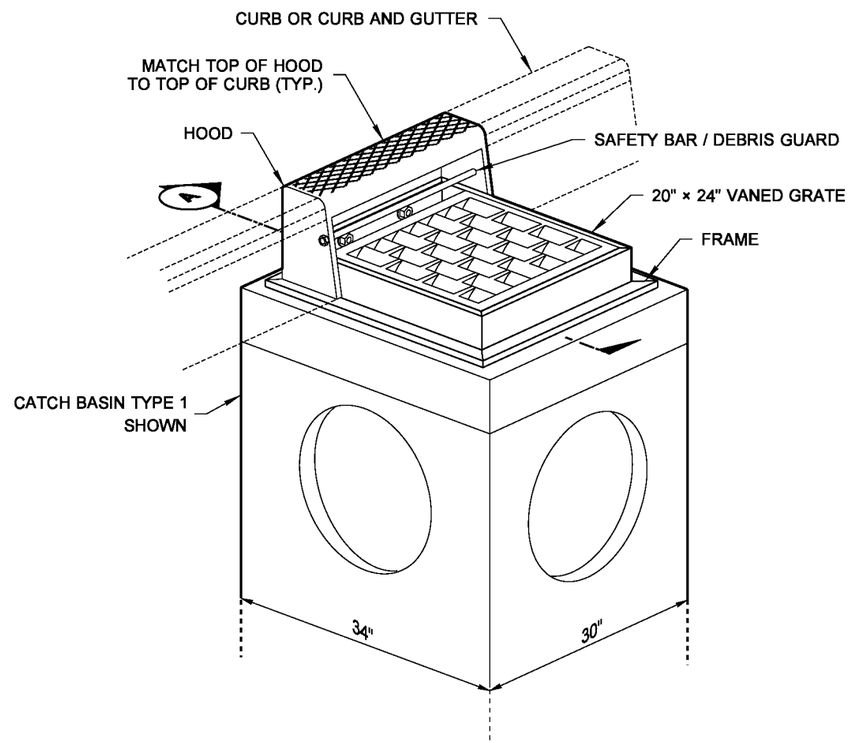


TOP VIEW

FRAME DETAIL



SECTION (A)



ISOMETRIC VIEW

COMBINATION INLET
FRAME, HOOD, AND VANED GRATE

CASEY M. KRAMER
STATE OF WASHINGTON
44535
REGISTERED
PROFESSIONAL ENGINEER

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COMBINATION INLET

STANDARD PLAN B-25.20-01

SHEET 1 OF 1 SHEET

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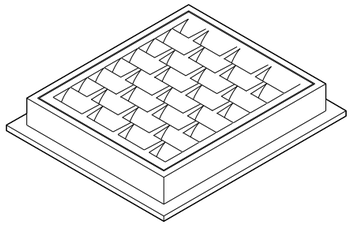
Pasco Bakotich III — STATE DESIGN ENGINEER

03-15-12 — DATE

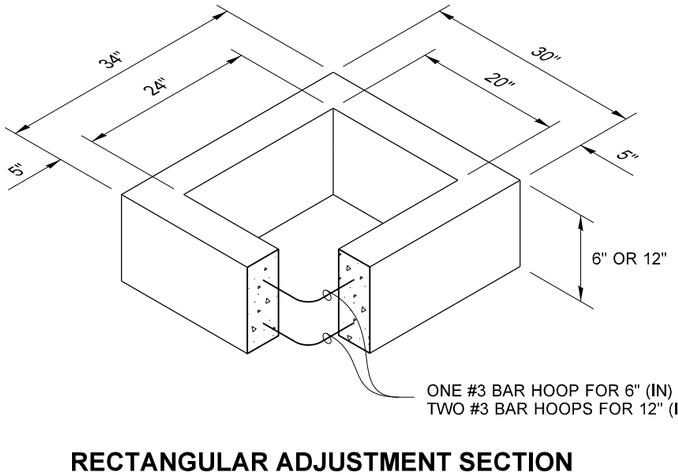
Washington State Department of Transportation

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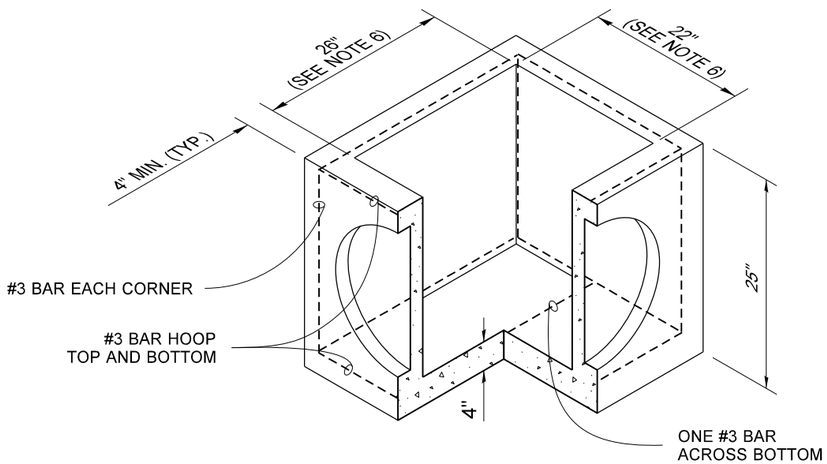
DRAWN BY: MARK SUJKA



FRAME AND VANED GRATE



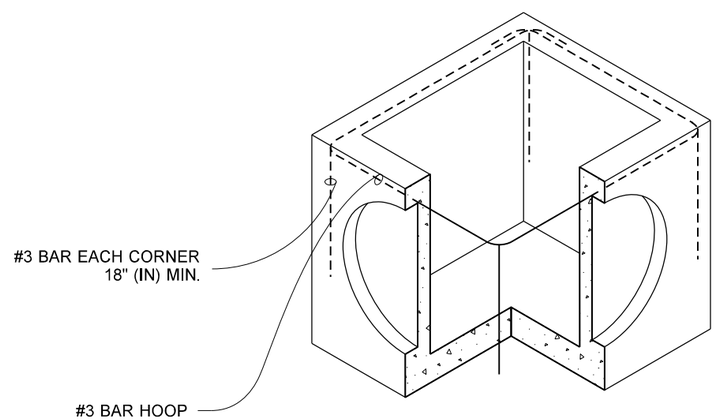
RECTANGULAR ADJUSTMENT SECTION



PRECAST BASE SECTION

PIPE ALLOWANCES	
PIPE MATERIAL	MAXIMUM INSIDE DIAMETER (INCHES)
REINFORCED OR PLAIN CONCRETE	12"
ALL METAL PIPE	15"
CPSSP * (STD. SPEC. SECT. 9-05.20)	12"
POLYPROPYLENE (STD. SPEC. SECT. 9-05.24)	12"
SOLID WALL PVC (STD. SPEC. SECT. 9-05.12(1))	15"
PROFILE WALL PVC (STD. SPEC. SECT. 9-05.12(2))	15"

* CORRUGATED POLYETHYLENE STORM SEWER PIPE



SEE NOTE 1

ALTERNATIVE PRECAST BASE SECTION

NOTES

1. As acceptable alternatives to the rebar shown in the **PRECAST BASE SECTION**, fibers (placed according to the Standard Specifications), or wire mesh having a minimum area of 0.12 square inches per foot shall be used with the minimum required rebar shown in the **ALTERNATIVE PRECAST BASE SECTION**. Wire mesh shall not be placed in the knockouts.

2. The knockout diameter shall not be greater than 18" (in) . Knockouts shall have a wall thickness of 2" (in) minimum to 2.5" (in) maximum. Provide a 1.5" (in) minimum gap between the knockout wall and the outside of the pipe. After the pipe is installed, fill the gap with joint mortar in accordance with **Standard Specification Section 9-04.3**.

3. The maximum depth from the finished grade to the lowest pipe invert shall be 5' (ft).

4. The frame and grate may be installed with the flange up or down. The frame may be cast into the adjustment section.

5. The Precast Base Section may have a rounded floor, and the walls may be sloped at a rate of 1 : 24 or steeper.

6. The opening shall be measured at the top of the precast base section.

7. All pickup holes shall be grouted full after the inlet has been placed.



CONCRETE INLET

STANDARD PLAN B-25.60-02

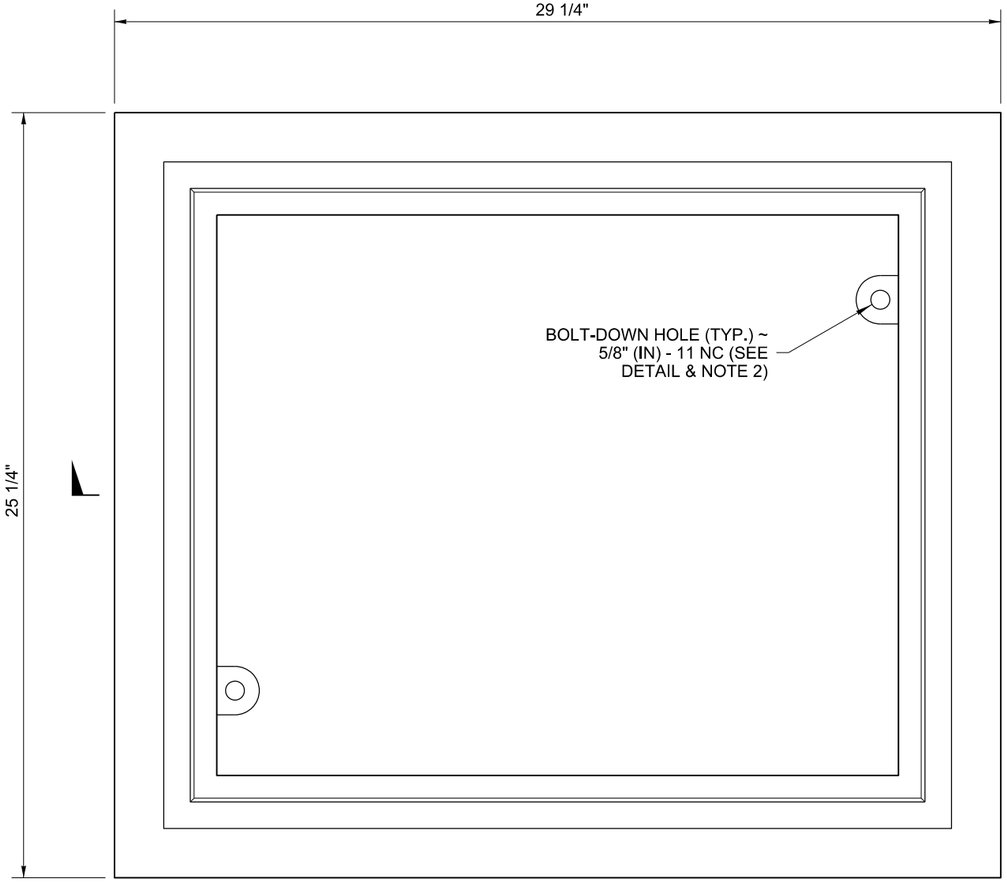
SHEET 1 OF 1 SHEET

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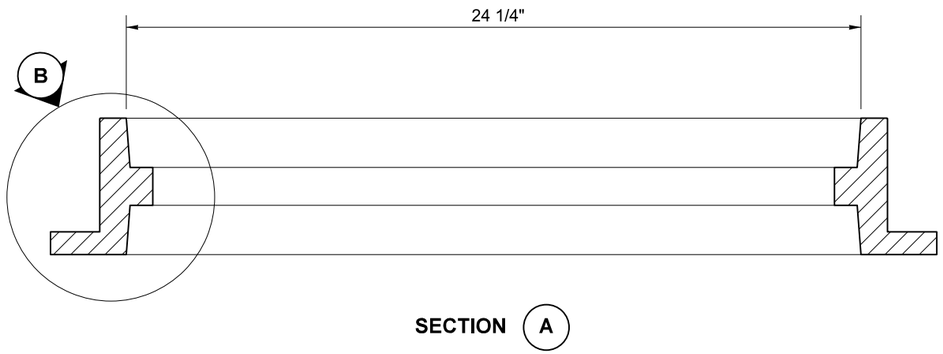
STATE DESIGN ENGINEER

Washington State Department of Transportation

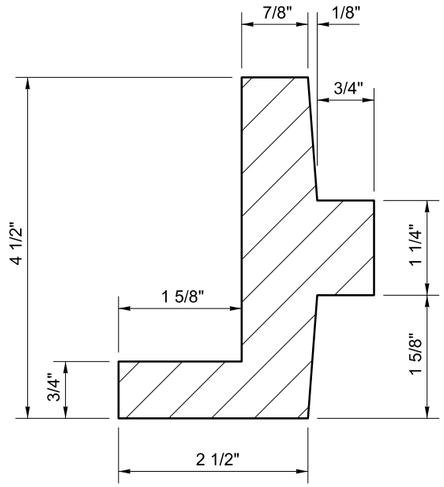
January 21, 2026



TOP



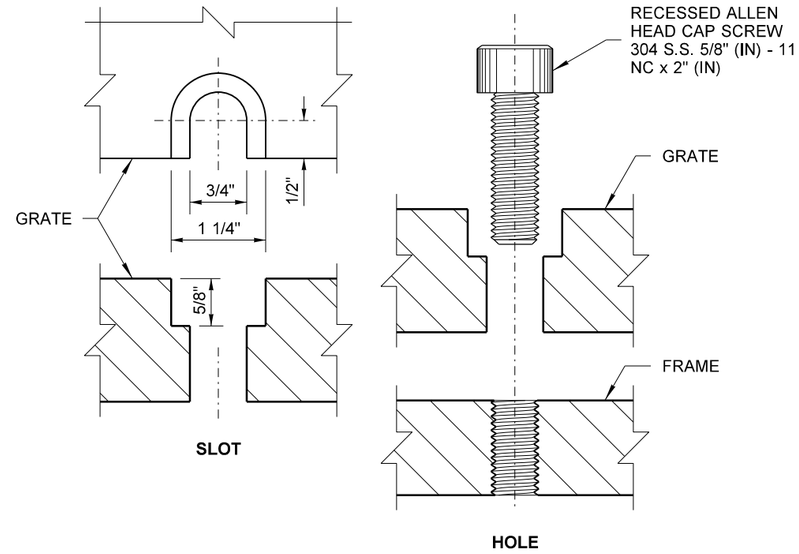
SECTION A



DETAIL B

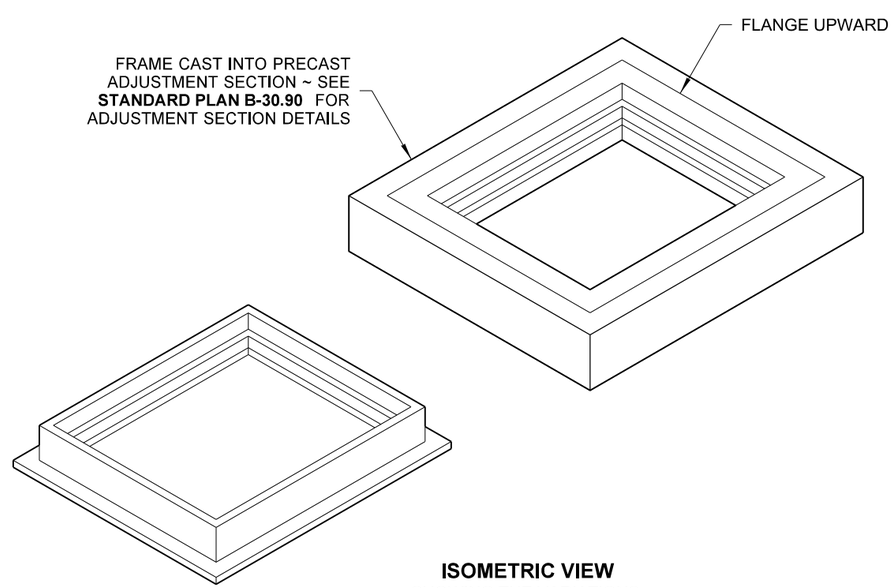
NOTES

1. This frame is designed to accommodate 20" (in) × 24" (in) grates or covers as shown on **Standard Plans B-30.20, B-30.30, B-30.40,** and **B-30.50.**
2. Bolt-down capability is required on all frames, grates, and covers, unless specified otherwise in the Contract. Provide 2 holes in the frame that are vertically aligned with the grate or cover slots. The frame shall accept the 304 Stainless Steel (S.S.) 5/8" (in) - 11 NC × 2" (in) allen head cap screw by being tapped, or other approved mechanism. Location of bolt-down holes varies by manufacturer.
3. Refer to **Standard Specification Section 9-05.15(2)** for additional requirements.



SLOT **HOLE**

BOLT-DOWN DETAILS
SEE NOTE 2



ISOMETRIC VIEW
SHOWING THE VARIATIONS

JULIE HEILMAN
STATE OF WASHINGTON
41819
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PROFESSIONAL ENGINEER

RECTANGULAR FRAME (REVERSIBLE)

STANDARD PLAN B-30.10-02

SHEET 1 OF 1 SHEET

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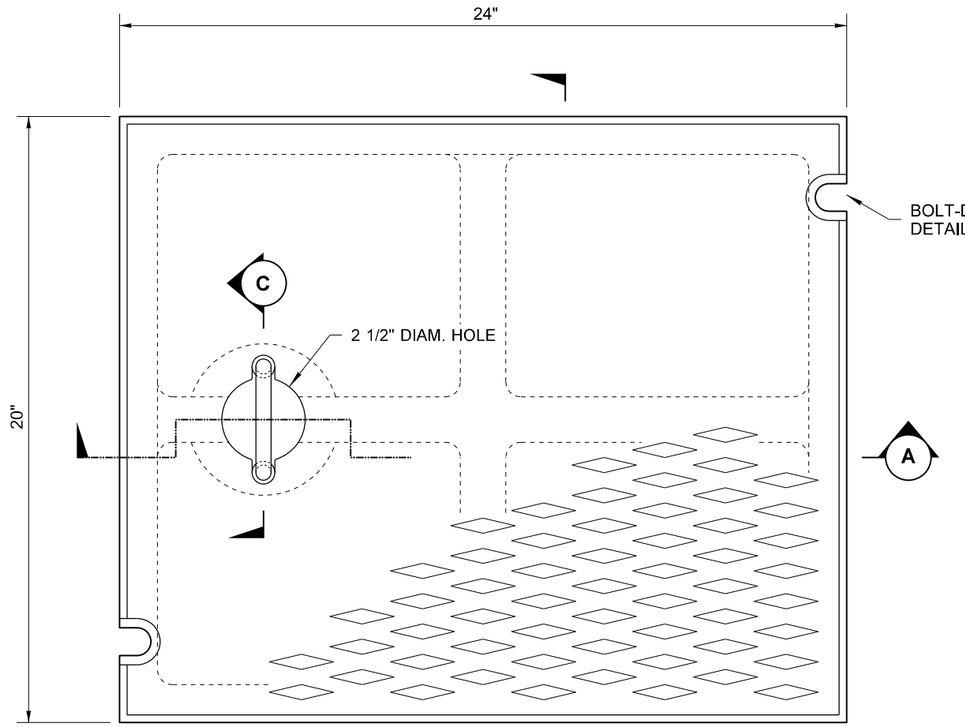
STATE DESIGN ENGINEER

Washington State Department of Transportation

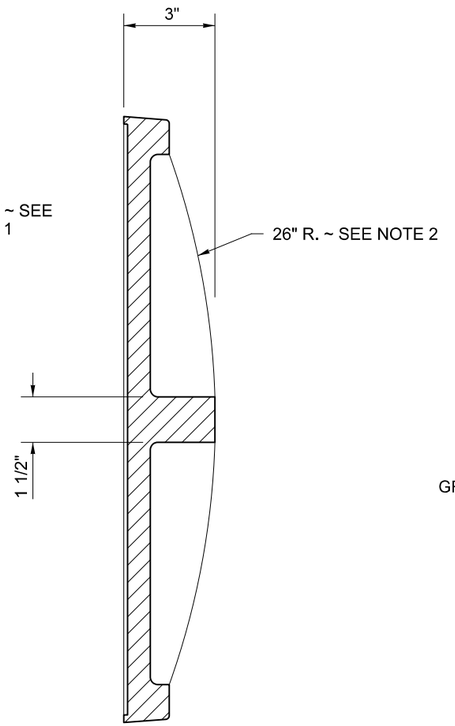
DRAWN BY: FERN LIDDELL

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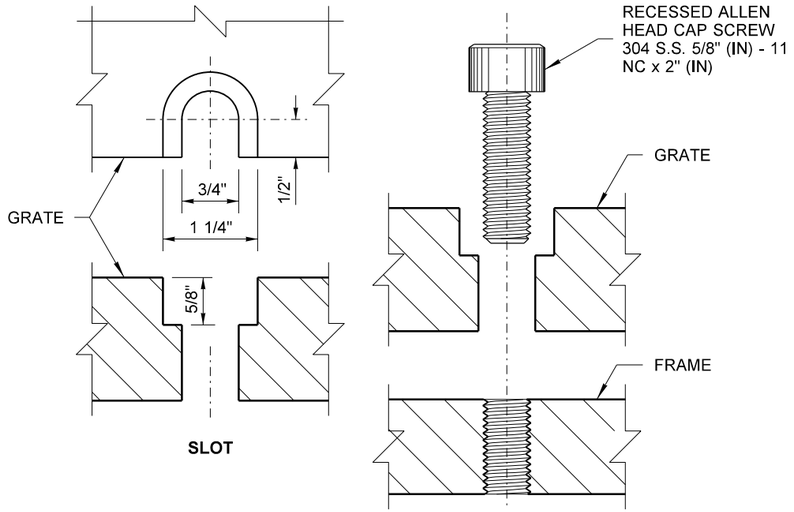
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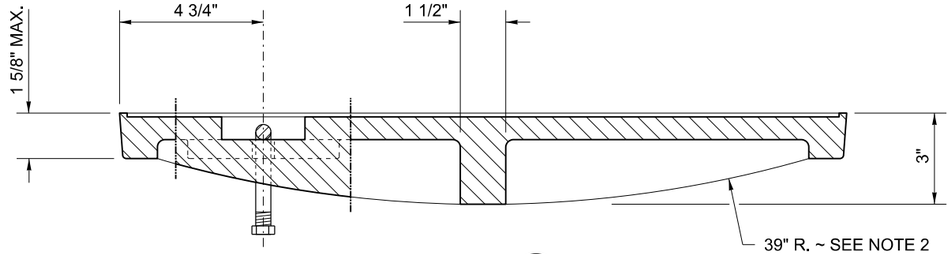
SECTION B

NOTES

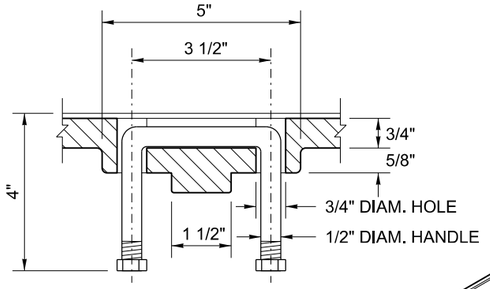
1. Bolt-down capability is required on all frames, grates, and covers, unless specified otherwise in the Contract. Provide 2 holes in the frame that are vertically aligned with the grate or cover slots. The frame shall accept the 304 Stainless Steel (S.S.) 5/8" (in) - 11 NC × 2" (in) Allen head cap screw by being tapped, or other approved mechanism. Location of bolt-down holes varies by manufacturer.
2. Alternative reinforcing designs are acceptable in lieu of the rib design.
3. Refer to **Standard Specification Section 9-05.15(2)** for additional requirements.
4. For frame details, see **Standard Plan B-30.10.**



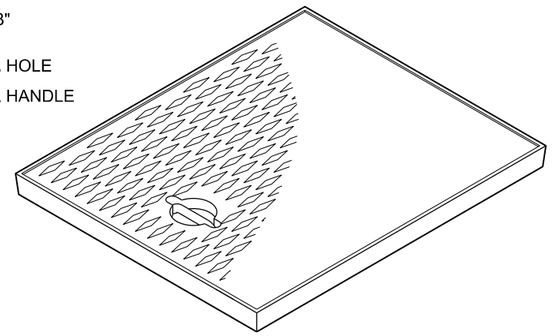
BOLT-DOWN DETAILS
SEE NOTE 1



SECTION A



SECTION C



ISOMETRIC

JULIE HEILMAN
STATE OF WASHINGTON
41819
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PROFESSIONAL ENGINEER

RECTANGULAR SOLID METAL COVER

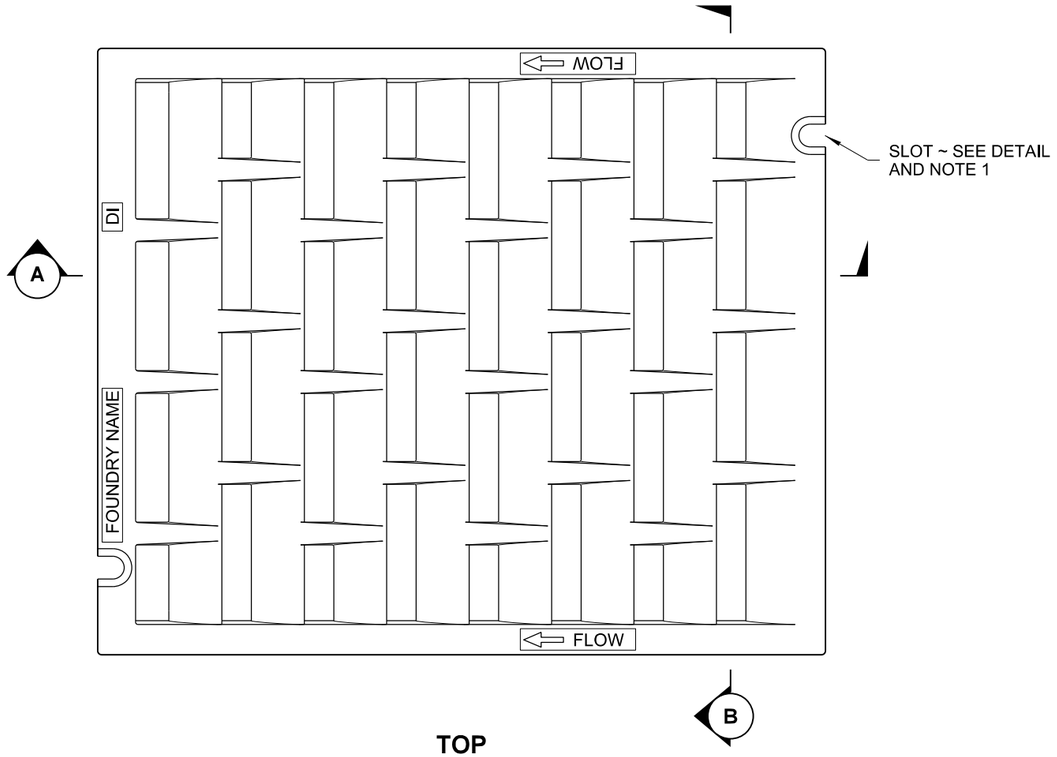
STANDARD PLAN B-30.20-03

SHEET 1 OF 1 SHEET

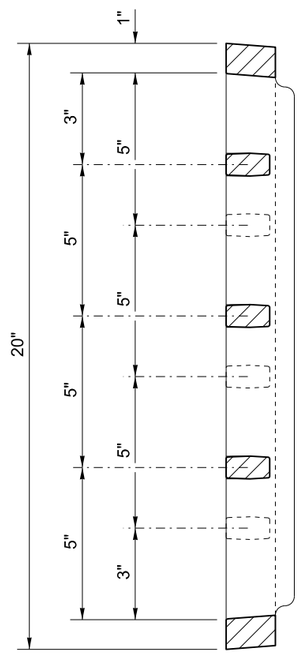
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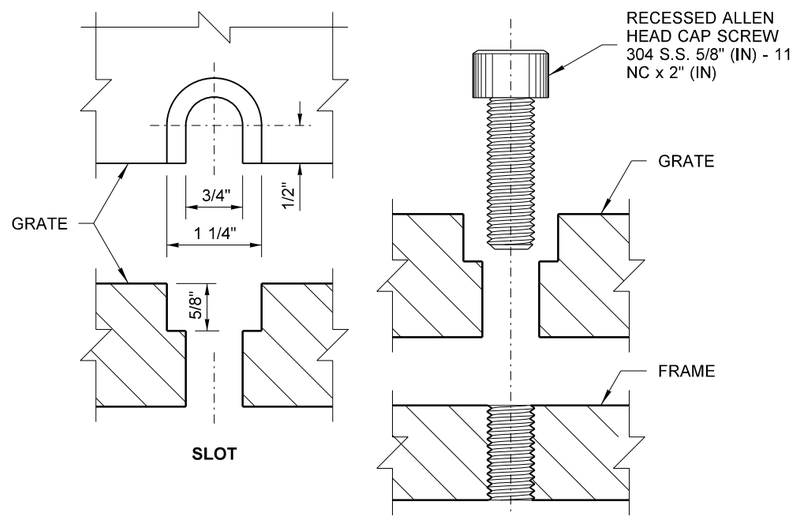
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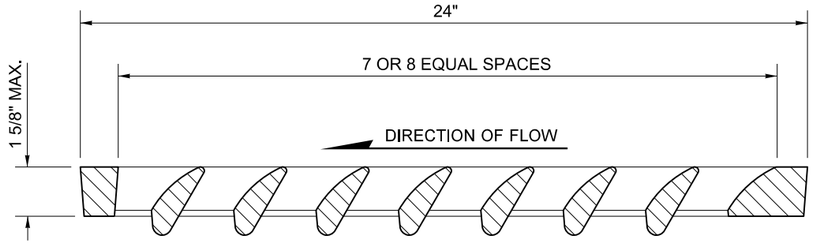
SECTION B

NOTES

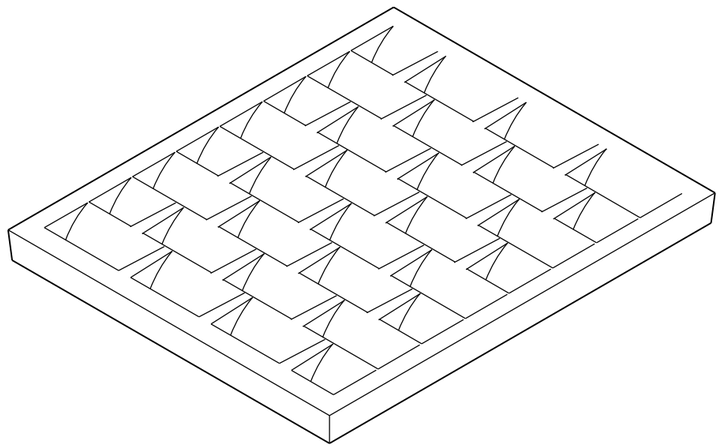
1. Bolt-down capability is required on all frames, grates, and covers, unless specified otherwise in the Contract. Provide 2 holes in the frame that are vertically aligned with the grate or cover slots. The frame shall accept the 304 Stainless Steel (S.S.) 5/8" (in) - 11 NC × 2" (in) Allen head cap screw by being tapped, or other approved mechanism. Location of bolt-down holes varies by manufacturer.
2. Refer to **Standard Specification Section 9-05.15(2)** for additional requirements.
3. For frame details, see **Standard Plan B-30.10**.



BOLT-DOWN DETAILS
SEE NOTE 1



SECTION A



ISOMETRIC

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JULIE HEILMAN
STATE OF WASHINGTON
41819
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RECTANGULAR VANED GRATE

STANDARD PLAN B-30.30-02

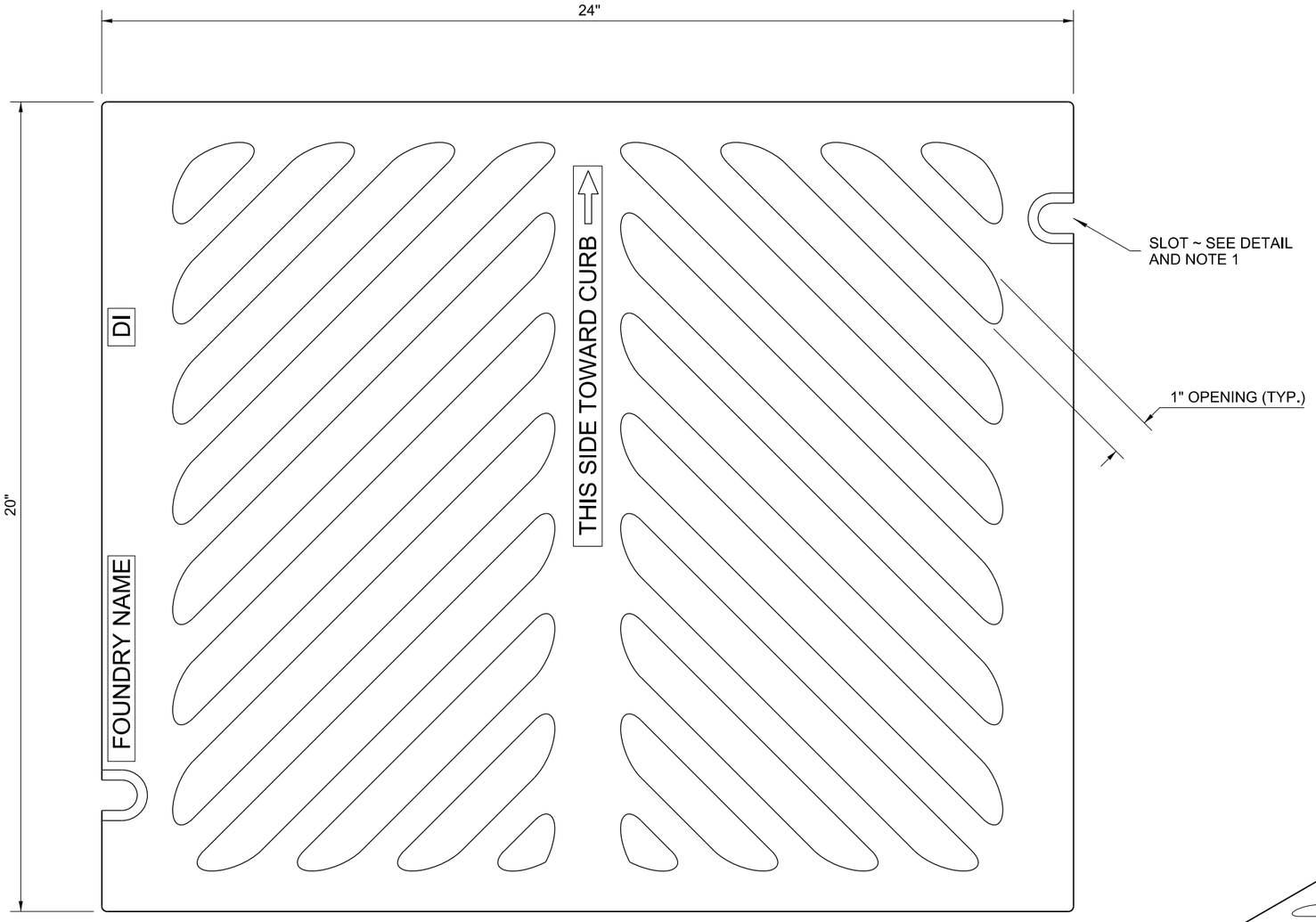
SHEET 1 OF 1 SHEET

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Washington State Department of Transportation

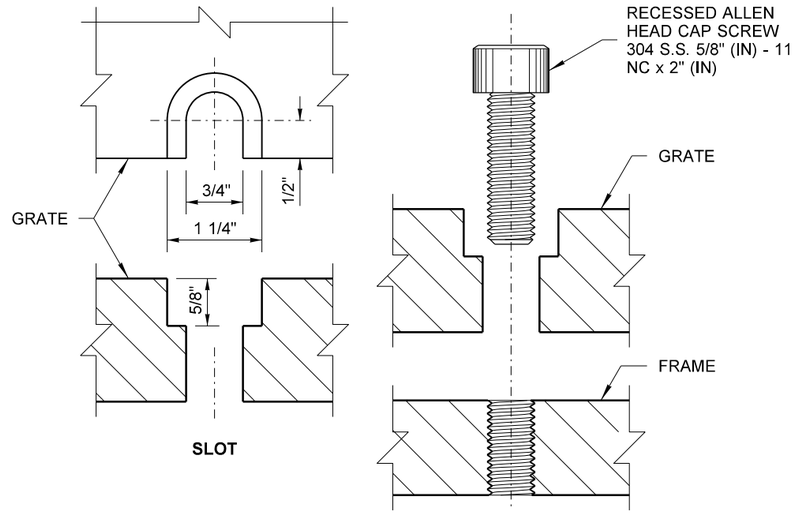
DRAWN BY: FERN LIDDELL



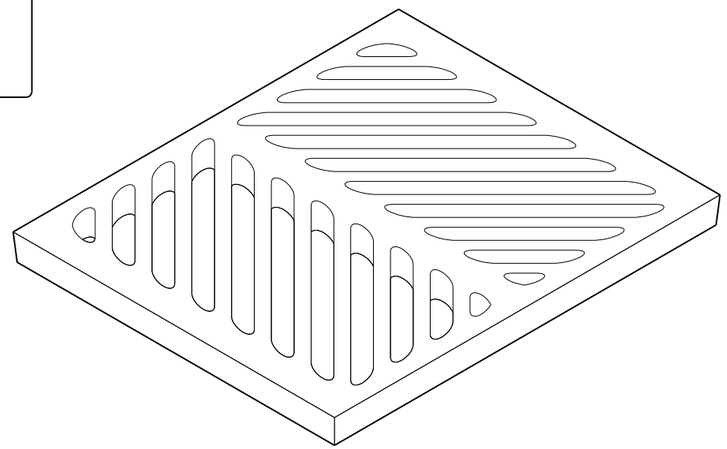
TOP

NOTES

1. Bolt-down capability is required on all frames, grates, and covers, unless specified otherwise in the Contract. Provide 2 holes in the frame that are vertically aligned with the grate or cover slots. The frame shall accept the 304 Stainless Steel (S.S.) 5/8" (in) - 11 NC × 2" (in) Allen head cap screw by being tapped, or other approved mechanism. Location of bolt-down holes varies by manufacturer.
2. Refer to **Standard Specification section 9-05.15(2)** for additional requirements.
3. For frame details, see **Standard Plan B-30.10**.
4. The thickness of the grate shall not exceed 1 5/8" (in).



BOLT-DOWN DETAILS
SEE NOTE 1



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RECTANGULAR HERRINGBONE GRATE

STANDARD PLAN B-30.50-02

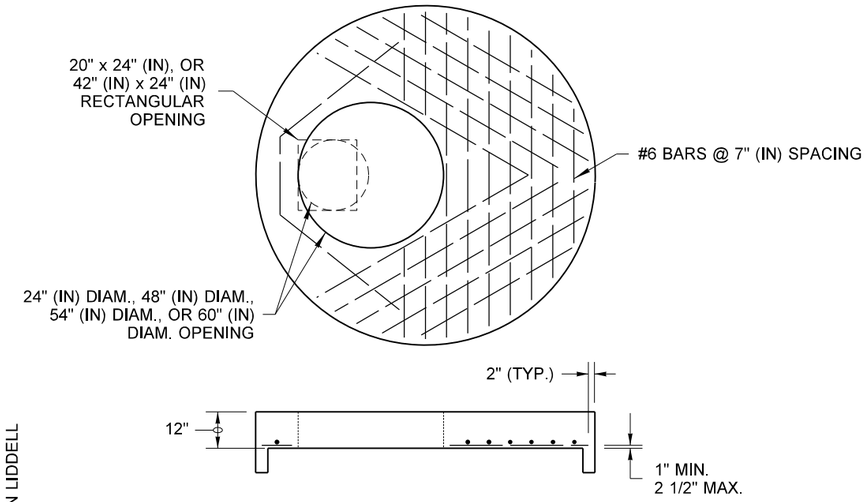
SHEET 1 OF 1 SHEET

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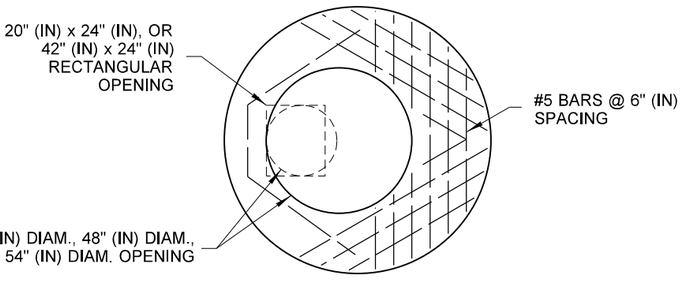
STATE DESIGN ENGINEER

Washington State Department of Transportation

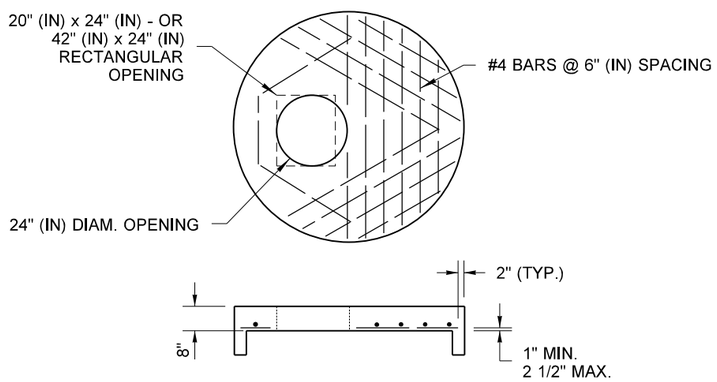
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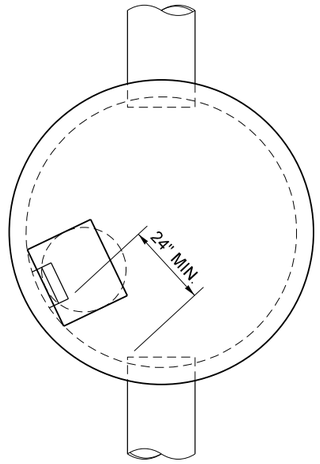
84" (IN) or 96" (IN) FLAT SLAB TOP



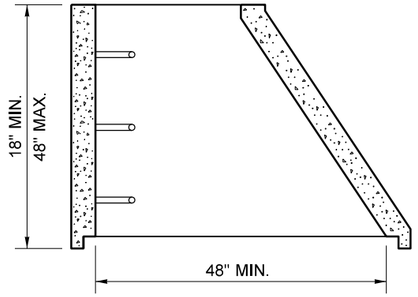
72" (IN) FLAT SLAB TOP



48" (IN), 54", or 60" (IN) FLAT SLAB TOP



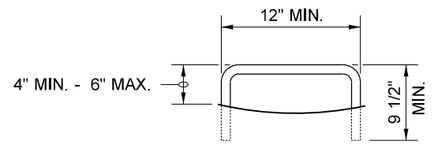
TYPICAL ORIENTATION FOR ACCESS AND STEPS



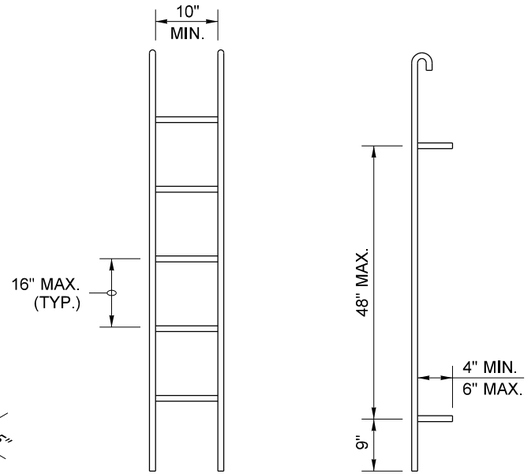
ECCENTRIC CONE SECTION

NOTE

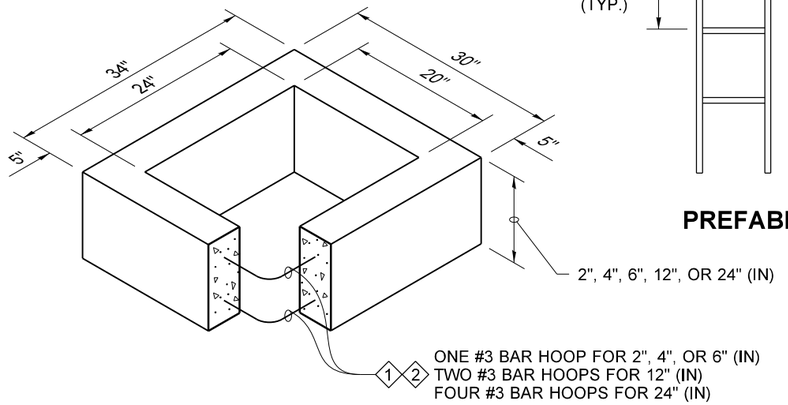
1. Ladder rungs for manholes and catch basins shall meet the requirements of **AASHTO M 199.**



STEP

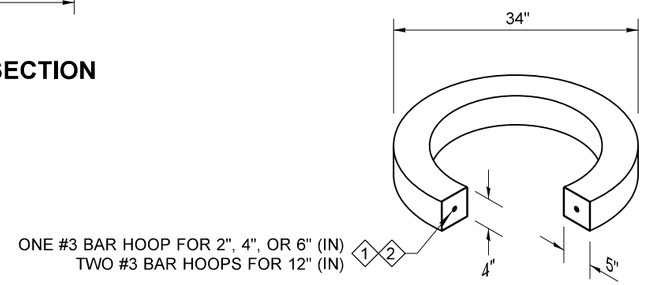


PREFABRICATED LADDER



RECTANGULAR ADJUSTMENT SECTION

1. As an acceptable alternative to rebar, wire mesh having a minimum area of 0.12 square inches per foot may be used for adjustment sections.
2. As an acceptable alternative to conventional steel reinforcment, manufacturers shall use Synthetic Structural Fibers meeting the requirements of **Standard Specification Section 9-05.50(10)**.



CIRCULAR ADJUSTMENT SECTION

For rectangular and circular adjustment sections, approved alternate material compositions are acceptable in lieu of precast concrete designs

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MISCELLANEOUS DETAILS FOR DRAINAGE STRUCTURES STANDARD PLAN B-30.90-02

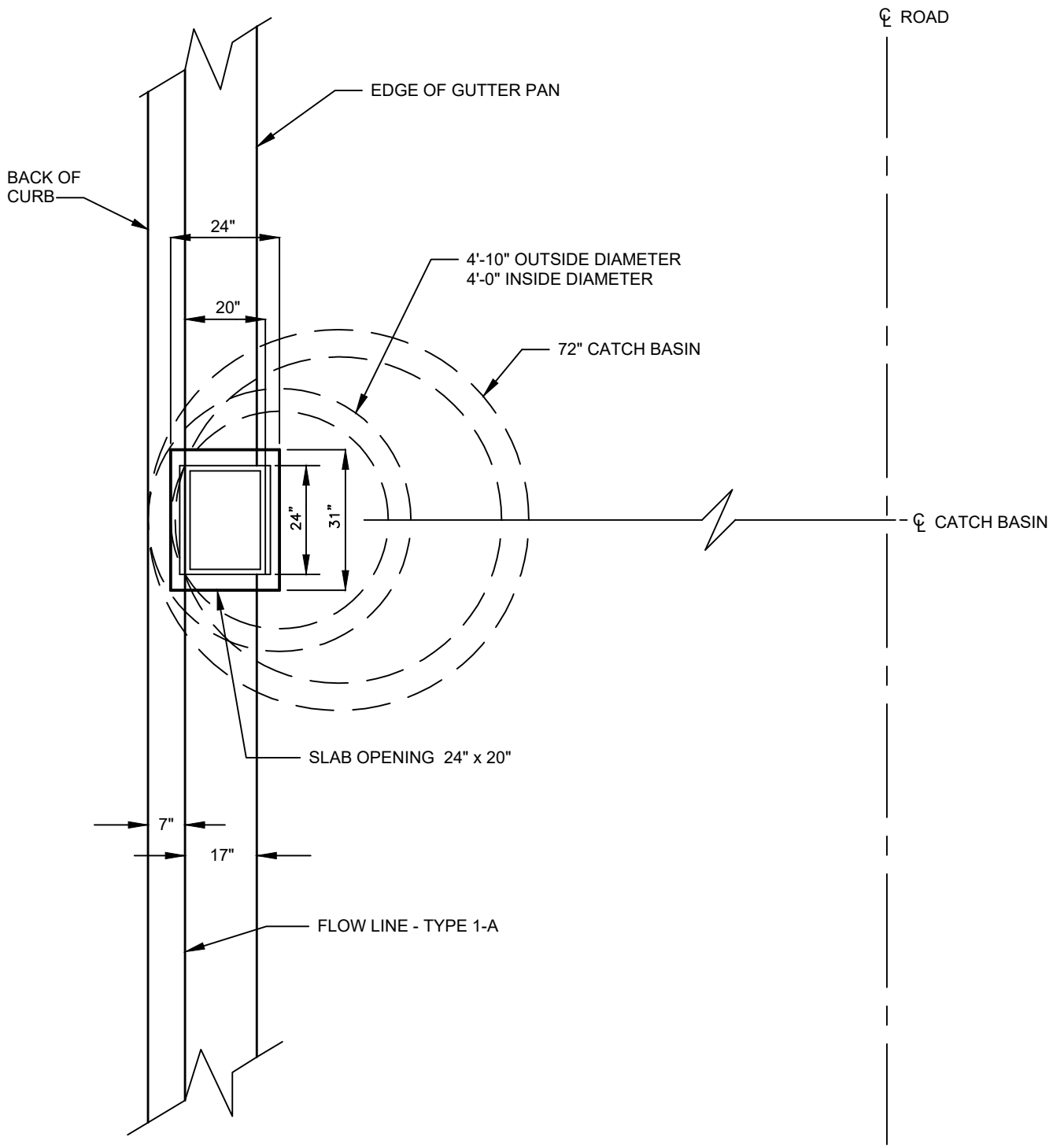
SHEET 1 OF 1 SHEET

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Washington State Department of Transportation

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PLAN
NTS

Gary M. Schimek

APPROVED BY: GARY M. SCHIMEK
ENVIRONMENTAL AND UTILITY SERVICES DIVISION MANAGER

REVISION DATE: MARCH 01, 2019

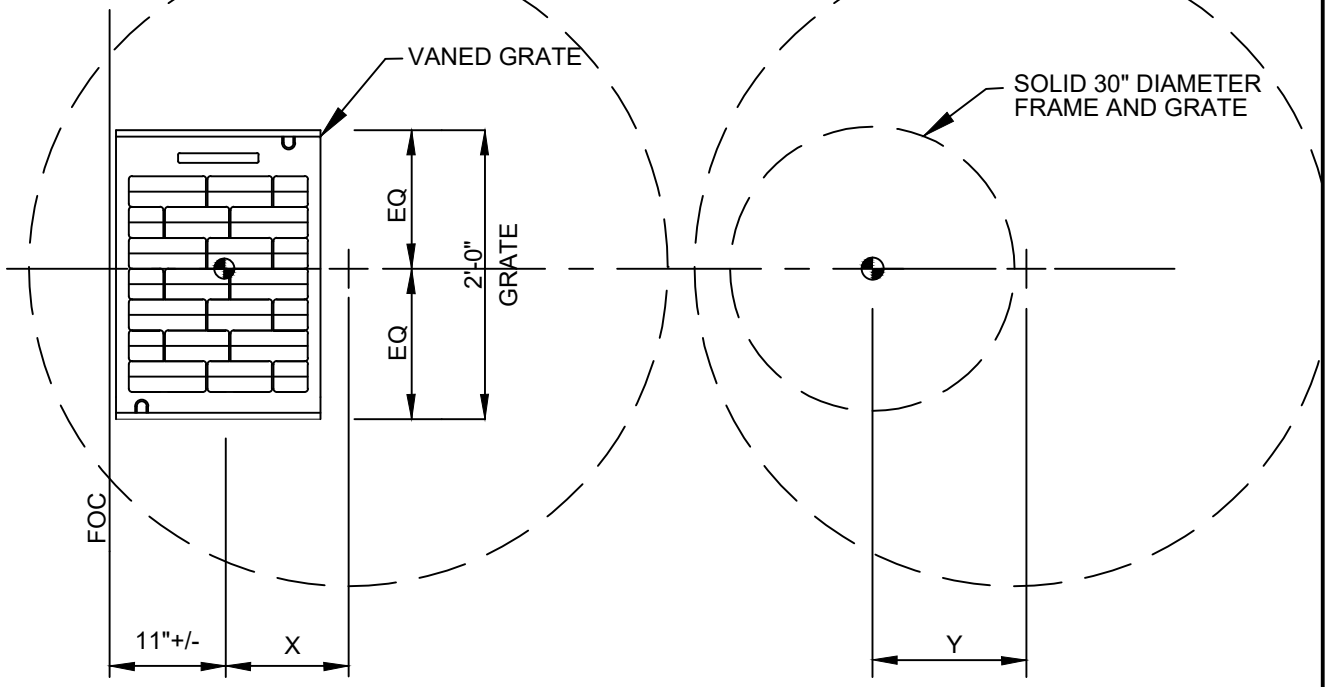
CityofRedmond WASHINGTON

STANDARD DETAILS

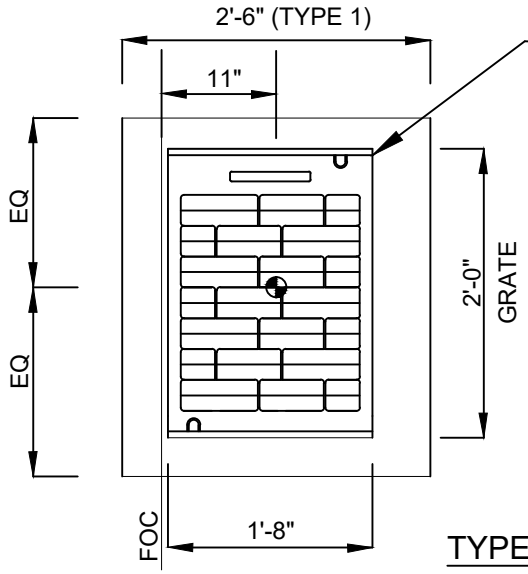
TYPICAL ORIENTATION OF TYPE 2 CB IN CITY STREET SECTION

FILE NAME: SD609A.DWG | DETAIL NUMBER: **609A**

DocuSign Envelope ID: F681597A-CCE8-405B-ACDB-A8564C559739



PLAN VIEW
NTS



TYPE 1/1L
NTS

CB TYPE 2		X	Y
I.D.	O.D.		
48"	58"	11"	12"
54"	65"	14"	15"
60"	72"	17"	18"
72"	86"	24"	24"

KEY

CENTER OF GRATE

CENTER OF STRUCTURE

NOTES:
1. CENTER OF GRATE = CENTER OF STRUCTURE FOR TYPE 1 AND TYPE 1L STRUCTURES ONLY.
2. SPECIFIED STATION AND OFFSET REFERENCE CENTER OF STRUCTURE FOR ALL DRAINAGE FACILITIES UNLESS OTHERWISE NOTED ON PLANS.
3. ALL GRATES SHALL BE VANED UNLESS OTHERWISE SHOWN.

Gary M. Schimek

APPROVED BY: GARY M. SCHIMEK
ENVIRONMENTAL AND UTILITY SERVICES DIVISION MANAGER

REVISION DATE: MARCH 01, 2020

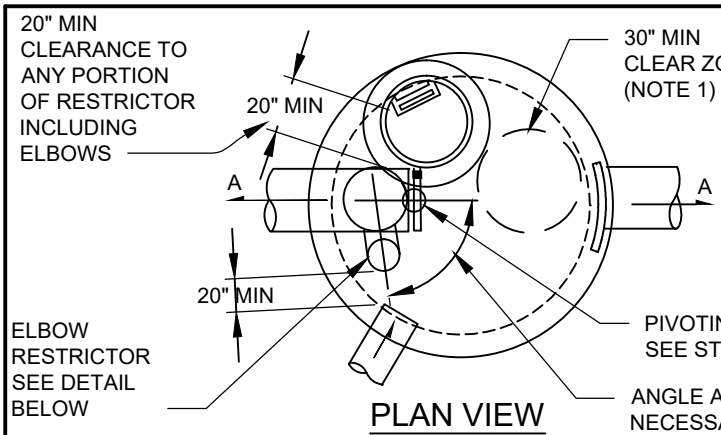
CityofRedmond WASHINGTON

STANDARD DETAILS

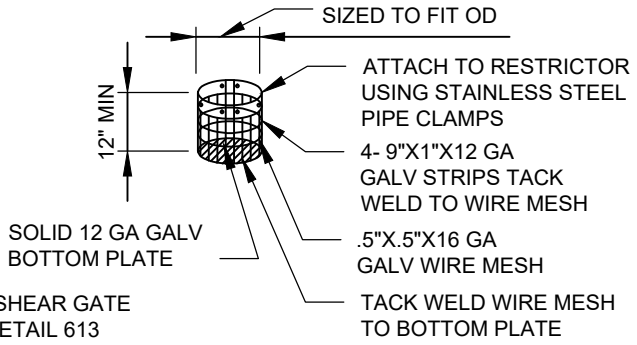
TYPICAL CATCH BASIN PLACEMENT

FILE NAME: SD609B.DWG | DETAIL NUMBER: **609B**

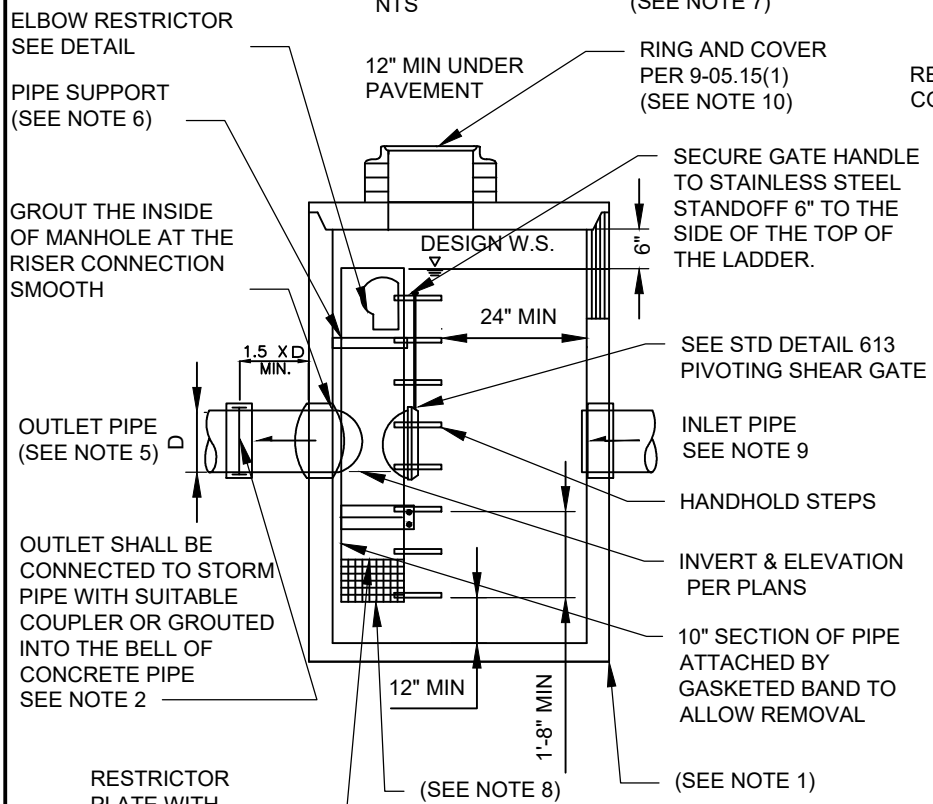
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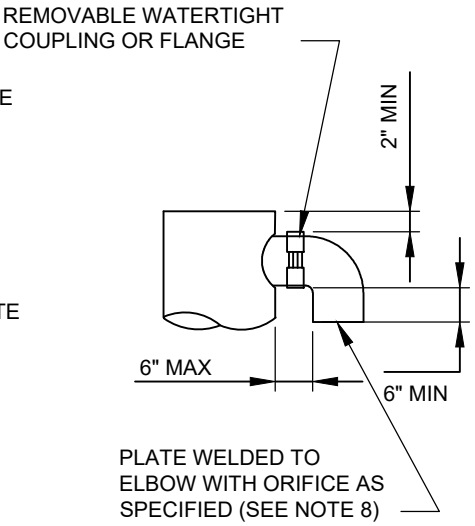
PLAN VIEW
NTS



ORIFICE SCREEN
NTS



SECTION A
NTS



ELBOW
NTS

NOTES:

1. MINIMUM 54" TYPE 2 CB. LARGER MANHOLES REQUIRED AS NEEDED TO PROVIDE MINIMUM 30" DIAMETER CLEAR ZONE NEXT TO RESTRICTOR.
2. RESTRICTOR FABRICATED FROM ALUMINUM OR PVC PIPE.
3. FRAME AND LADDER OR STEPS OFFSET SO:
   A. CLEANOUT GATE IS VISIBLE FROM TOP;
   B. CLIMB-DOWN SPACE IS CLEAR OF RISER AND CLEANOUT GATE;
   C. FRAME IS CLEAR OF CURB.
5. IF METAL OUTLET PIPE CONNECTS TO CEMENT CONCRETE PIPE, OUTLET PIPE TO HAVE SMOOTH O.D. EQUAL TO CONCRETE PIPE ID. LESS ¼ IN.
6. PROVIDE AT LEAST TWO 3 X 0.090 GAUGE STAINLESS STEEL SUPPORT BRACKETS ANCHORED TO CONCRETE WALL WITH ⅝ IN STAINLESS STEEL EXPANSION BOLTS OR EMBEDDED SUPPORTS 2 IN INTO M/H WALL. MAX 3' OC.
7. LOCATE ELBOW RESTRICTOR(S) AS NECESSARY TO PROVIDE MIN CLEARANCE AS SHOWN.
8. ORIFICE SCREEN IS REQUIRED FOR ORIFICES LESS THAN 3" DIAMETER. RESTRICTOR PLATE FROM 12 GAUGE ALUMINUM OR PVC PIPE.
9. PIPE PENETRATIONS SHALL BE WATER TIGHT. SAND COLLAR OR KOR-N-SEAL BOOT.
10. IF OUTLET PIPE IS GREATER THAN 12" DIAMETER HATCH IS REQUIRED PER 9-05.15(5)

Gary M. Schimek

APPROVED BY: GARY M. SCHIMEK
ENVIRONMENTAL AND UTILITY SERVICES DIVISION MANAGER

REVISION DATE: MARCH 01, 2019

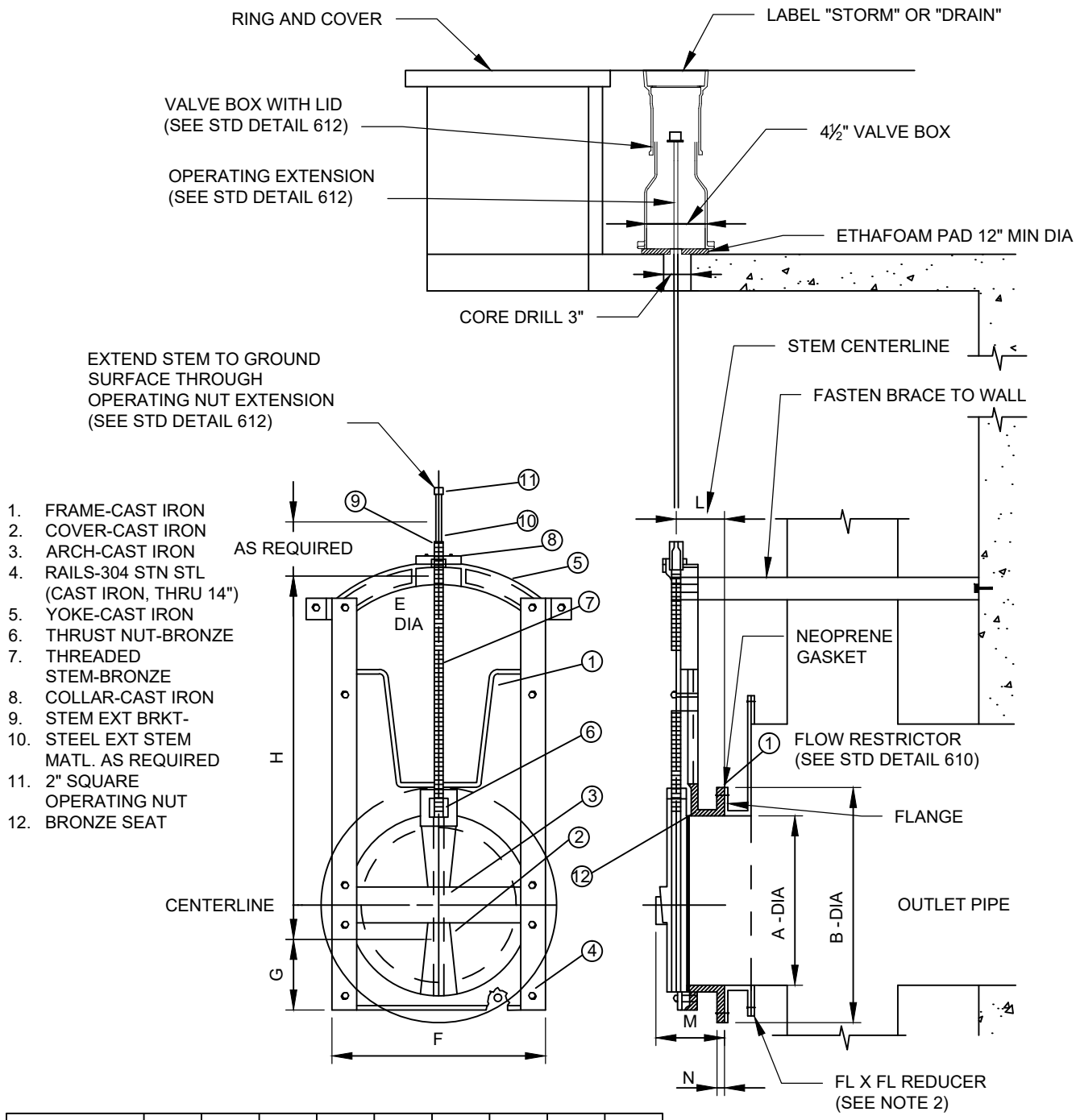
CityofRedmond WASHINGTON

STANDARD DETAILS

FLOW CONTROL STRUCTURE

FILE NAME: SD610.DWG | DETAIL NUMBER: **610**

DocuSign Envelope ID: F681597A-CCE8-405B-ACDB-A8564C559739



1. FRAME-CAST IRON
2. COVER-CAST IRON
3. ARCH-CAST IRON
4. RAILS-304 STN STL (CAST IRON, THRU 14")
5. YOKE-CAST IRON
6. THRUST NUT-BRONZE
7. THREADED STEM-BRONZE
8. COLLAR-CAST IRON
9. STEM EXT BRKT-
10. STEEL EXT STEM MATL. AS REQUIRED
11. 2" SQUARE OPERATING NUT
12. BRONZE SEAT

	A	B	E	F	G	H	L	M	N
DIMENSIONS (IN INCHES)	8	11 ¾	⅞	11 ⅛	5 ½	17 ⅝	4 1/2	7	¾

NOTES:

1. AWWA C509 RESILIENT SEATED GATE VALVE MAY BE SUBSTITUTED FOR STORMWATER VALVE PER ENGINEER'S APPROVAL.
2. CONSTRUCT FLOW RESTRICTOR TO ACCOMMODATE 8" FLANGE CONNECTION FOR VALVE. MAY USE 8" X OUTLET PIPE DIAMETER FLANGED REDUCER OR ACCEPTED EQUIVALENT.

Gary M. Schimek

APPROVED BY: GARY M. SCHIMEK
ENVIRONMENTAL AND UTILITY SERVICES DIVISION MANAGER

REVISION DATE: MARCH 01, 2019

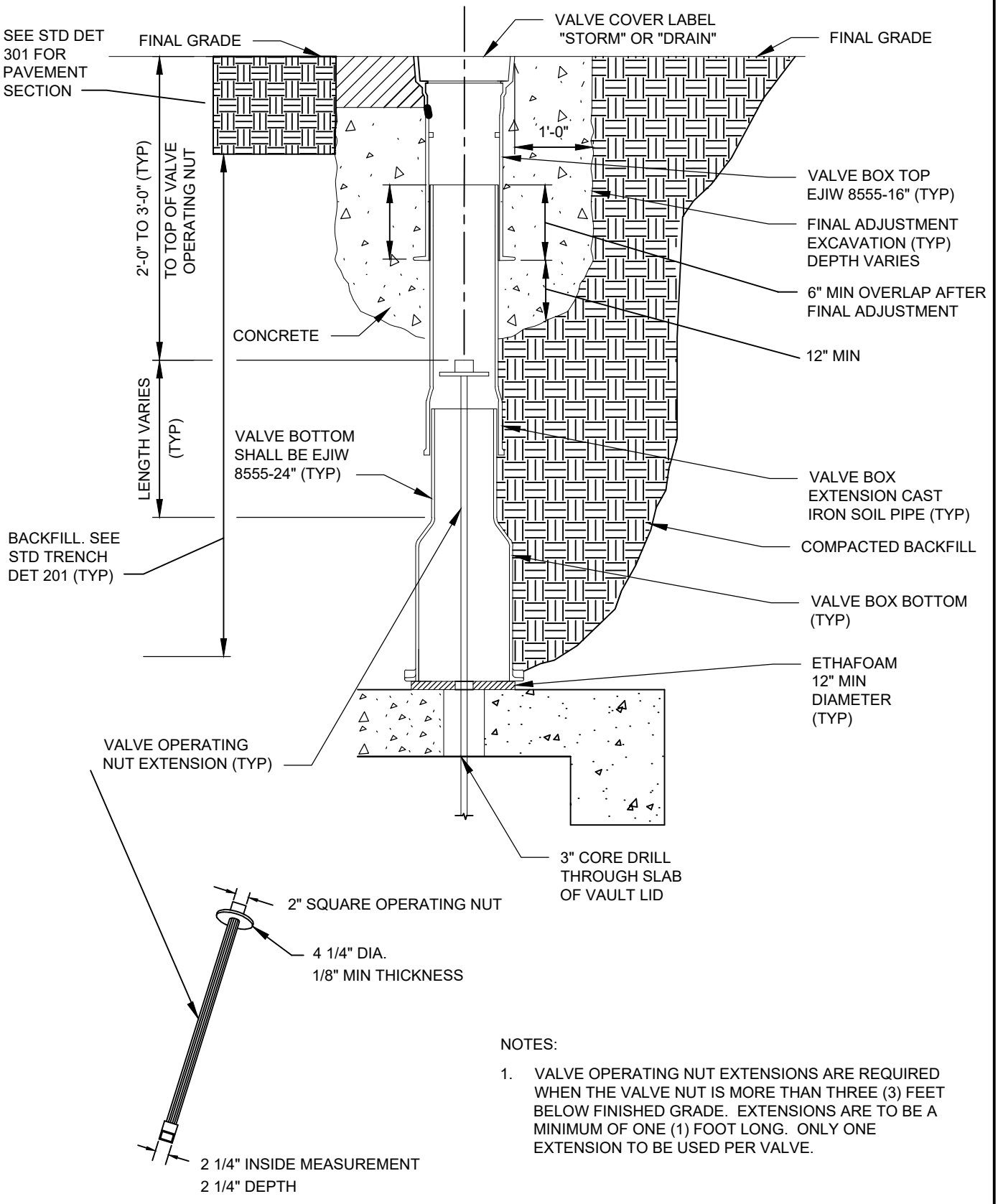
CityofRedmond WASHINGTON

STANDARD DETAILS

STORMWATER GATE VALVE

FILE NAME: SD611.DWG | DETAIL NUMBER: **611**

DocuSign Envelope ID: F681597A-CCE8-405B-ACDB-A8564C559739



NOTES:

1. VALVE OPERATING NUT EXTENSIONS ARE REQUIRED WHEN THE VALVE NUT IS MORE THAN THREE (3) FEET BELOW FINISHED GRADE. EXTENSIONS ARE TO BE A MINIMUM OF ONE (1) FOOT LONG. ONLY ONE EXTENSION TO BE USED PER VALVE.

Gary M. Schimek

APPROVED BY: GARY M. SCHIMEK
ENVIRONMENTAL AND UTILITY SERVICES DIVISION MANAGER

REVISION DATE: MARCH 01, 2019

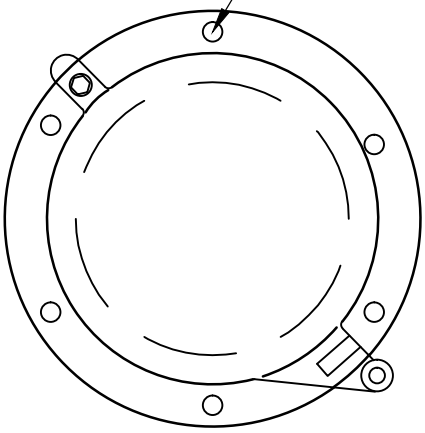
CityofRedmond WASHINGTON

STANDARD DETAILS

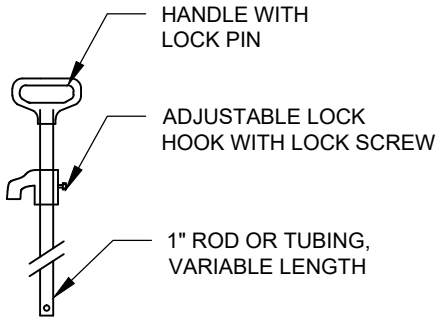
STORMWATER GATE VALVE BOX AND EXTENSION

FILE NAME: SD612.DWG | DETAIL NUMBER: **612**

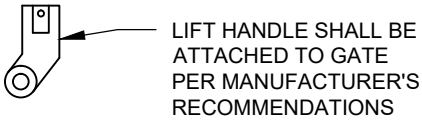
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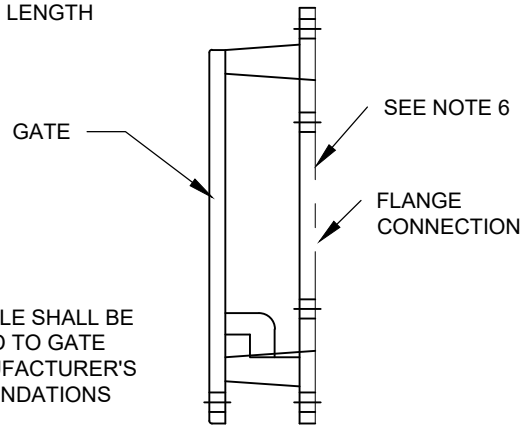
FRONT
NTS



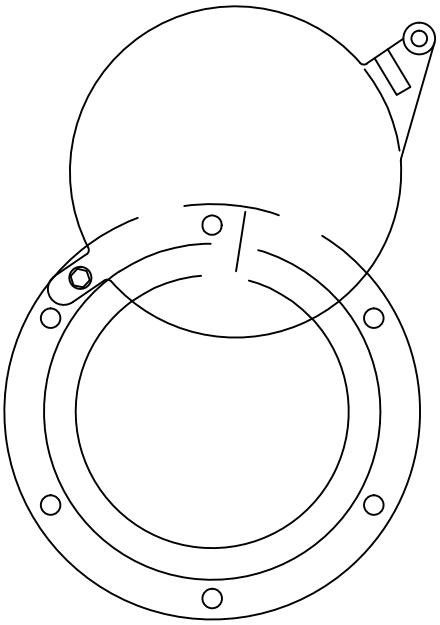
LIFT ROD
NTS



LIFT HANDLE CONNECTOR
NTS



SIDE VIEW
NTS



MAXIMUM OPENING
OF GATE

NOTES:

1. SHEAR GATE SHALL BE ALUMINUM ALLOY PER ASTM B-26-ZG-32A AS REQUIRED.
2. GATE SHALL BE 8 INCH DIAMETER FOR PIPE 12 INCHES OR LESS IN DIAMETER, 12 INCH DIAMETER FOR PIPES GREATER THAN 12 INCHES.
3. GATE SHALL BE JOINED TO TEE SECTION BY BOLTING THROUGH FLANGE.
4. LIFT ROD: AS SPECIFIED BY MFR. WITH HANDLE EXTENDING TO WITHIN ONE FOOT OF COVER AND ADJUSTABLE HOOK LOCK FASTENED TO STANDOFF AS DESCRIBED IN STD DETAIL 610.
5. GATE SHALL NOT OPEN BEYOND THE CLEAR OPENING BY LIMITED HINGE MOVEMENT, STOP TAB, OR SOME OTHER DEVICE.
6. NEOPRENE RUBBER GASKET REQUIRED BETWEEN RISER MOUNTING FLANGE, STOP TAB, OR SOME OTHER DEVICE.
7. MATING SURFACES OF LID AND BODY TO BE MACHINED FOR PROPER FIT.
8. FLANGE MOUNTING BOLTS SHALL BE 3/8 INCH DIAMETER STAINLESS STEEL.
9. ALTERNATE SHEAR GATES TO THE DESIGN SHOWN ARE ACCEPTABLE, PROVIDED THEY MEET THE MATERIAL SPECIFICATIONS ABOVE.

Gary M. Schimek

APPROVED BY: GARY M. SCHIMEK
ENVIRONMENTAL AND UTILITY SERVICES DIVISION MANAGER

REVISION DATE: MARCH 01, 2019

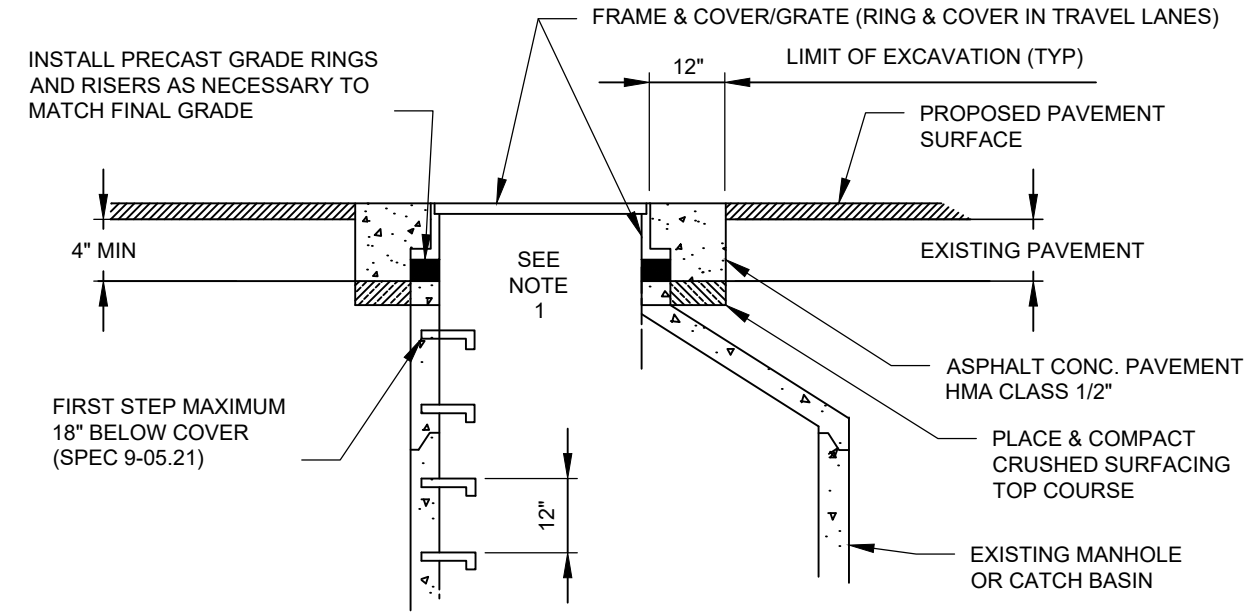
CityofRedmond
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STANDARD DETAILS

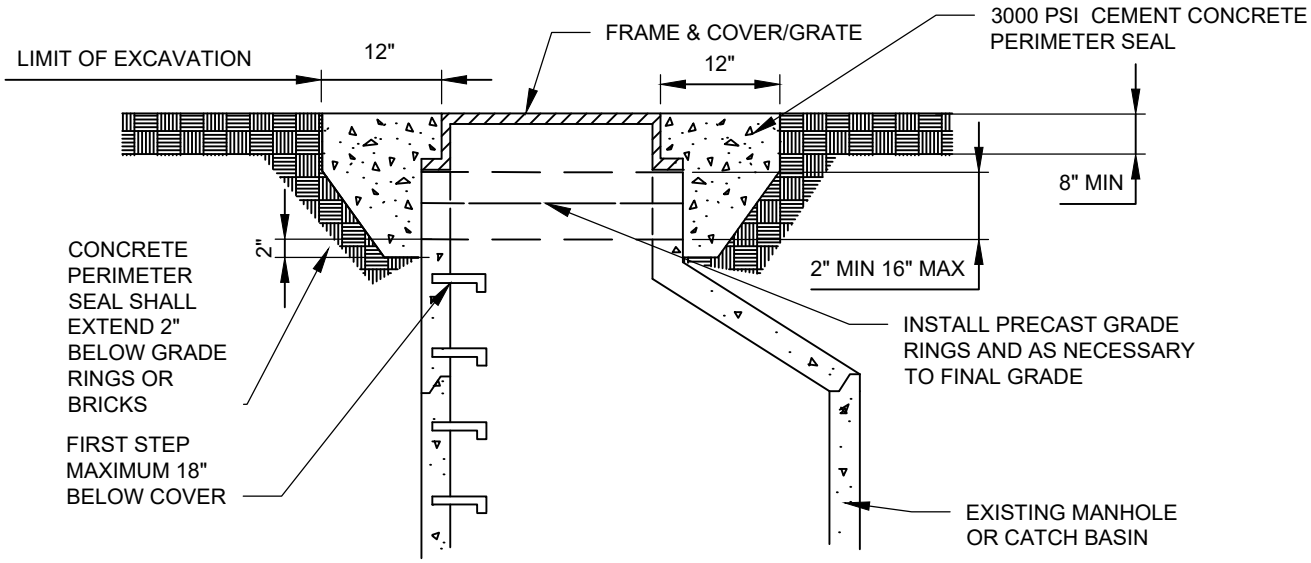
STORMWATER SHEAR GATE

FILE NAME: SD613.DWG | DETAIL NUMBER: **613**

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PAVED AREAS
NTS



UNPAVED AREAS
NTS

NOTES:

1. WHERE DEPTH OF NECK EXCEEDS 16 INCHES, ADJUST MANHOLE/CATCH BASIN TO GRADE BY INSERTING NEW BARREL SECTION BETWEEN THE CONE/SLAB AND EXISTING BARREL.
2. GRADE RINGS AND CONCRETE RISERS AND SHALL BE SET IN ¾ INCH NON-SHRINK GROUNT, PLASTER SMOOTH INSIDE AND OUT.
3. STEPS OR HAND HOLDS SHALL BE ADDED AS NEEDED, PER SPEC 9-05.21. DO NOT HANG A LADDER FROM THE TOP STEP.
4. PRECAST GRADE RINGS AND RISERS MUST BE CAST WITH GROOVE TO ALLOW FIELD INSTALLATION OF SAFETY STEP.
5. REPLACE EXISTING FRAME AND COVER/GRATE IF NON-STANDARD OR WORN. IF STRUCTURE IS IN TRAVEL LANE, REPLACE FRAME AND GRATE WITH RING AND COVER. SEE SD DETAIL 631.
6. GROUT INSIDE AND OUTSIDE OF MANHOLE/CATCH BASIN NECK TO ACHIEVE WATER TIGHT CONSTRUCTION. FINISH SMOOTH THE INSIDE OF THE NECK. USE NON-SHRINK GROUT ONLY.
7. LOCKING RING AND COVERS ARE REQUIRED IN ALL UNPAVED AREAS AND EASEMENTS. LOCKING RING AND COVER SHALL CONFORM TO STANDARD SPEC 9-05.15(2).

Gary M. Schimek

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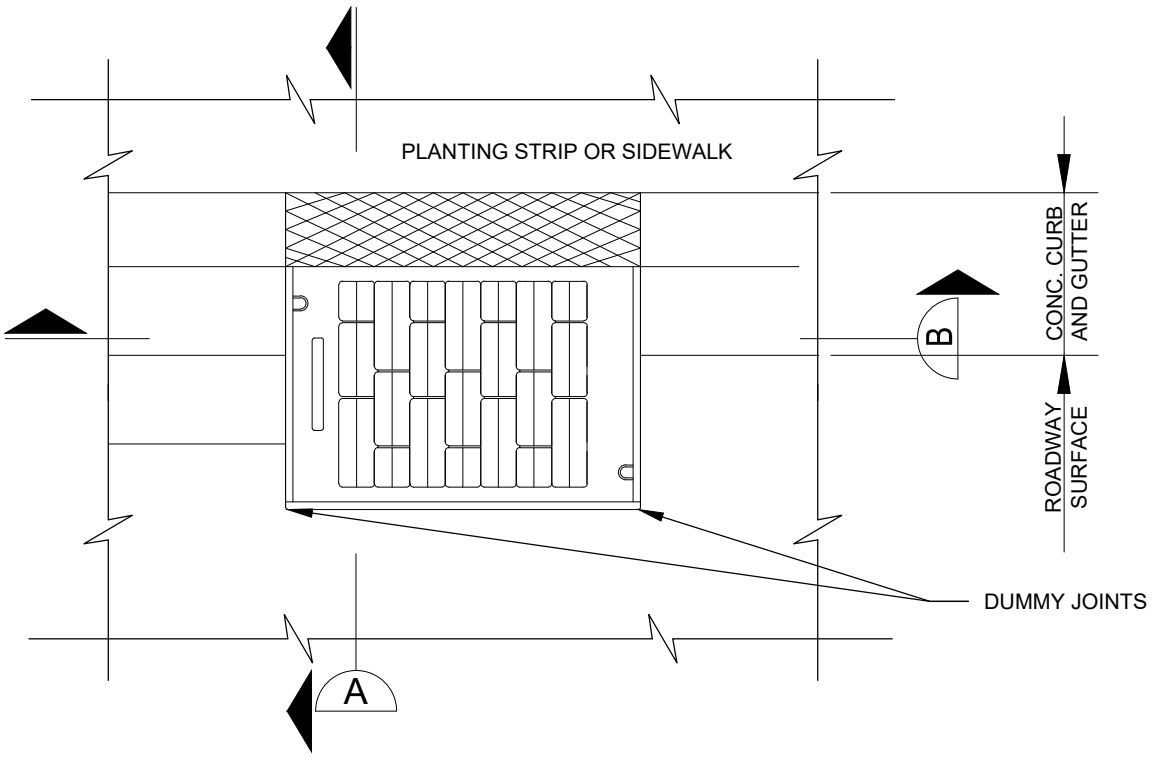
CityofRedmond WASHINGTON

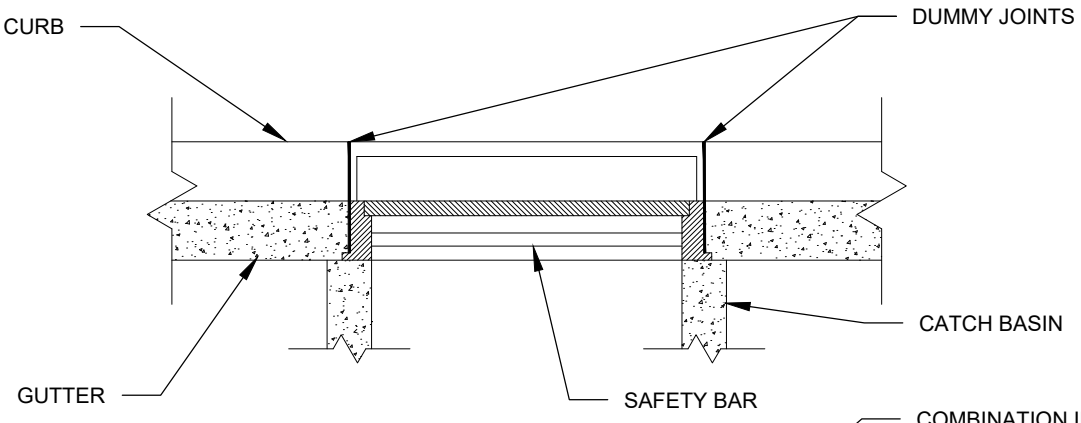
STANDARD DETAILS

STORMWATER MANHOLE/CATCH BASIN ADJUSTMENT DETAIL

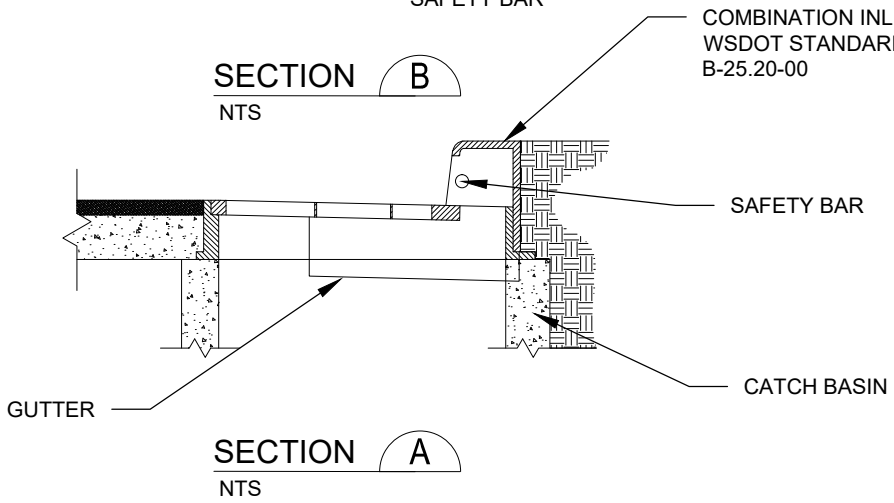
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SECTION B
NTS



SECTION A
NTS

NOTES:

1. SET TO GRADE AND CONSTRUCT ROAD AND GUTTER TO BE FLUSH WITH FRAME.
2. SEE DETAIL NUMBER: 303 FOR JOINT REQUIREMENTS.

Gary M. Schimek

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ENVIRONMENTAL AND UTILITY SERVICES DIVISION MANAGER

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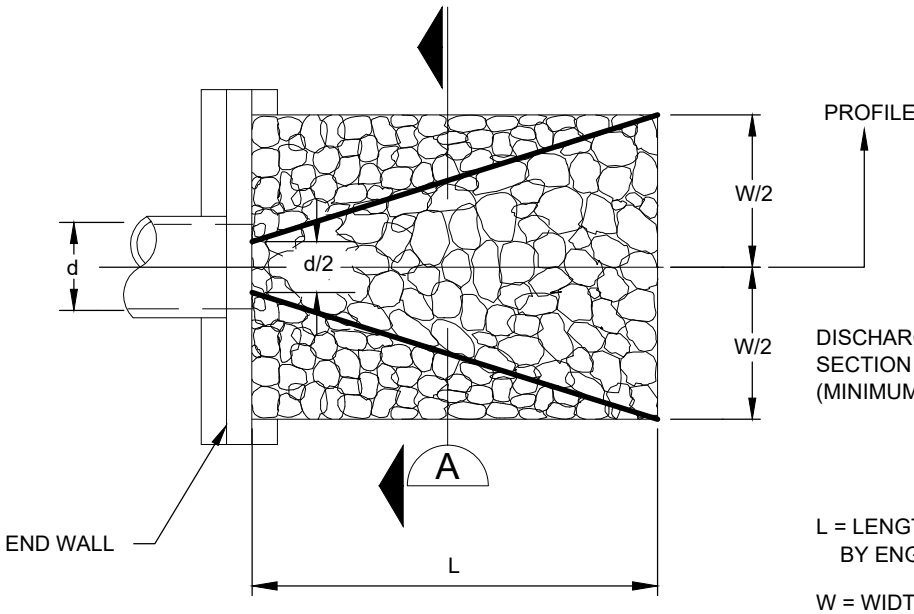
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STANDARD DETAILS

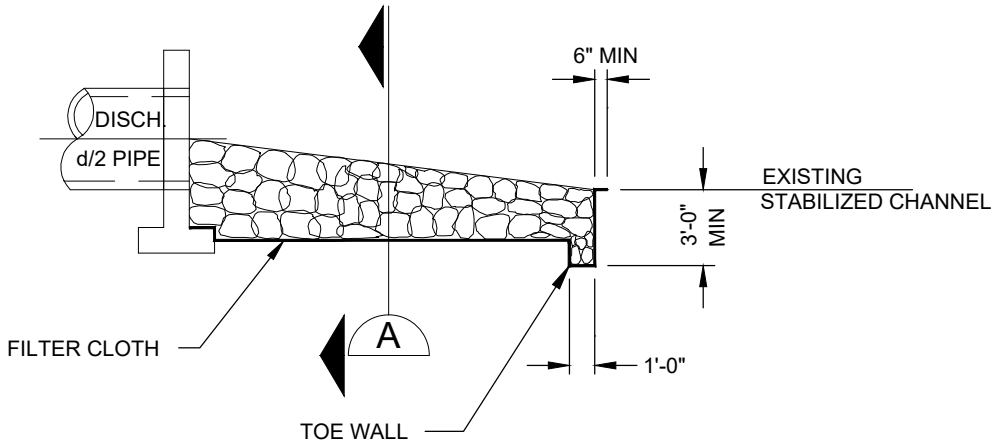
THRU CURB INLET FRAME AND GRATE WITH VERTICAL CURB INSTALLATION

FILE NAME: SD618.DWG | DETAIL NUMBER: **618**

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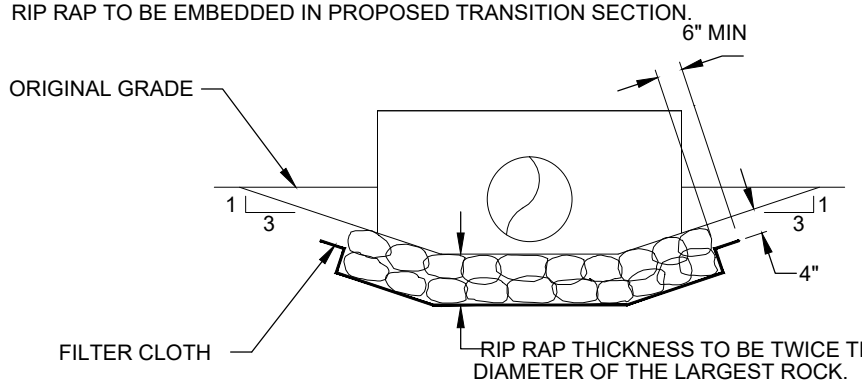


PLAN VIEW
NTS



ELEVATION VIEW
NTS

RIP RAP TO BE EMBEDDED IN PROPOSED TRANSITION SECTION.



SECTION A
NTS

Gary M. Schimek

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REVISION DATE: MARCH 01, 2019

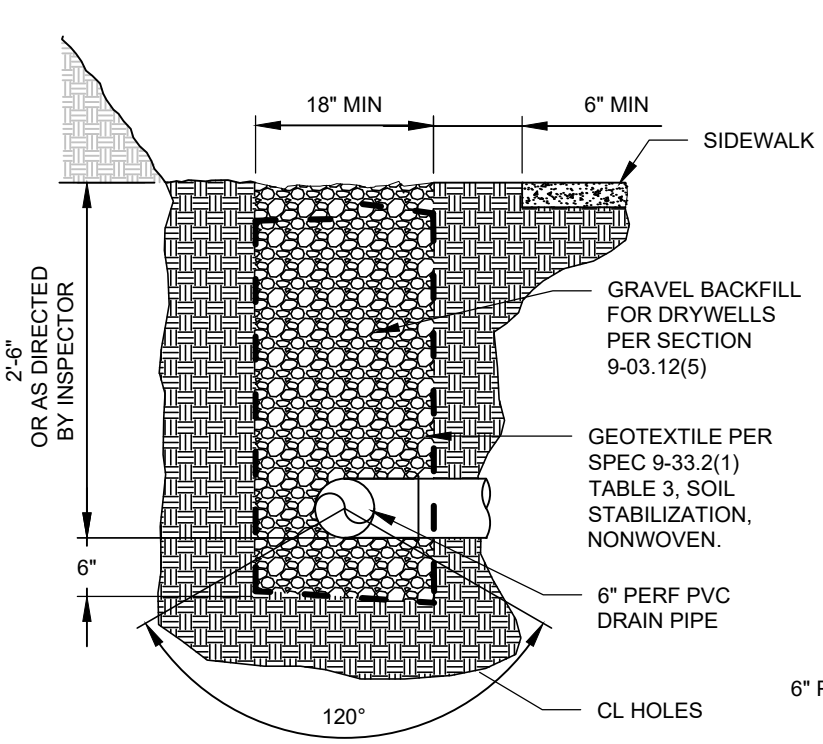
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STANDARD DETAILS

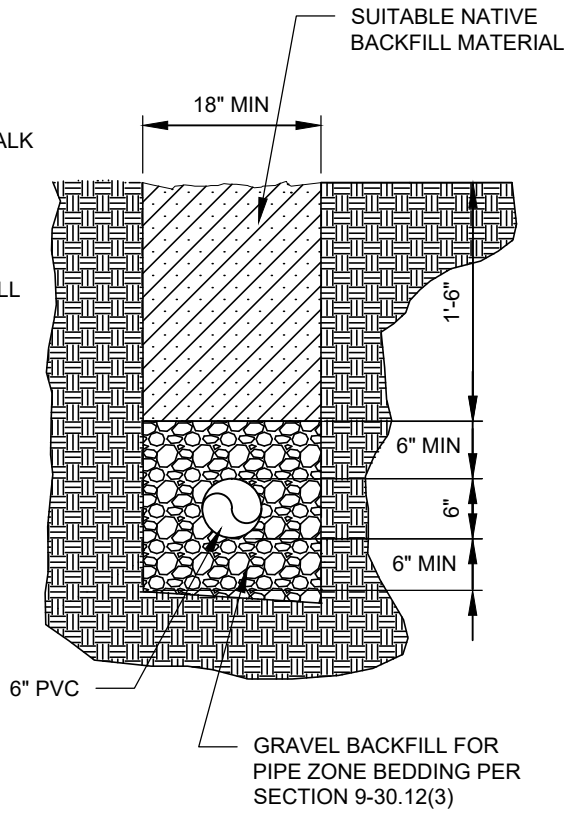
HEAD WALL AND RIP RAP

FILE NAME: SD620.DWG | DETAIL NUMBER: **620**

DocuSign Envelope ID: F681597A-CCE8-405B-ACDB-A8564C559739



PERF-DRAIN
NTS



TIGHT-LINE
NTS

NOTES:

1. SEE DETAIL 623 FOR STORMWATER CLEANOUT DETAIL
2. FRENCH DRAINS BEHIND SIDEWALK REQUIRED IN ALL CUT SITUATIONS AND AT THE BASE OF SLOPES
3. FRENCH DRAINS BEHIND SIDEWALK SHALL NOT BE LOCATED WITHIN RIGHT-OF-WAY OR PUBLIC EASEMENT, THEY SHALL BE PRIVATE SYSTEM

Gary M. Schimek

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ENVIRONMENTAL AND UTILITY SERVICES DIVISION MANAGER

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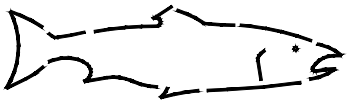
STANDARD DETAILS

FRENCH DRAIN

FILE NAME: SD621.DWG | DETAIL NUMBER: **621**

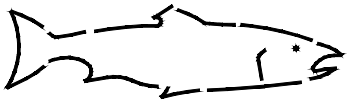
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DUMP NO WASTE



DRAINS TO LAKE

DUMP NO WASTE



DRAINS TO STREAM

DUMP NO WASTE

PROTECT YOUR

GROUNDWATER



NOTES:

1. 2" LETTERS IN TRAFFIC WHITE, STENCIL SIZE 20" X 27"
2. PAINT SPECIFICATION SHALL FOLLOW CURRENT CITY TRAFFIC STANDARDS ASSUMING TRAFFIC WHITE NON-LEAD PAINT, MIN 2 COATS. PAINT SPEC - ENNIS FLINT WHITE TRAFFIC PAINT, PRODUCT CODE 983711
3. STENCILS ARE AVAILABLE AT THE CUSTOMER SERVICE COUNTER AT CITY HALL
4. ALL STORM DRAINAGE CONSTRUCTION SHALL REQUIRE STENCILING PAVED SURFACE AREA NEAR CATCH BASIN
5. STENCIL TYPE SHALL BE DETERMINED BY THE CITY AND SPECIFIED IN CONSTRUCTION PLANS

STENCILING DETAIL

NTS

Gary M. Schimek

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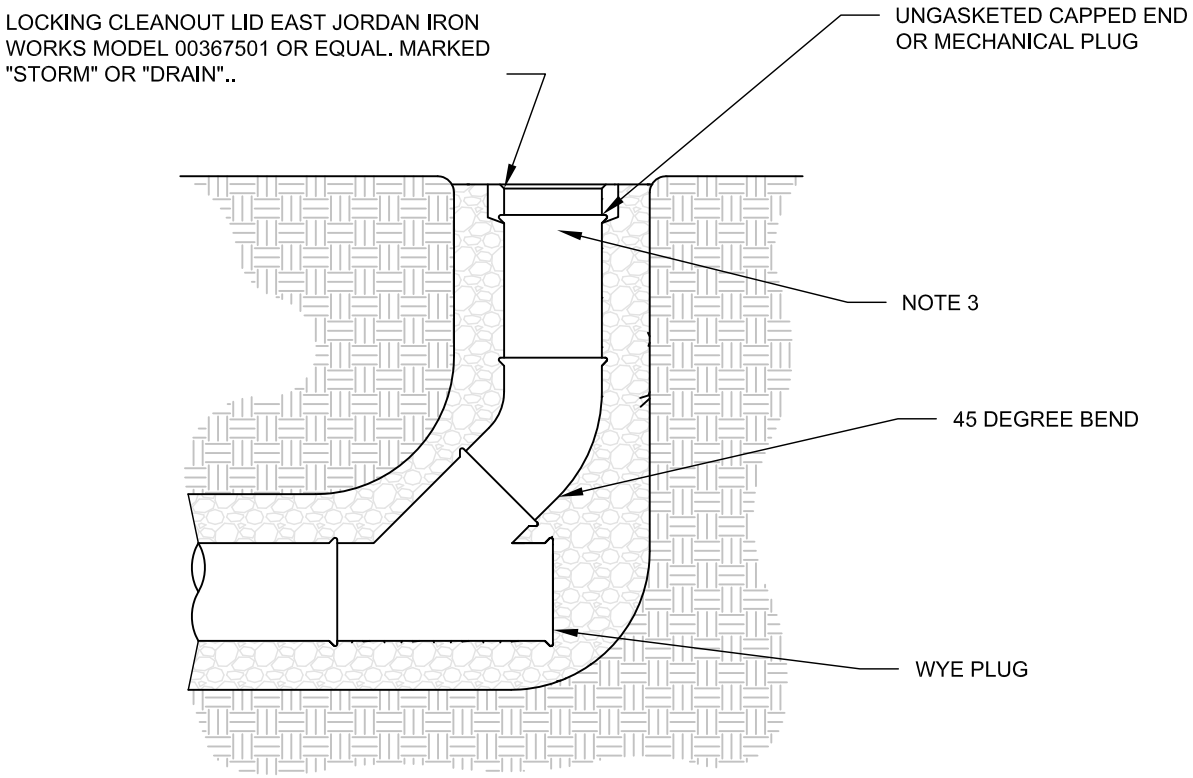
CityofRedmond WASHINGTON

STANDARD DETAILS

STORMWATER DRAINAGE STENCILING DETAIL

FILE NAME: SD622.DWG | DETAIL NUMBER: **622**

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CLEANOUT

NTS

NOTES:

1. LATERALS TO LOTS: WYE TO LOT CAP AND MARK LOCATION WITH 2"X4" POST MARKED "STORM".
2. CLEANOUT LOCATIONS TO BE AT BENDS, END OF LINES AND AT 100' OC MAX SPACING.
3. POUR CONCRETE COLLAR, 18"X18"X4" THICK AROUND PUBLIC CLEANOUTS TO SUPPORT THE FRAME AND LID. COMPACT BEDDING MATERIAL TO SUPPORT CONCRETE. PLACE LID AT FINISHED GRADE.
4. POUR CONCRETE COLLAR 12"X12"X4" THICK AROUND PRIVATE CLEANOUTS TO SUPPORT THE FRAME AND LID. COMPACT BEDDING MATERIAL TO SUPPORT CONCRETE. PLACE LID AT FINISHED GRADE.

Gary M. Schimek

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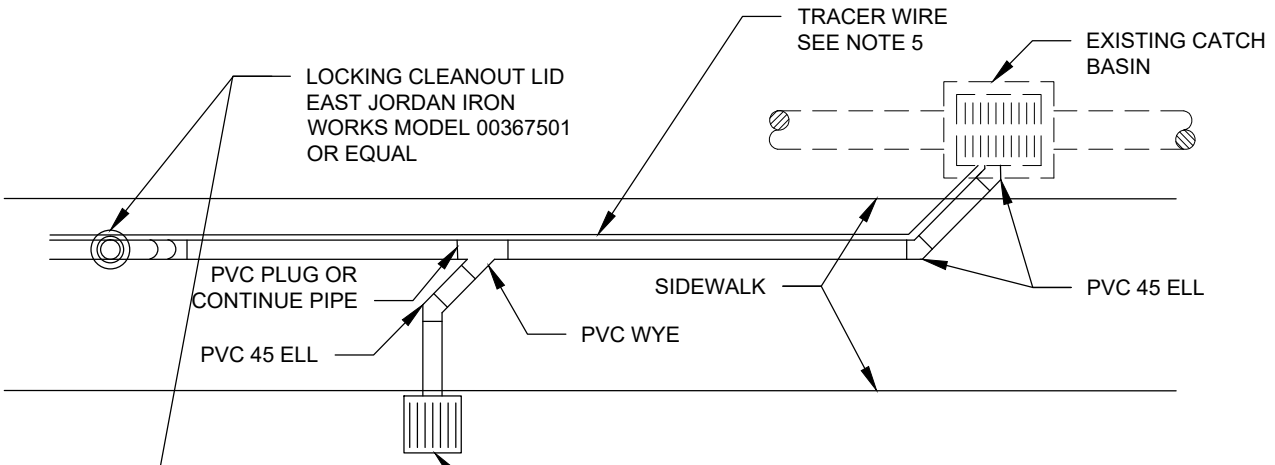
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STANDARD DETAILS

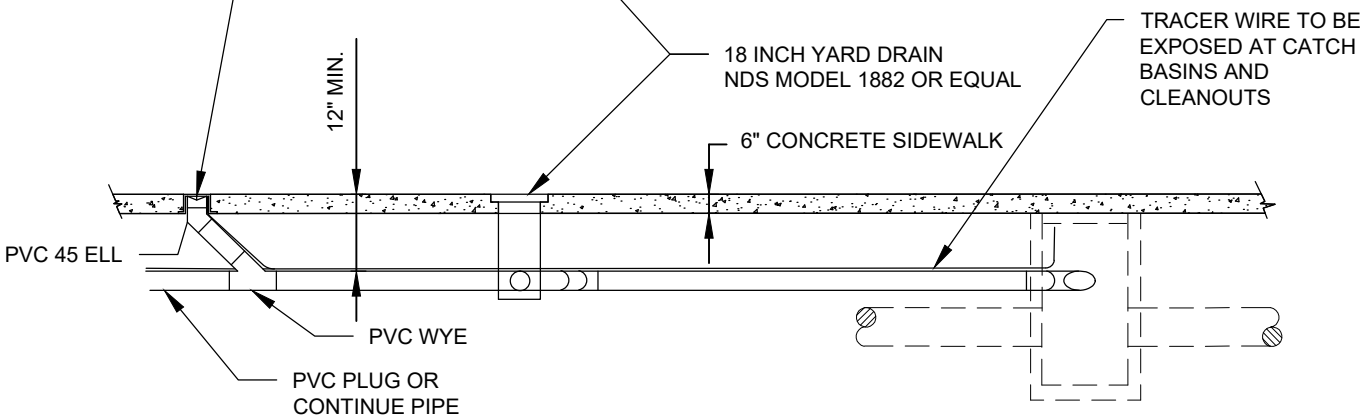
STORMWATER CLEANOUT

FILE NAME: SD623.DWG | DETAIL NUMBER: **623**

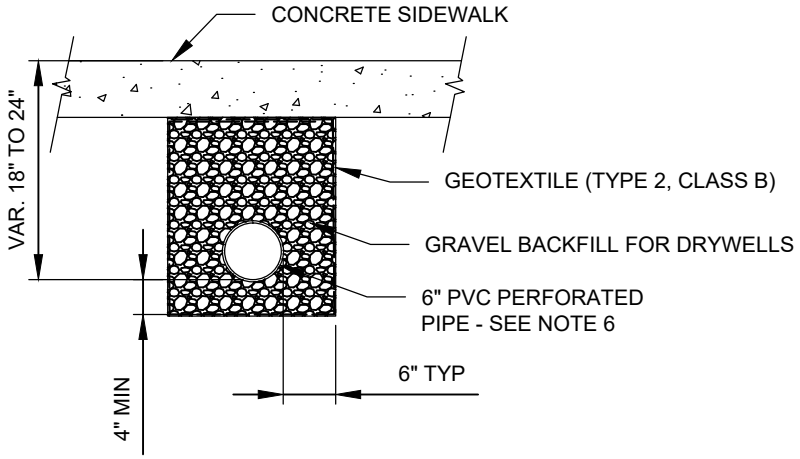
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PLAN VIEW
NTS



PROFILE VIEW
NTS



TYPICAL SECTION
NTS

NOTES:

1. MAXIMUM DISTANCE BETWEEN PIPE CLEANOUTS OR YARD DRAINS SHALL BE 100 FEET.
2. FOR NEW CONSTRUCTION, LOCATE YARD DRAINS NEAR PROPERTY LINES. YARD DRAINS MAY BE SHARED BY TWO PROPERTIES.
3. FOR RETROFITS, LOCATE YARD DRAINS AND LIMITS OF SIDEWALK REPLACEMENT AS DIRECTED BY INSPECTOR. REMOVE SIDEWALK TO EXISTING EXPANSION JOINTS.
4. PROTECT ADJACENT WALLS, VEGETATION, DRIVEWAYS, AND OTHER FEATURES.
5. TRACER WIRE TO BE SOLID WIRE 12 GA., AND SHALL BE PLACED FROM START OF RUN AT FIRST MANHOLE TO THE END OF THE UNDERDRAIN.
6. UNDERDRAIN TO BE PERFORATED SCHEDULE 20 PVC.

Gary M. Schimek

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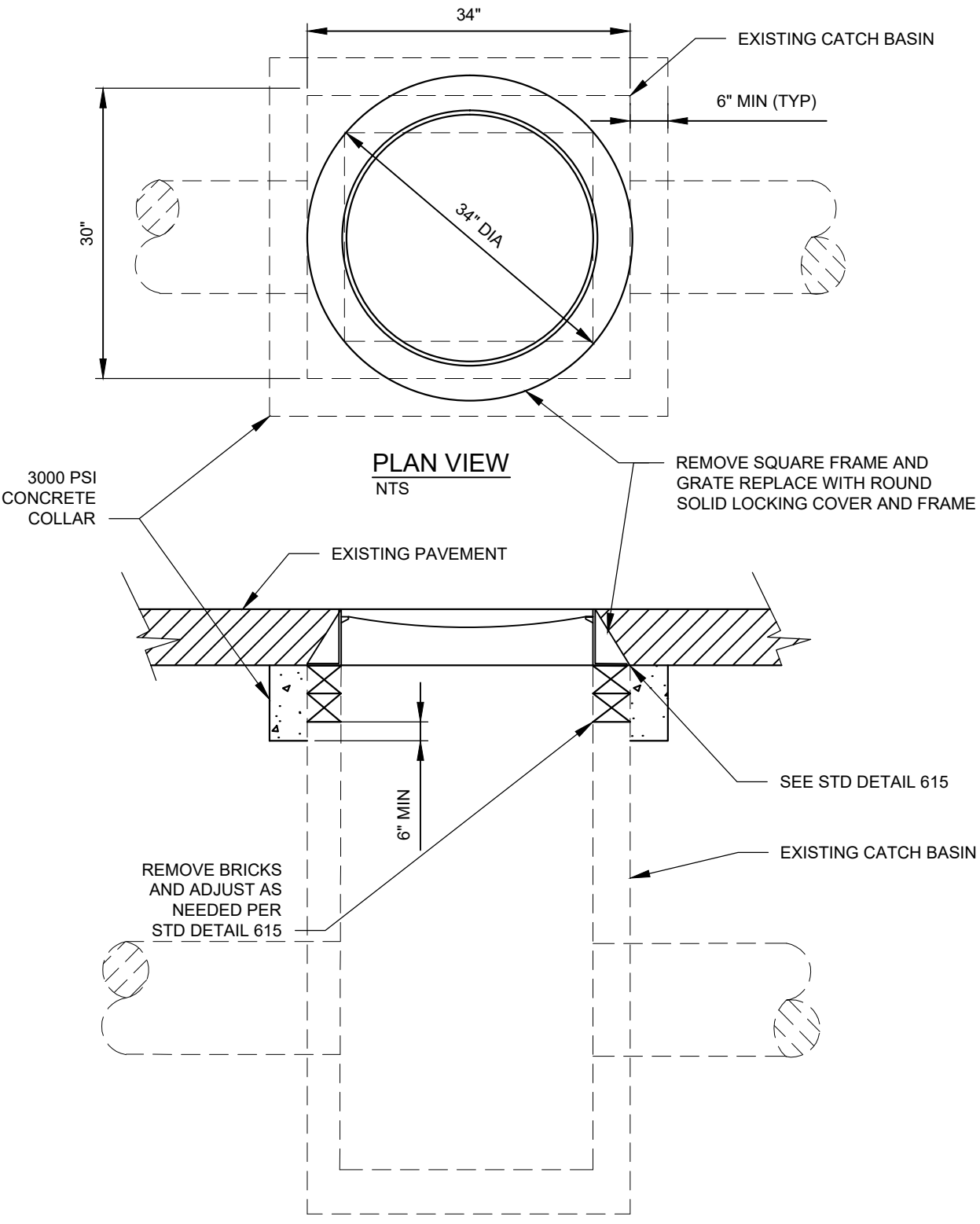
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STANDARD DETAILS

SIDEWALK UNDERDRAIN SYSTEM

FILE NAME: SD630.DWG | DETAIL NUMBER: **630**

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PLAN VIEW
NTS

PROFILE VIEW
NTS

Gary M. Schimek

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ENVIRONMENTAL AND UTILITY SERVICES DIVISION MANAGER

REVISION DATE: MARCH 01, 2019

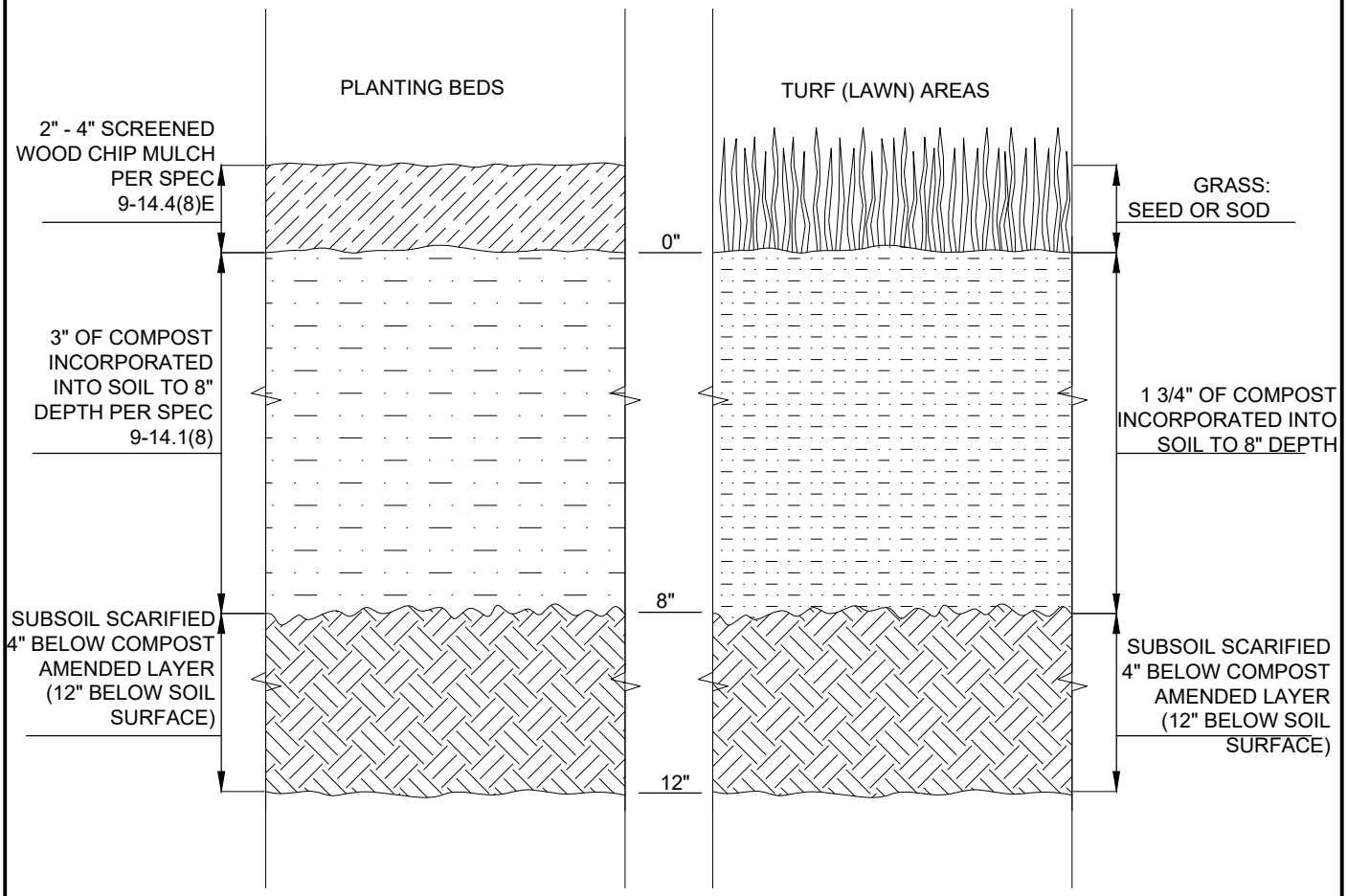
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STANDARD DETAILS

REPLACE FRAME & GRATE WITH RING & COVER

FILE NAME: SD631.DWG | DETAIL NUMBER: **631**

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SOIL AMENDMENT AND DEPTH

NTS

NOTES:

1. ALL SOIL AREAS DISTURBED OR COMPACTED DURING CONSTRUCTION, AND NOT COVERED BY BUILDINGS OR PAVEMENT, SHALL BE AMENDED WITH COMPOST TO A MINIMUM 8 INCH DEPTH, AND SUBSOIL SCARIFIED 4 INCH BELOW THAT COMPOST-AMENDED LAYER, FOR A FINISHED 12 INCH OF UN-COMPACTED DEPTH IN ALL LANDSCAPE AREAS. (SPEC 9-14.1(14))
2. PLANTING BED AND TURF AREA SOIL PREPARATION ARE THE SAME, EXCEPT FOR AMOUNT OF COMPOST AMENDMENT, AND MULCH ADDED TO PLANTING BEDS.
3. COMPOST SHALL BE TILLED INTO 8 INCH DEPTH INTO EXISTING SOIL, OR PLACE 8 INCHES OF COMPOST-AMENDED SOIL, PER SOIL SPECIFICATION. SUBSOIL SHALL BE SCARIFIED (LOOSENED) 4 INCHES BELOW AMENDED LAYER, TO PRODUCE 12-INCH DEPTH OF UN-COMPACTED SOIL, EXCEPT WHERE SCARIFICATION WOULD DAMAGE TREE ROOTS.
4. TURF AREAS SHALL RECEIVE 1.75 INCHES OF COMPOST TILLED INTO 8-INCH DEPTH, OR PLACE 8 INCHES OF IMPORTED SOIL CONTAINING 20-25% COMPOST BY VOLUME. THEN PLANT GRASS SEED OR SOD PER SPECIFICATIONS.
5. PLANTING BEDS SHALL RECEIVE 3 INCHES OF COMPOST TILLED INTO 8-INCH DEPTH, OR PLACE 8 INCHES OF IMPORTED SOIL CONTAINING 35-40% COMPOST BY VOLUME. MULCH AFTER PLANTING, WITH 2-4 INCHES OF ARBORIST WOOD CHIP MULCH OR APPROVED EQUAL.

Gary M. Schimek

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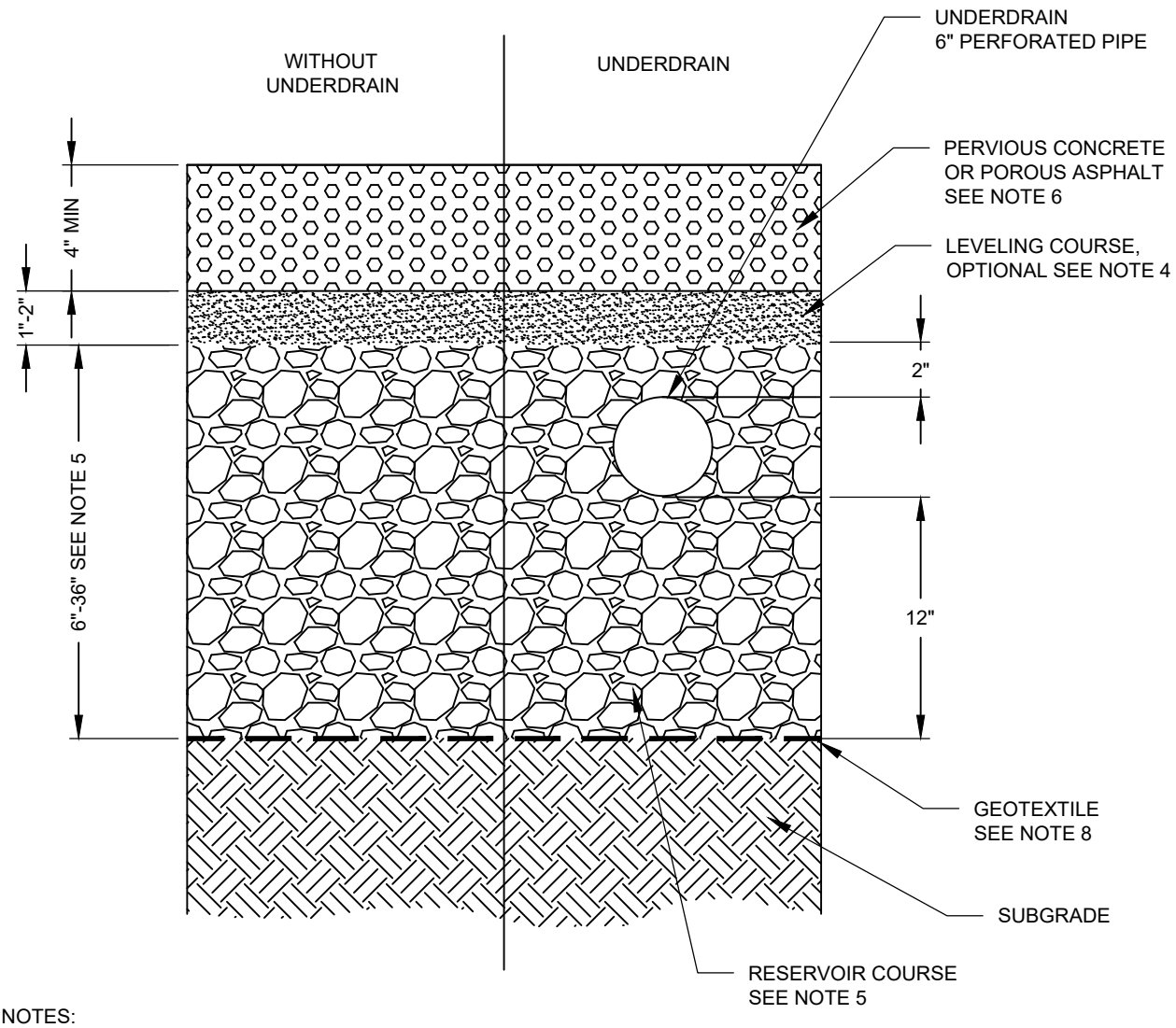
CityofRedmond WASHINGTON

STANDARD DETAILS

SOIL AMENDMENT AND DEPTH

FILE NAME: SD632.DWG | DETAIL NUMBER: **632**

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NOTES:

1. THESE GUIDELINES PROVIDE A MINIMUM DEPTH FOR THE HYDROLOGIC PERFORMANCE. THE STRUCTURAL CAPACITY OF PAVEMENT SECTIONS WHEN SUBJECT TO VEHICULAR LOADS DEPENDS ON SEVERAL FACTORS AND MUST BE DESIGNED BY A LICENSED PROFESSIONAL ENGINEER.
2. LONGITUDINAL SLOPE, 0 TO 5% MAX FOR POROUS ASPHALT, 10% MAX FOR PERVIOUS CONCRETE.
3. USE CHECK DAM OR OTHER METHODS TO MAXIMIZE PONDING IN THE SUBSURFACE FOR LONGITUDINAL SLOPES EXCEEDING 2%. SEE STANDARD DETAIL 647.
4. LEVELING COURSE MATERIALS: GRAVEL BACKFILL FOR WALLS PER SPEC 9-03.12(2)
5. RESERVOIR COURSE MINIMUM DEPTH OF 6" WITHOUT UNDERDRAIN, 22" MINIMUM WITH UNDERDRAIN. PERMEABLE BALLAST PER SPEC 9-03.9(2)
6. PERVIOUS CONCRETE MUST BE INSTALLED BY A CERTIFIED PERVIOUS CONCRETE INSTALLER. POROUS ASPHALT MUST BE INSTALLED BY AN EXPERIENCED POROUS ASPHALT INSTALLER. (NRMCA OR EQUIVALENT).
7. PERMEABLE PAVEMENTS SHALL NOT BE USED FOR POLLUTION GENERATING SURFACES (SURFACES SUBJECT TO REGULAR VEHICLE TRAFFIC) IN CRITICAL AQUIFER RECHARGE AREAS I AND II.
8. GEOTEXTILE PER SPEC 9-33.2(1) TABLE 3, SOIL STABILIZATION, NONWOVEN. INSPECTOR MAY WAIVE GEOTEXTILE DEPENDING ON SUBGRADE.
9. PERMEABLE PAVEMENT SHALL NOT BE USED IN DOWNTOWN OR PUBLIC ROADS.

Gary M. Schimek

APPROVED BY: GARY M. SCHIMEK
ENVIRONMENTAL AND UTILITY SERVICES DIVISION MANAGER

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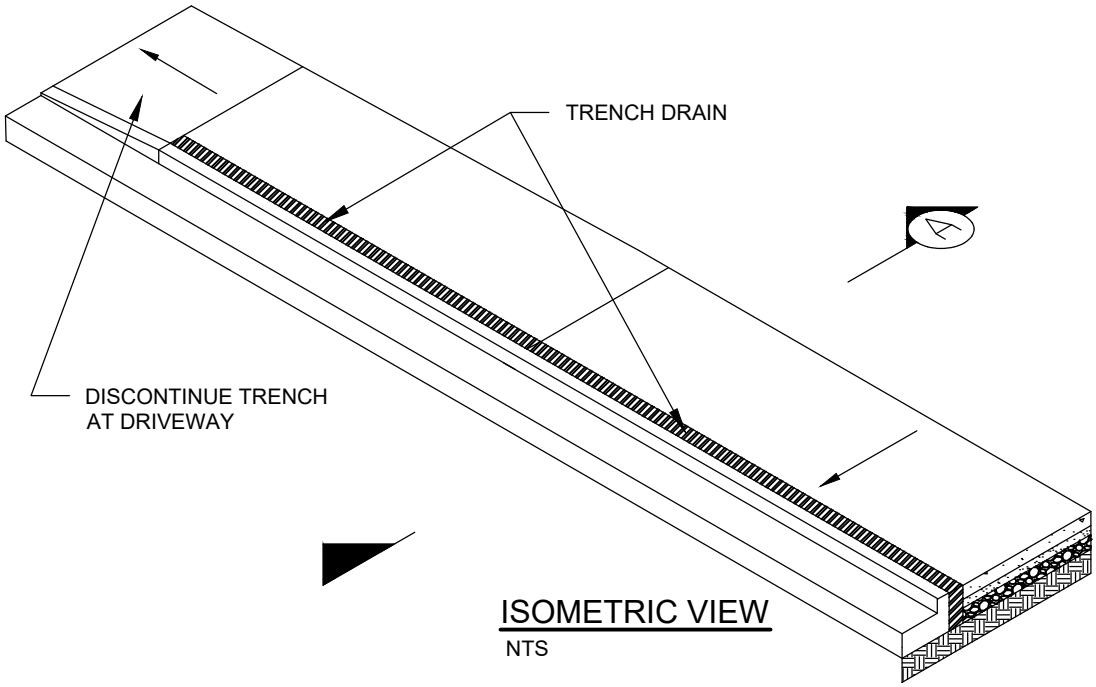
CityofRedmond WASHINGTON

STANDARD DETAILS

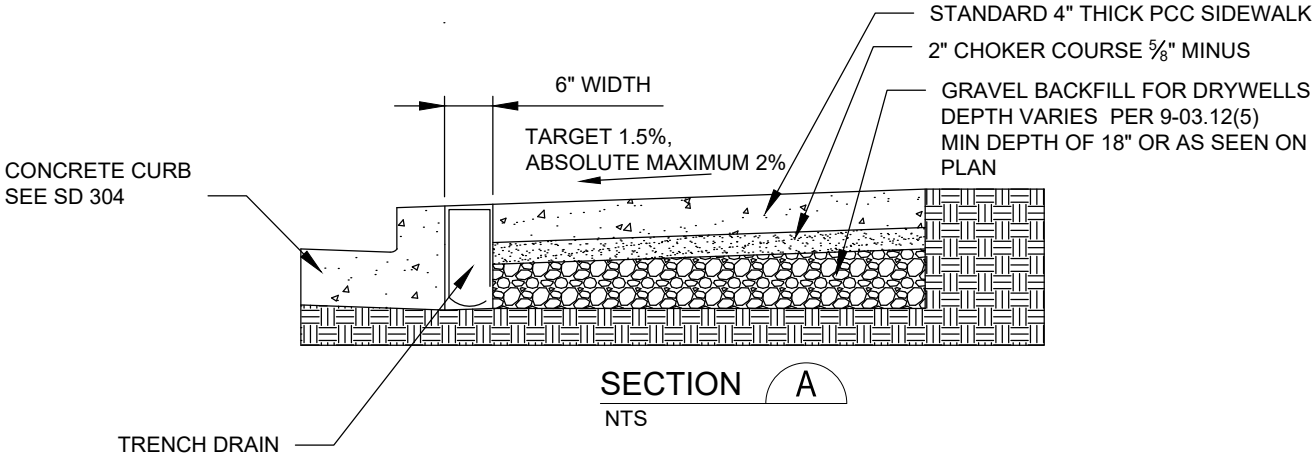
PERMEABLE PAVEMENT SECTION (PRIVATE USE ONLY)

FILE NAME: SD643.DWG | DETAIL NUMBER: **643**

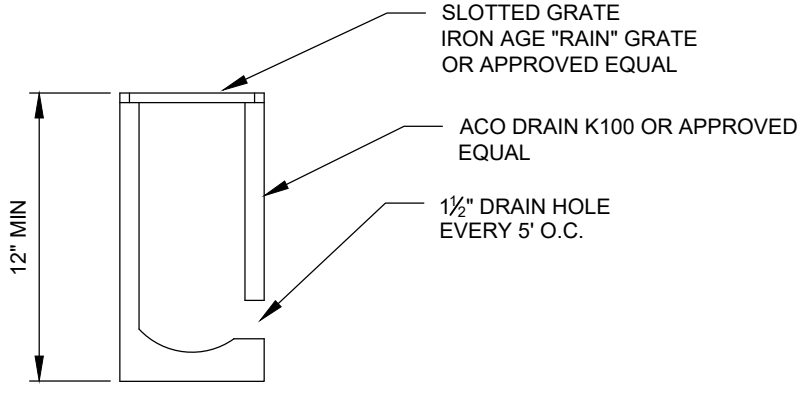
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ISOMETRIC VIEW
NTS



SECTION A
NTS



TRENCH DRAIN
NTS

NOTES:

1. USE CHECK DAM OR OTHER METHODS TO MAXIMIZE PONDING IN THE SUBSURFACE FOR LONGITUDINAL SLOPES EXCEEDING 2%. SEE STANDARD DETAIL 647.

Gary M. Schimek

APPROVED BY: GARY M. SCHIMEK
ENVIRONMENTAL AND UTILITY SERVICES DIVISION MANAGER

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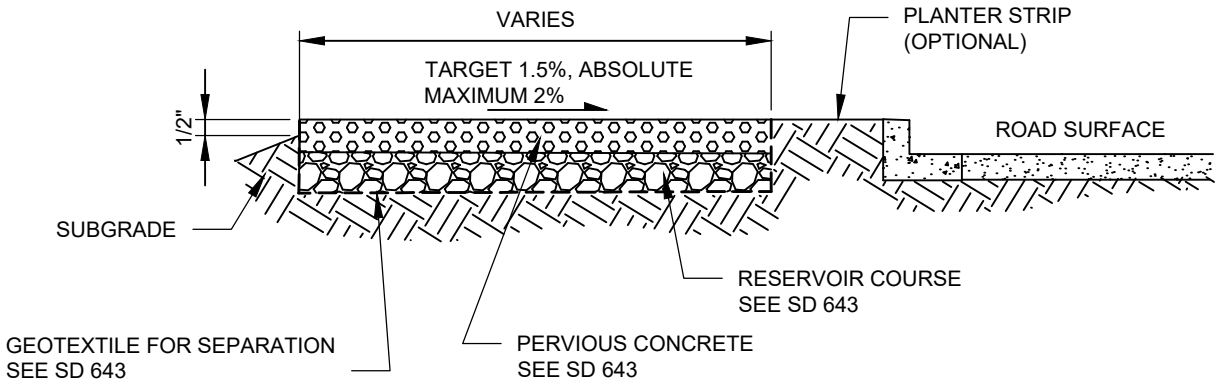
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STANDARD DETAILS

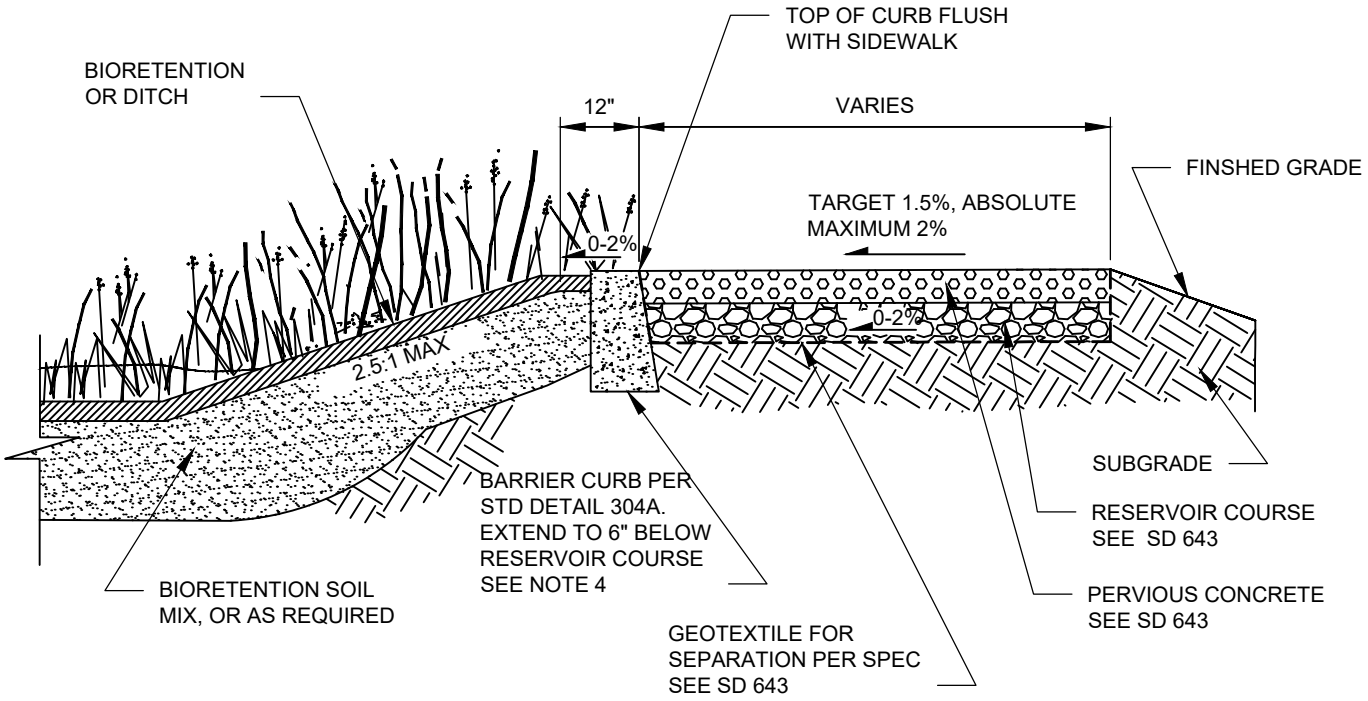
FUNCTIONAL EQUIVALENT INFILTRATION SIDEWALK

FILE NAME: SD645.DWG | DETAIL NUMBER: **645**

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PERVIOUS CONCRETE SIDEWALK ADJACENT TO CURB



ADJACENT TO BIORETENTION OR DITCH PERVIOUS CONCRETE SIDEWALK

NTS

NOTES:

1. ROUGH GRADE DITCH OR BIORETENTION FIRST.
2. SUBGRADE SHOULD NOT BE COMPACTED.
3. COVER TO PROTECT SURFACE UNTIL FINAL LANDSCAPING IS COMPLETE.
4. INSPECTOR MAY WAIVE BARRIER CURB DEPENDING ON SITE CONDITIONS
5. USE CHECK DAM OR OTHER METHODS TO MAXIMIZE PONDING IN THE SUBSURFACE FOR LONGITUDINAL SLOPES EXCEEDING 2%. SEE STANDARD DETAIL 647.

Gary M. Schimek

APPROVED BY: GARY M. SCHIMEK
ENVIRONMENTAL AND UTILITY SERVICES DIVISION MANAGER

REVISION DATE: MARCH 01, 2020

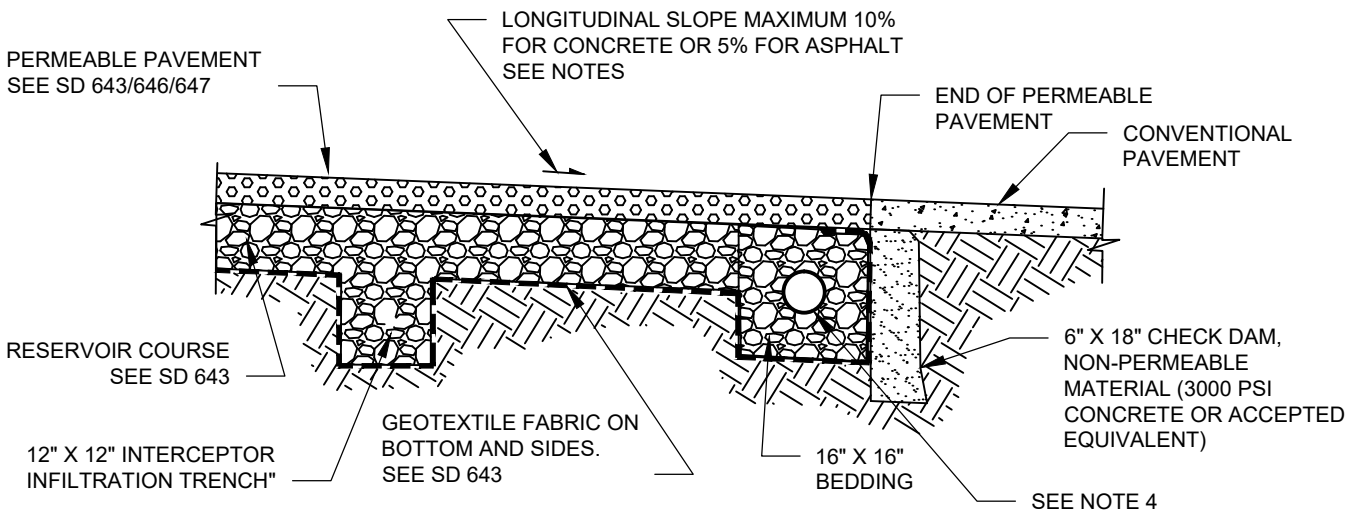
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STANDARD DETAILS

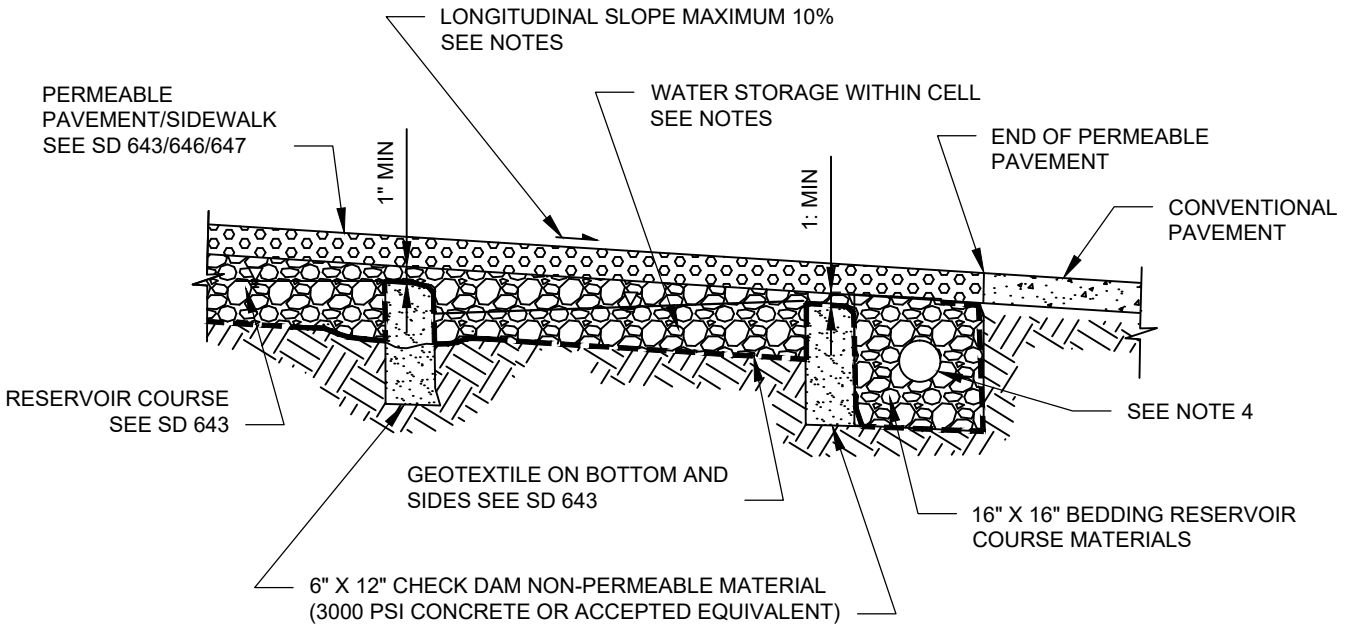
PERVIOUS CONCRETE SIDEWALK PRIVATE USE ONLY

FILE NAME: SD646.DWG | DETAIL NUMBER: **646**

DocuSign Envelope ID: F681597A-CCE8-405B-ACDB-A8564C559739



INTERCEPTOR INFILTRATION TRENCH



CHECK DAM

NOTES:

1. FOR PRIVATE USE ONLY.
2. CHECK DAM OR INTERCEPTOR REQUIRED FOR LONGITUDINAL SLOPES > 2%.
3. SPACE CHECK DAMS BASED ON SLOPE TO ACHIEVE DESIGN AVERAGE PONDING DEPTH BEFORE OVERTOPPING DAM.
4. CALCULATE STORAGE VOLUME BETWEEN CHECK DAMS BASED ON CHECK DAM HEIGHT AND SLOPE FOR MODELING.
5. 6" PVC PERF PIPE WITH CLEANOUTS AND CONNECTION TO STORM, SIMILAR TO STD DETAIL 630.
6. PERMEABLE PAVEMENT NOT ALLOWED FOR POLLUTION GENERATING SURFACE IN CRITICAL AQUIFER RECHARGE AREAS I AND II.

Gary M. Schimek

APPROVED BY: GARY M. SCHIMEK
ENVIRONMENTAL AND UTILITY SERVICES DIVISION MANAGER

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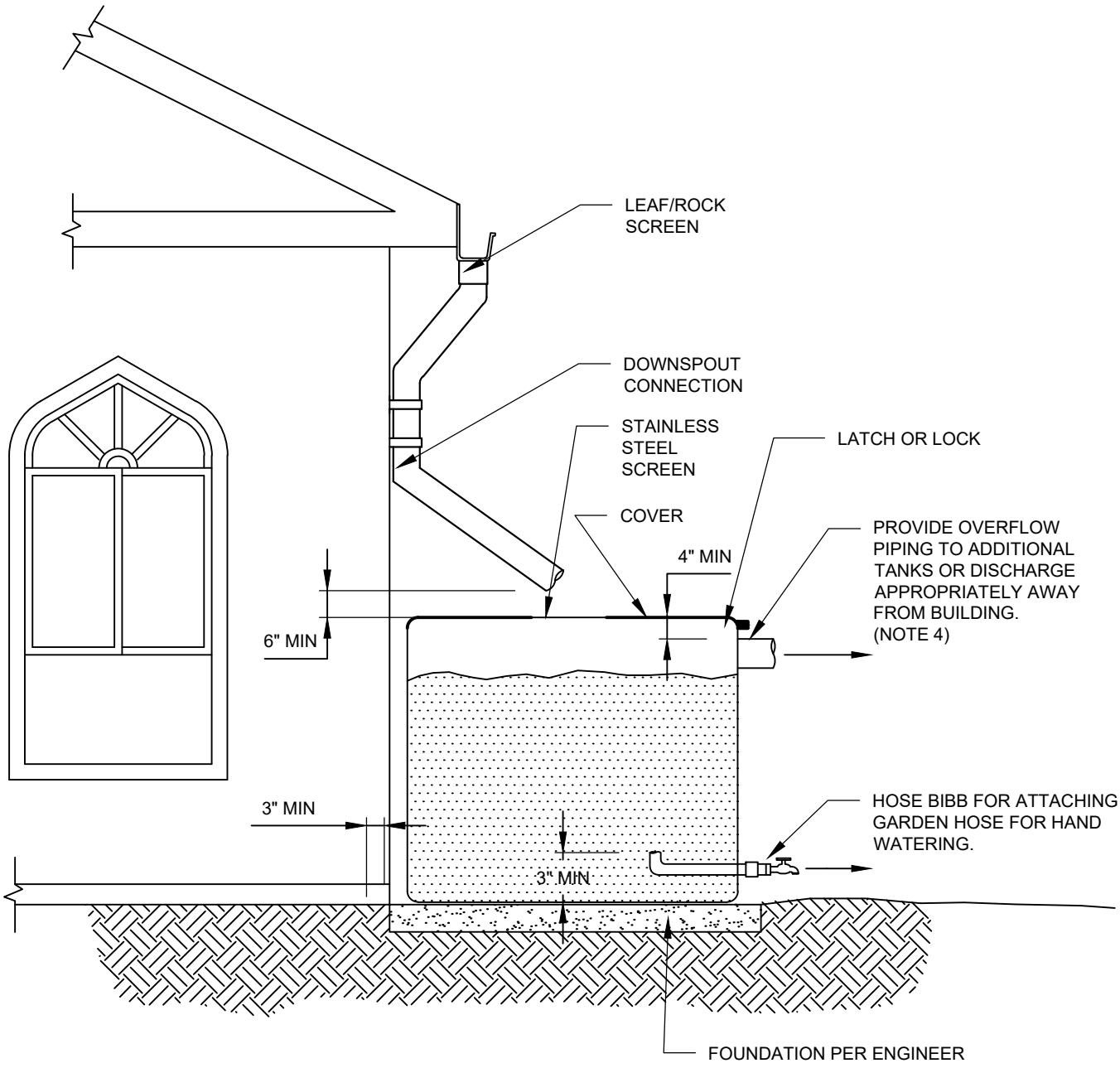
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PERMEABLE PAVEMENT ON SLOPES (PRIVATE USE ONLY)

FILE NAME: SD647.DWG | DETAIL NUMBER: **647**

DocuSign Envelope ID: F681597A-CCE8-405B-ACDB-A8564C559739



NOTES:

1. ELECTRICAL PERMIT REQUIRED IF WATER PUMP IS TO BE INSTALLED.
2. ENGINEERING DESIGN IS REQUIRED FOR CISTERNS GREATER THAN 60 GALLONS OR FOR BELOW GROUND SYSTEMS.
3. THERE SHALL BE NO CONNECTION BETWEEN RAIN HARVESTING SYSTEM AND POTABLE WATER SUPPLY.
4. THE OWNER IS RESPONSIBLE FOR ENSURING SAFE DISCHARGE OF OVERFLOWS WITHOUT CONCENTRATING FLOWS TO CAUSE EROSION OR FLOODING.
5. ENGINEERING DESIGN IS REQUIRED FOR CISTERNS GREATER THAN 60 GALLONS OR FOR BELOW GROUND SYSTEMS. IRRIGATION SYSTEMS CONNECTED TO SUCH CISTERNS SHALL MEET TREATMENT AND DESIGN GUIDANCE FROM THE STORMWATER TECHNICAL NOTEBOOK.

Gary M. Schimek

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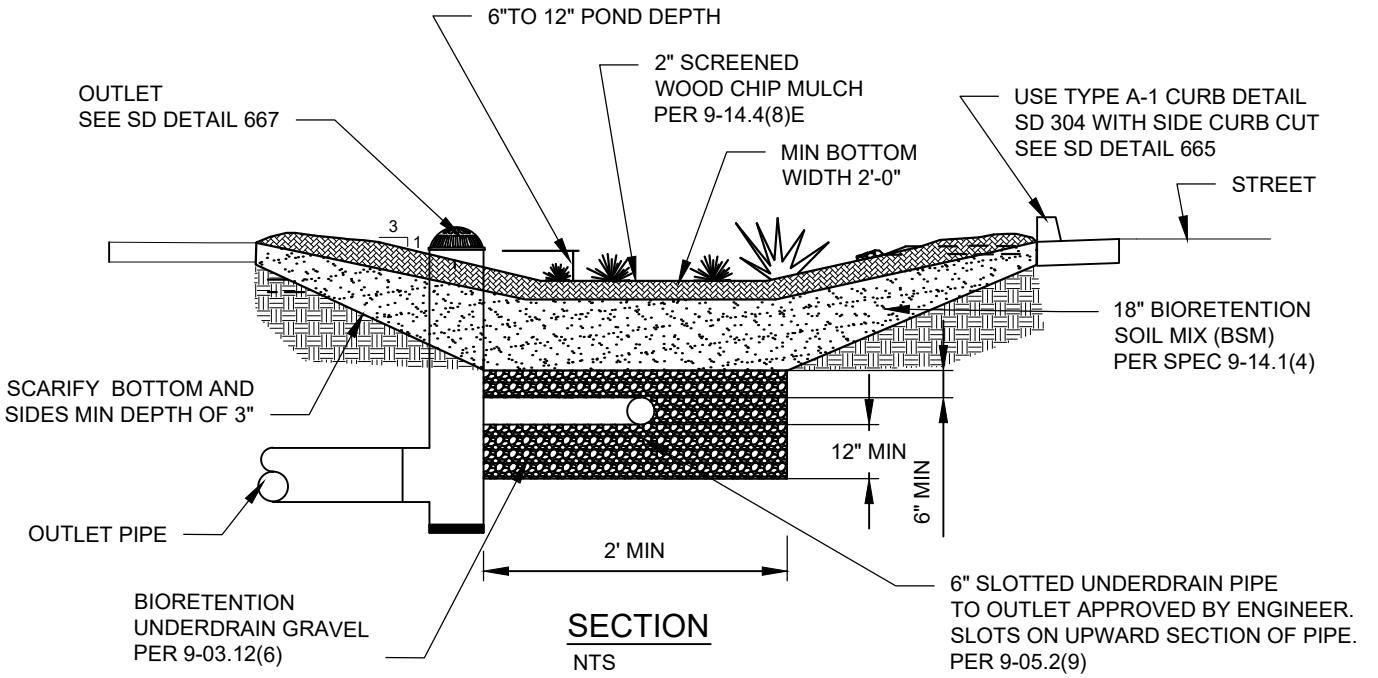
CityofRedmond WASHINGTON

STANDARD DETAILS

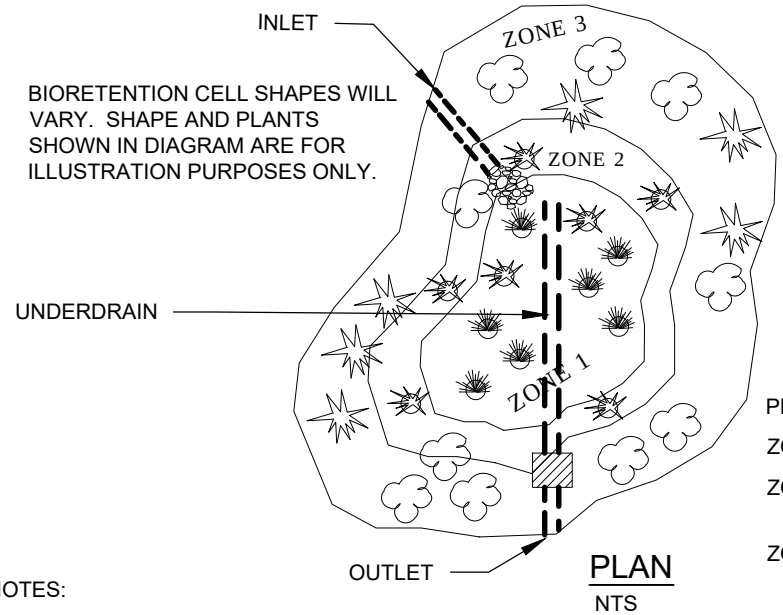
ROOF RAIN HARVESTING

FILE NAME: SD650.DWG | DETAIL NUMBER: **650**

DocuSign Envelope ID: F681597A-CCE8-405B-ACDB-A8564C559739



SECTION
NTS



PLAN
NTS

PLANTING ZONES:

ZONE 1: AREA WITH FREQUENT STANDING WATER

ZONE 2: AREA WITH OCCASIONAL STANDING WATER, AND EXTENDED DRIER PERIOD.

ZONE 3: AREA WITH DRIER CONDITIONS.

NOTES:

1. MAXIMUM BOTTOM SLOPE OF CELL IS 0.5%
2. OVERFLOW POINT SHALL BE AT LEAST 6 INCHES BELOW ANY ADJACENT PAVEMENT AREA.
3. INSTALL STREAMBED COBBLE (1" - 4") AT INLET TO DISSIPATE RUNOFF
4. IF OPTIONAL UNDERDRAIN IS USED:
   - 0.5% MIN SLOPE
   - PROVIDE A CLEAN OUT EVERY 250-300 FEET
5. MINIMUM 3 FOOT DEPTH BETWEEN UNDERDRAIN (IF PRESENT) OR BOTTOM OF BIORETENTION SOIL MIX (BSM) AND WATER TABLE.
6. MINIMUM SETBACK OF 5 FEET FROM TOP OF BIORETENTION CELL TO BUILDING STRUCTURES AND PROPERTY LINES. DO NOT LOCATE IMMEDIATELY UP SLOPE OF BUILDING STRUCTURES.
7. AVOID COMPACTION OF EXISTING SUBGRADE BELOW PLANTER DURING CONSTRUCTION.
8. SEE STANDARD DETAIL 657 FOR PLANTS ALLOWED IN EACH ZONE.

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BIORETENTION FACILITY

FILE NAME: SD655.DWG

DETAIL NUMBER: **655**

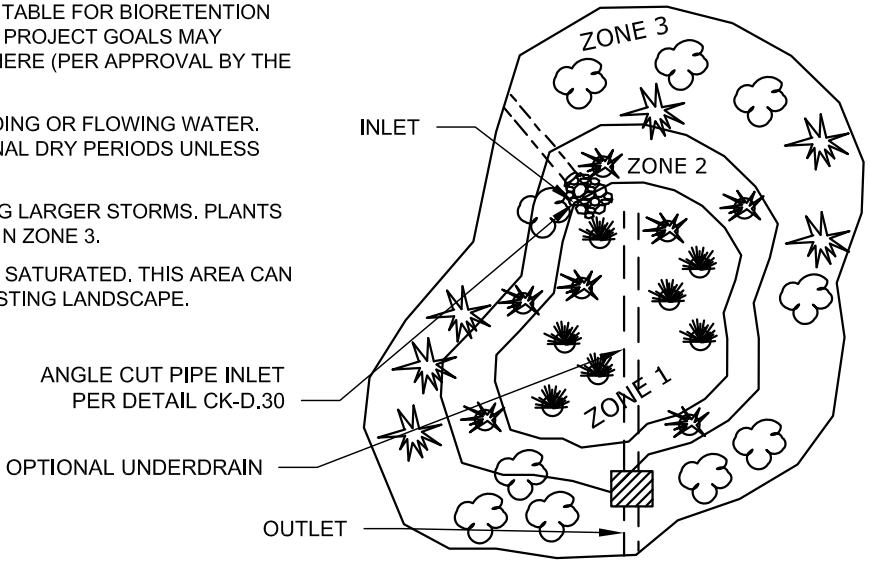
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THE FOLLOWING LIST INCLUDES NATIVE AND NON-NATIVE PLANT SPECIES COMMONLY AVAILABLE IN PUGET SOUND, AND SUITABLE FOR BIORETENTION CELLS AND SWALES. SITE CHARACTERISTICS AND PROJECT GOALS MAY REQUIRE MODIFICATIONS TO PLANT PROPOSED HERE (PER APPROVAL BY THE ENGINEER).

ZONE 1: AREA OF PERIODIC OR FREQUENT STANDING OR FLOWING WATER. ZONE 1 PLANTS SHOULD ALSO TOLERATE SEASONAL DRY PERIODS UNLESS IRRIGATION IS AVAILABLE.

ZONE 2: AREA PERIODICALLY SATURATED DURING LARGER STORMS. PLANTS LISTED UNDER ZONE 2 MAY ALSO BE APPLICABLE IN ZONE 3.

ZONE 3: AREA WITH DRIER SOILS INFREQUENTLY SATURATED. THIS AREA CAN BE USED TO TRANSITION OR BLEND WITH THE EXISTING LANDSCAPE.



ZONE 1 EMERGENT PLANTS
CAREX APERTA / COLUMBIA SEDGE
CAREX OBNUPTA / SLOUGH SEDGE
CAREX ROSTRATA / BEAKED SEDGE
CAREX STIPATA / SAWBEAK SEDGE
DESCHAMPSIA CAESPITOSA / TUFTED HAIRGRASS
ELEOCHARIS PALUSTRIS / COMMON SPIKE RUSH
JUNCUS EFFUSUS / SOFT RUSH
JUNCUS ENSIFOLIUS / DAGGER-LEAF RUSH
JUNCUS TENUIS / SLENDER RUSH
SCIRPUS ACUTUS / HARDSTEM BULRUSH
SCIRPUS MICROCARPUS / SMALL-FRUITED BULRUSH
SPARGANIUM SP. / BURREED

ZONE 1 SHRUBS
CORNUS SERICEA / RED-OSIER DOGWOOD
CORNUS S. 'KELSEYI'/ DWARF RED-OSIER DOGWOOD
SALIX PURPUREA 'NANA'/DWARF ARCTIC WILLOW
SPIRAEA DOUGLASII / HARDHACK
SPIRAEA JAPONICA /

ZONE 2 HERBACEOUS PLANTS
AQUILEGIA SP. / COLUMBINE
ARUNCUS SYLVESTER / GOAT'S BEARD
ATHYRIUM FELIX-FEMINA / LADY FERN
IRIS DOUGLASIANA / PACIFIC IRIS
IRIS SIBIRICA / SIBERIAN IRIS

ZONE 2 SHRUBS
CORNUS SERICEA / RED-OSIER DOGWOOD
CORNUS S. 'KELSEYI'/ DWARF RED-OSIER DOGWOOD
LONICERA INVOLUCRATA / BLACK TWINBERRY
OEMLARIA CERASIFORMIS / INDIAN PLUM
SPIRAEA JAPONICA
SYMPHORICARPOS ALBA / SNOWBERRY

ZONE 3 HERBACEOUS PLANTS & GROUNDCOVER
ARCTOSTAPHYLOS SP.
FESTUCA OVINA 'GLAUCA' / BLUE FESCUE
GAULTHERIA SHALLON / SALAL
HEMEROCALIS VARS. / DAYLILY
HEUCHERA VARS. / ALUMROOT
LAVANDULA ANGUSTIFOLIA / LAVENDER
MAHONIA REPENS / CREEPING MAHONIA
POLYSTICHUM ACROSTICHOIDES / CHRISTMAS FERN
POLYSTICHUM MUNITUM / SWORD FERN
RUDBECKIA HIRTA / BLACK-EYED SUSAN

ZONE 3 SHRUBS
ABELIA X GRANDIFLORA
ESCALLONIA VARS.
HOLODISCUS DISCOLOR / OCEANSPRAY
MAHONIA AQUIIFOLIUM / OREGON GRAPE
POTENTILLA FRUTICOSA / CINQUEFOIL
RIBES SANGUINEUM / RED-FLOWERING CURRANT
ROSA GYMNOCARPA / BALDHIP ROSE
VACCINIUM OVATUM / EVERGREEN HUCKLEBERRY

NOTE: CERTAIN TREES MAY BE APROPRIATE FOR USE IN THESE FACILITIES AND SHOULD BE SELECTED PENDING SITE CONDITIONS.

SPECIAL CONSIDERATIONS: IN ADDITION TO SOIL MOISTURE ZONES, PLANTS SHOULD BE SELECTED TO FIT EXPOSURE,AESTHETICS AND SAFETY ISSUES .
EXPOSURE: CAREFUL CONSIDERATION SHOULD BE GIVEN TO SELECTING PLANTS FOR SUN / SHADE EXPOSURE AT THE SITE. MANY RAIN GARDENS ARE LARGELY SURROUNDED WITH PAVEMENT WHICH INCREASES THE HEAT EFFECTS OF SUN EXPOSURE.
DROUGHT TOLERANCE: THIS LIST EMPHASIZES NATIVE PLANTS, WHICH ARE GENERALLY WELL ADAPTED TO WET WINTER AND DRY SUMMER CONDITIONS. HOWEVER, SEVERAL ZONE 1 PLANTS WILL REQUIRE IRRIGATION. IN GENERAL, ALL PLANTINGS REQUIRE WATER DURING ESTABLISHMENT.
SIGHT CLEARANCE: ENSURE ADEQUATE SIGHT DISTANCE FOR ALL USERS PER CODE.
TREES: TREES MAY NOT BE APPROPRIATE IN ALL BIORETENTION CELLS, AND PLACEMENT MUST BE APPROVED BY THE ENGINEER. CONSIDER HEIGHT, SPREAD, AND EXTENT OF ROOTS AT MATURITY. USE CAUTION IN TREE SELECTION FOR AREAS WITH UNDER-DRAIN PIPES OR OTHER STRUCTURES.

NOTES:

USE A MINIMUM OF 3 DIFFERENT SHRUBS AND 3 EMERGENT/GROUNDCOVER SPECIES IN EACH ZONE.
MINIMUM PLANT QUANTITIES ARE 90 PLANTS PER 100 SQ. FT. TREATMENT AREA, INCLUDING 4 SHRUBS MIN.
BIORETENTION CELLS MUST CONTAIN PLANTING ZONES 1, 2 AND 3, BIORETENTION CELLS WITH VERTICAL WALLS MAY NOT CONTAIN ALL THREE PLANTING ZONES.
EMERGENT PLANTS SHALL BE 4 INCH POTS OR 10 C.I.PLUGS, PLACED IN CLUSTERS OF 7-15 PLANTS AT 9 INCH O.C.
SHRUBS SHALL BE 1-GALLON, PLACED IN CLUSTERS OF 3-7.
NO TURF GRASS SHALL BE USED IN BIORETENTION CELLS.

Gary M. Schimek

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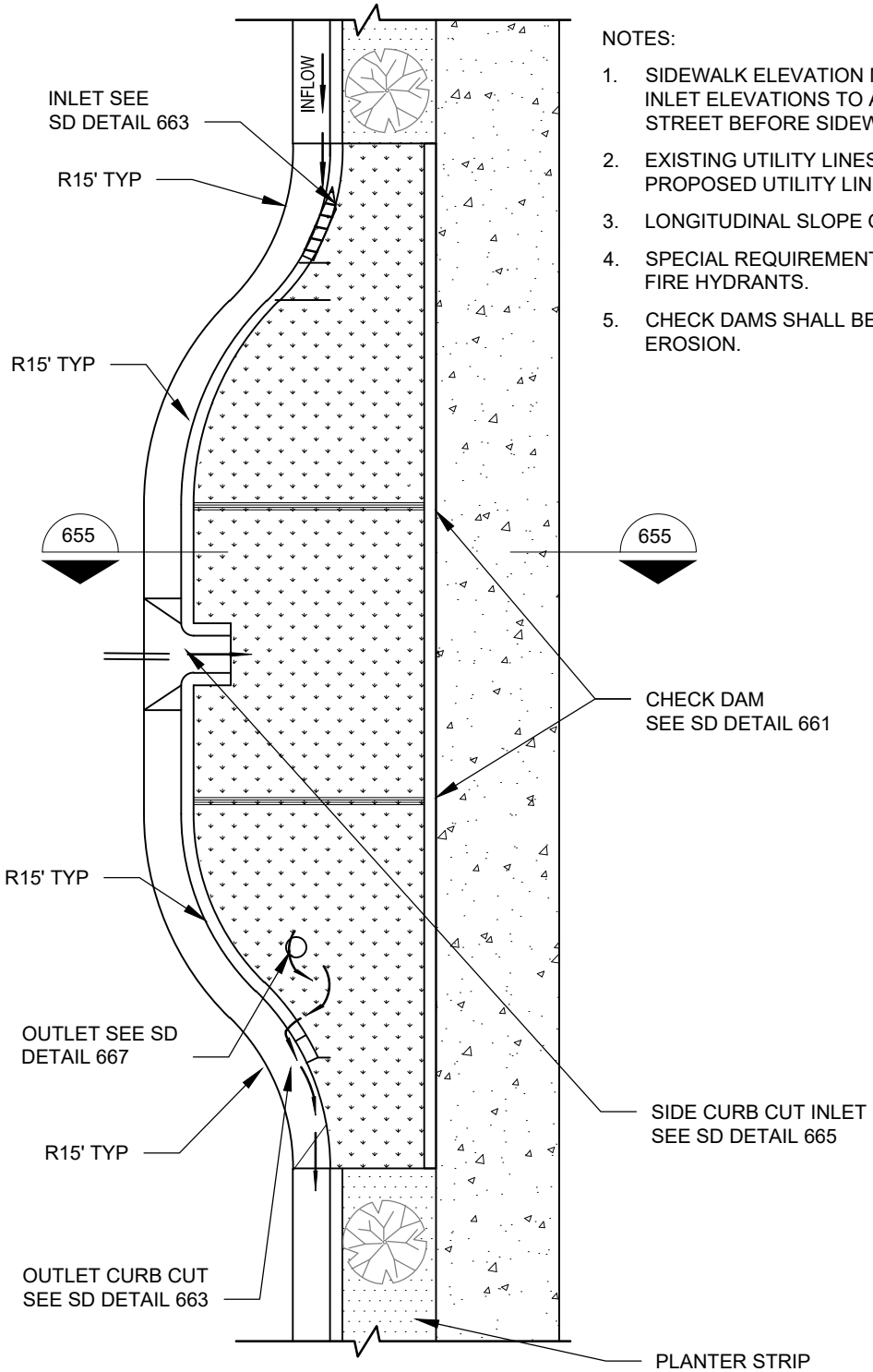
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STANDARD DETAILS

BIORETENTION PLANT PALETTE

FILE NAME: SD657.DWG | DETAIL NUMBER: **657**

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NOTES:

1. SIDEWALK ELEVATION MUST BE SET ABOVE CHECK DAM AND INLET ELEVATIONS TO ALLOW OVERFLOW TO DRAIN TO STREET BEFORE SIDEWALK.
2. EXISTING UTILITY LINES MUST BE SLEEVED OR RELOCATED. PROPOSED UTILITY LINES TO BE LOCATED OUT OF FACILITY.
3. LONGITUDINAL SLOPE OF PLANTER MATCHES THE ROAD.
4. SPECIAL REQUIREMENTS FOR WATER LINES, METERS, AND FIRE HYDRANTS.
5. CHECK DAMS SHALL BE PLACED AS NEEDED TO PREVENT EROSION.

PLAN
NTS

Gary M. Schimek

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ENVIRONMENTAL AND UTILITY SERVICES DIVISION MANAGER

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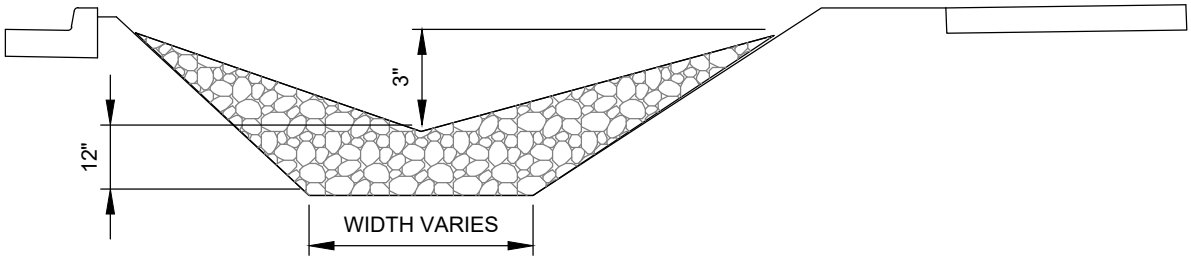
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STANDARD DETAILS

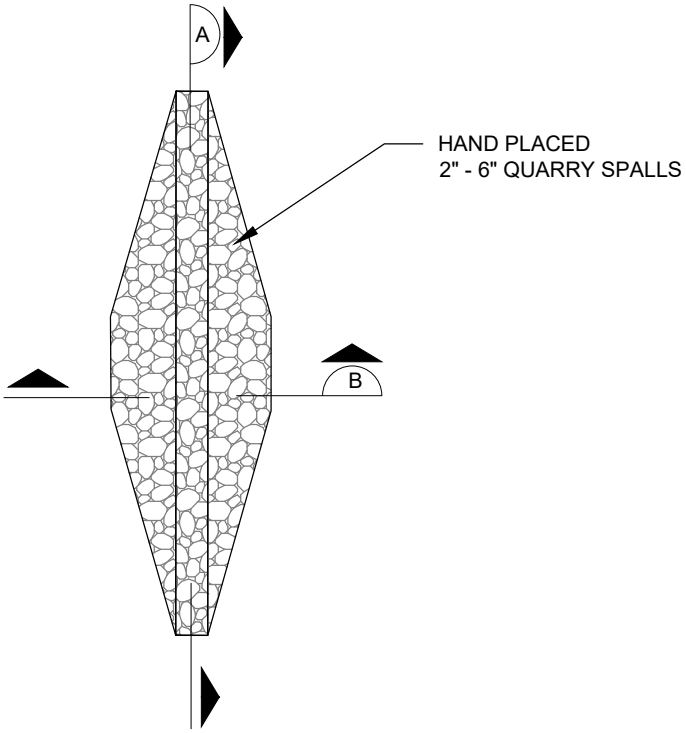
BIORETENTION CURB EXTENSION

FILE NAME: SD659.DWG | DETAIL NUMBER: **659**

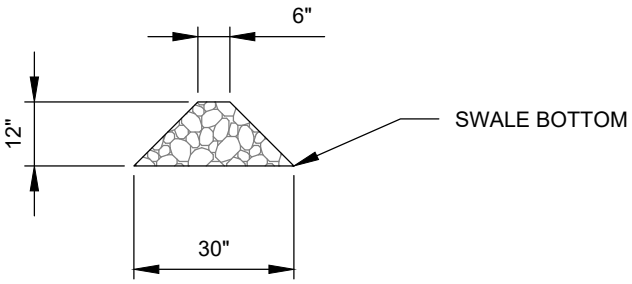
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SECTION A
NTS



TOP VIEW
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SECTION B
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Gary M. Schimek

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ENVIRONMENTAL AND UTILITY SERVICES DIVISION MANAGER

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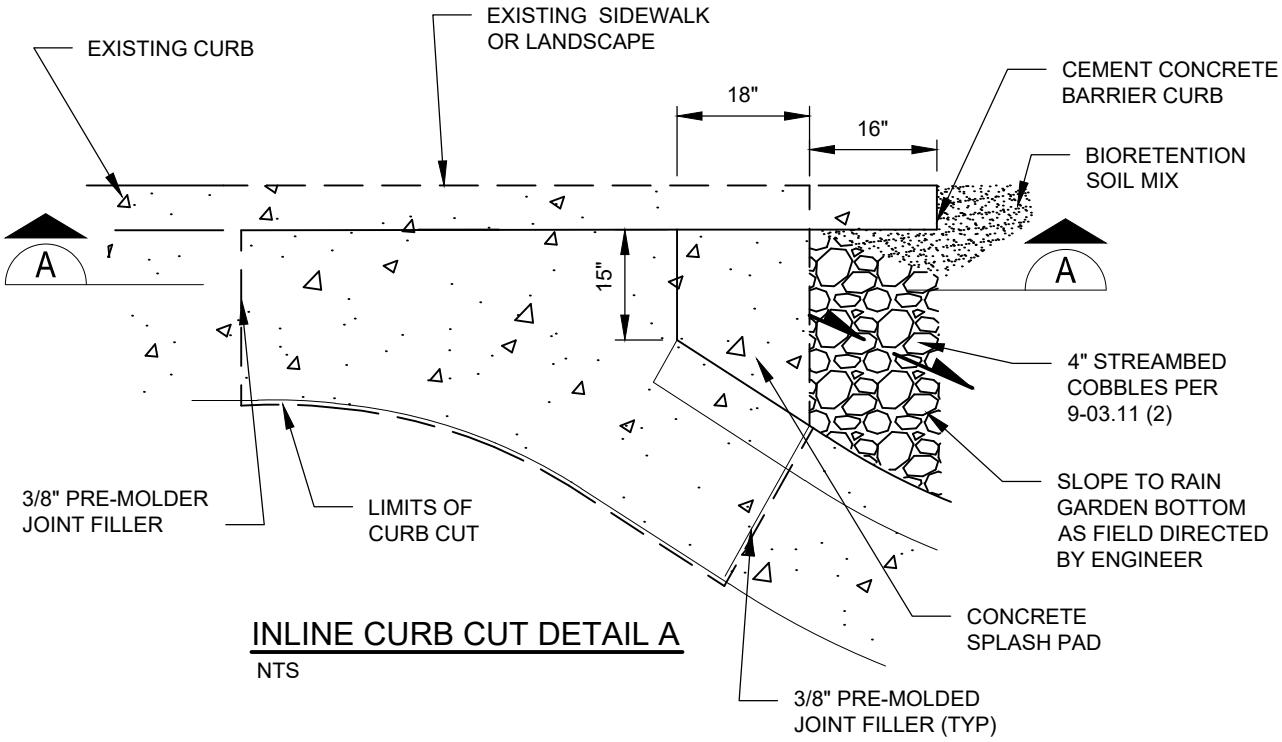
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STANDARD DETAILS

BIORETENTION CHECK DAM

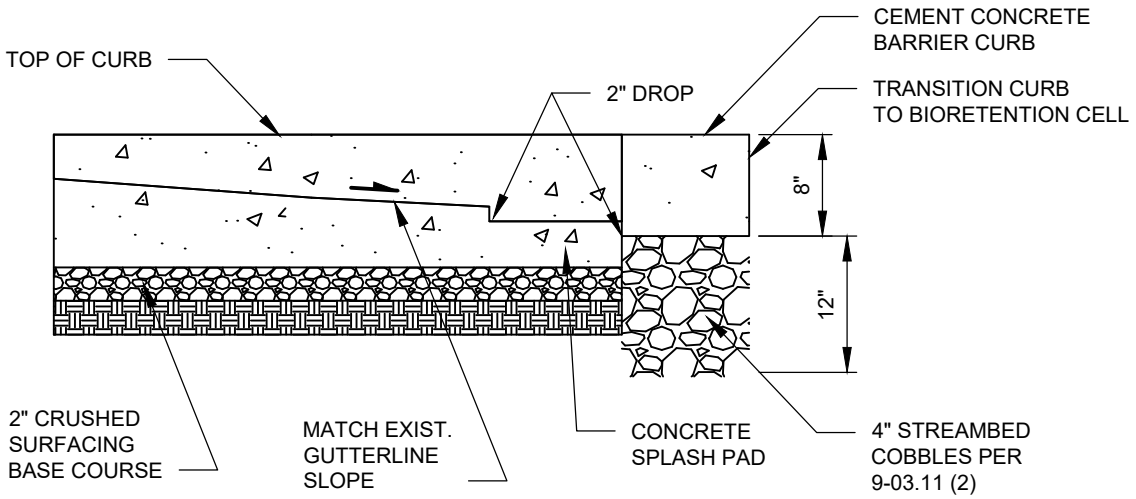
FILE NAME: SD661.DWG | DETAIL NUMBER: **661**

DocuSign Envelope ID: F681597A-CCE8-405B-ACDB-A8564C559739



INLINE CURB CUT DETAIL A

NTS



INLINE CURB CUT SECTION A-A

NTS

Gary M. Schimek

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ENVIRONMENTAL AND UTILITY SERVICES DIVISION MANAGER

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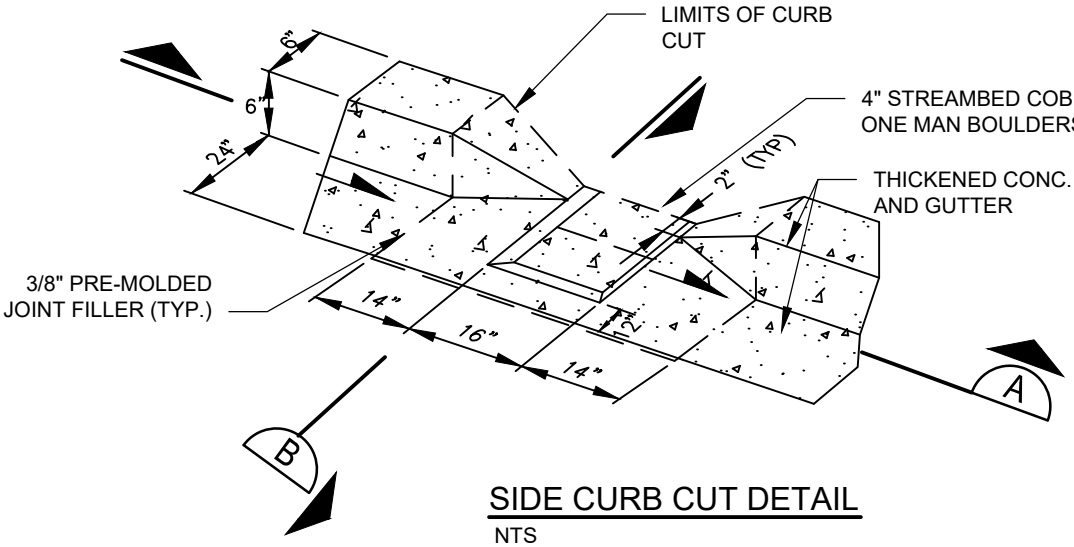
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STANDARD DETAILS

BIORETENTION IN-LINE CURB CUT

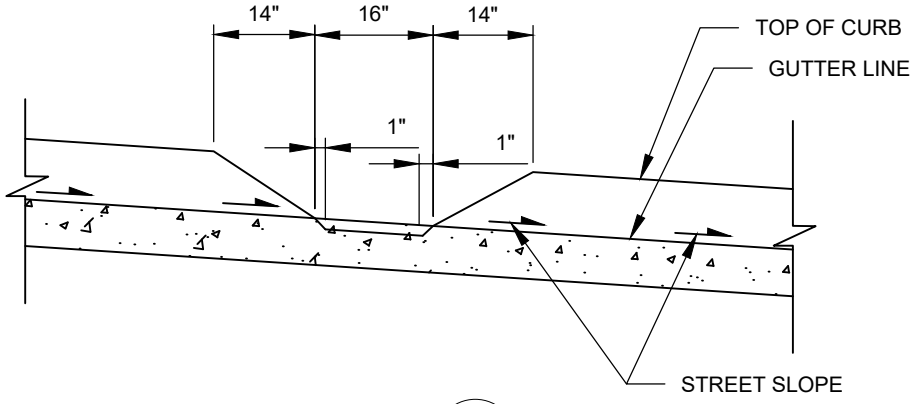
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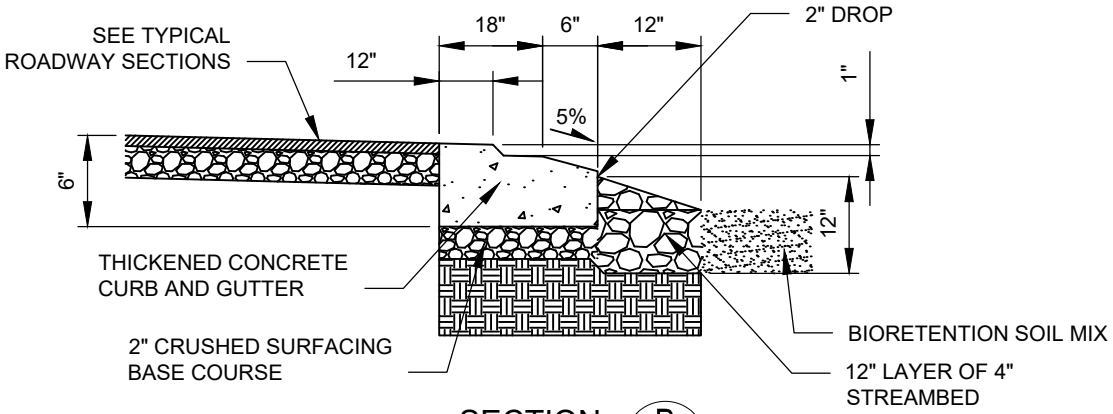
SIDE CURB CUT DETAIL

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SECTION A

NTS



SECTION B

NTS

Gary M. Schimek

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ENVIRONMENTAL AND UTILITY SERVICES DIVISION MANAGER

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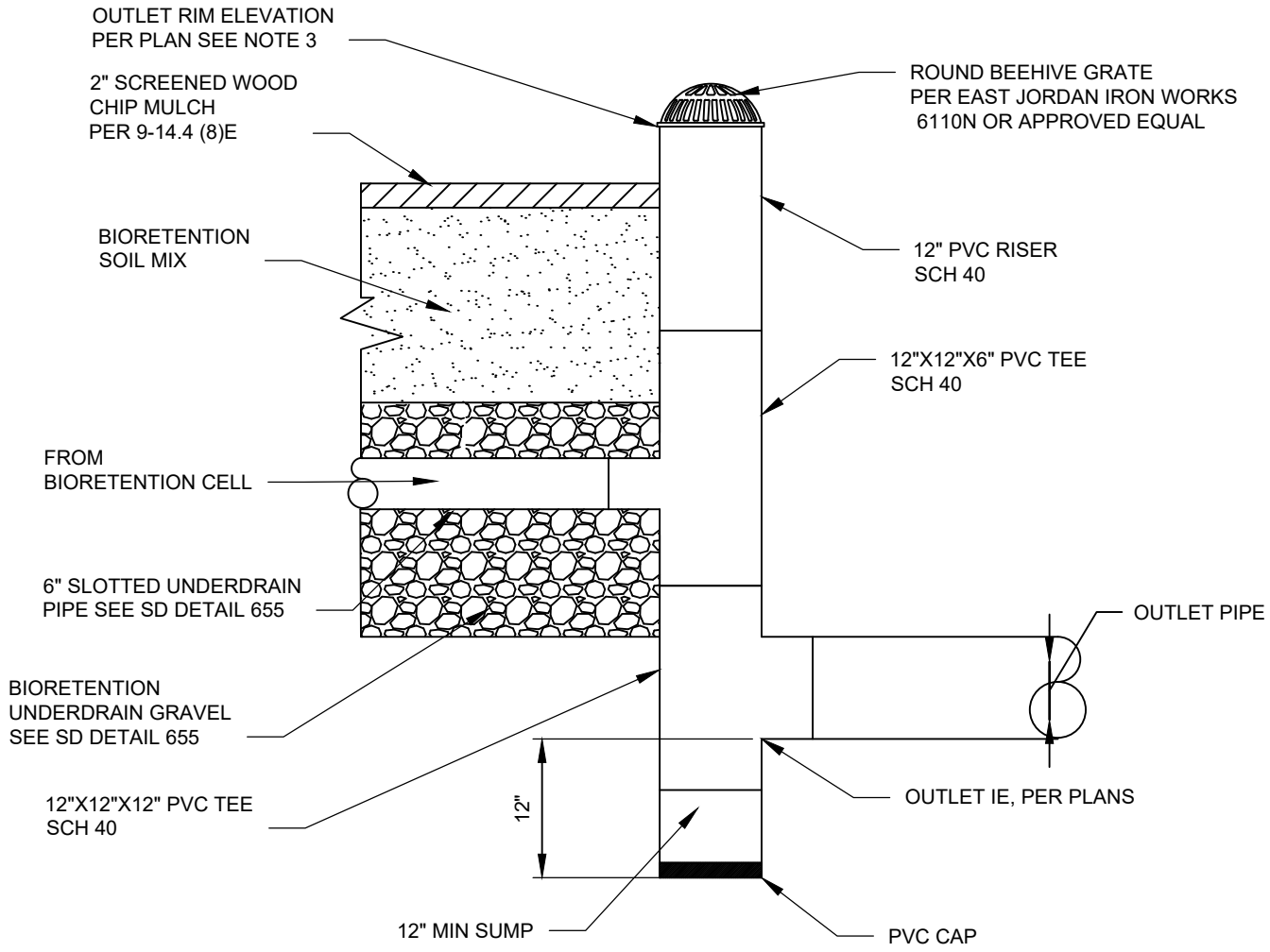
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STANDARD DETAILS

BIORETENTION SIDE CURB CUT

FILE NAME: SD665.DWG | DETAIL NUMBER: **665**

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OUTLET STRUCTURE

NTS

NOTES:

1. ALL FITTINGS TO BE RUBBER GASKETED.
2. ALL PVC RISERS AND FITTINGS INSTALLED ABOVE GRADE SHALL HAVE PROTECTIVE ULTRAVIOLET COATING, OPAQUE LATEX WATER BASED PAINT OR APPROVED EQUAL.
3. OUTLET RIM 3 INCH MINIMUM BELOW ADJACENT PAVEMENT OF SIDEWALK.

Gary M. Schimek

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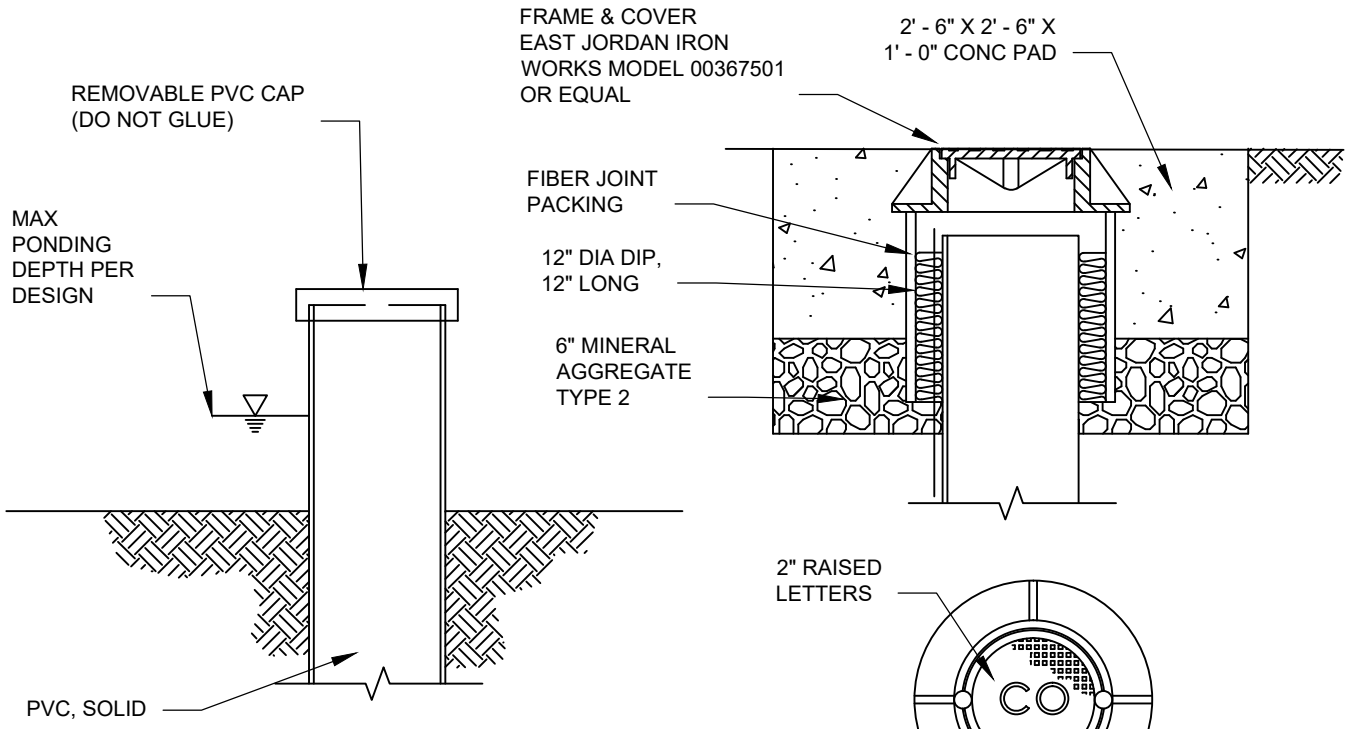
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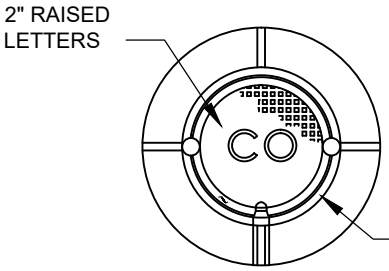
STANDARD DETAILS

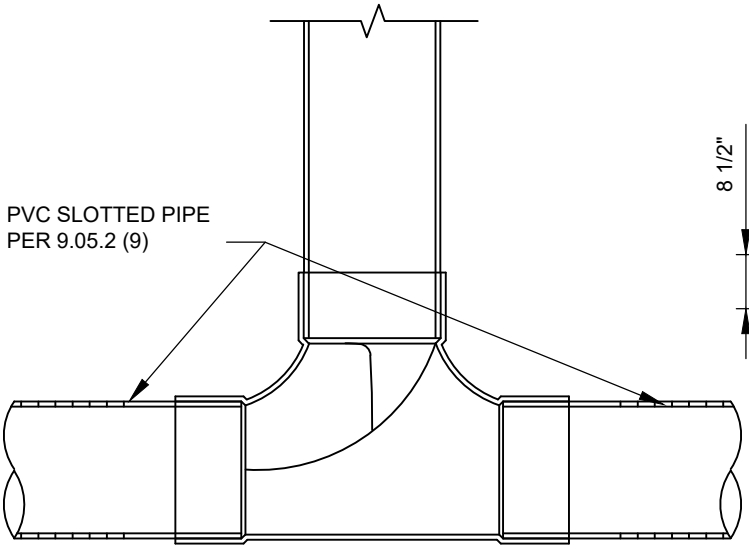
BIORETENTION OUTLET STRUCTURE

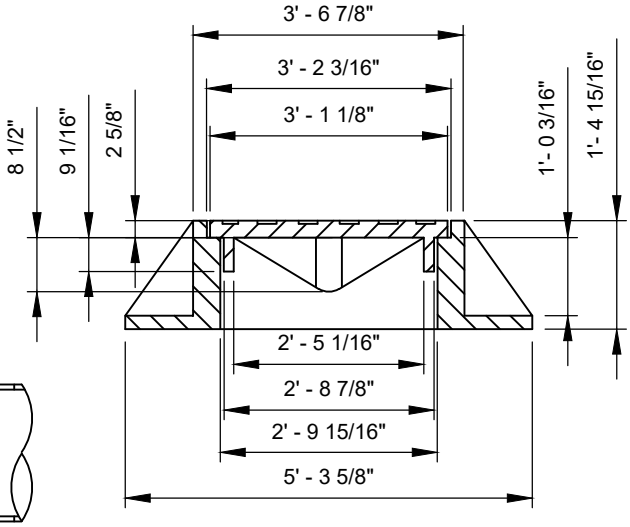
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BIORETENTION CLEAN OUT
NTS

CAST IRON FRAME AND COVER
NTS

NOTES:

1. LOCATE CLEANOUTS IN PAVED AREAS ADJACENT TO BIORETENTION WHERE POSSIBLE.

Gary M. Schimek

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ENVIRONMENTAL AND UTILITY SERVICES DIVISION MANAGER

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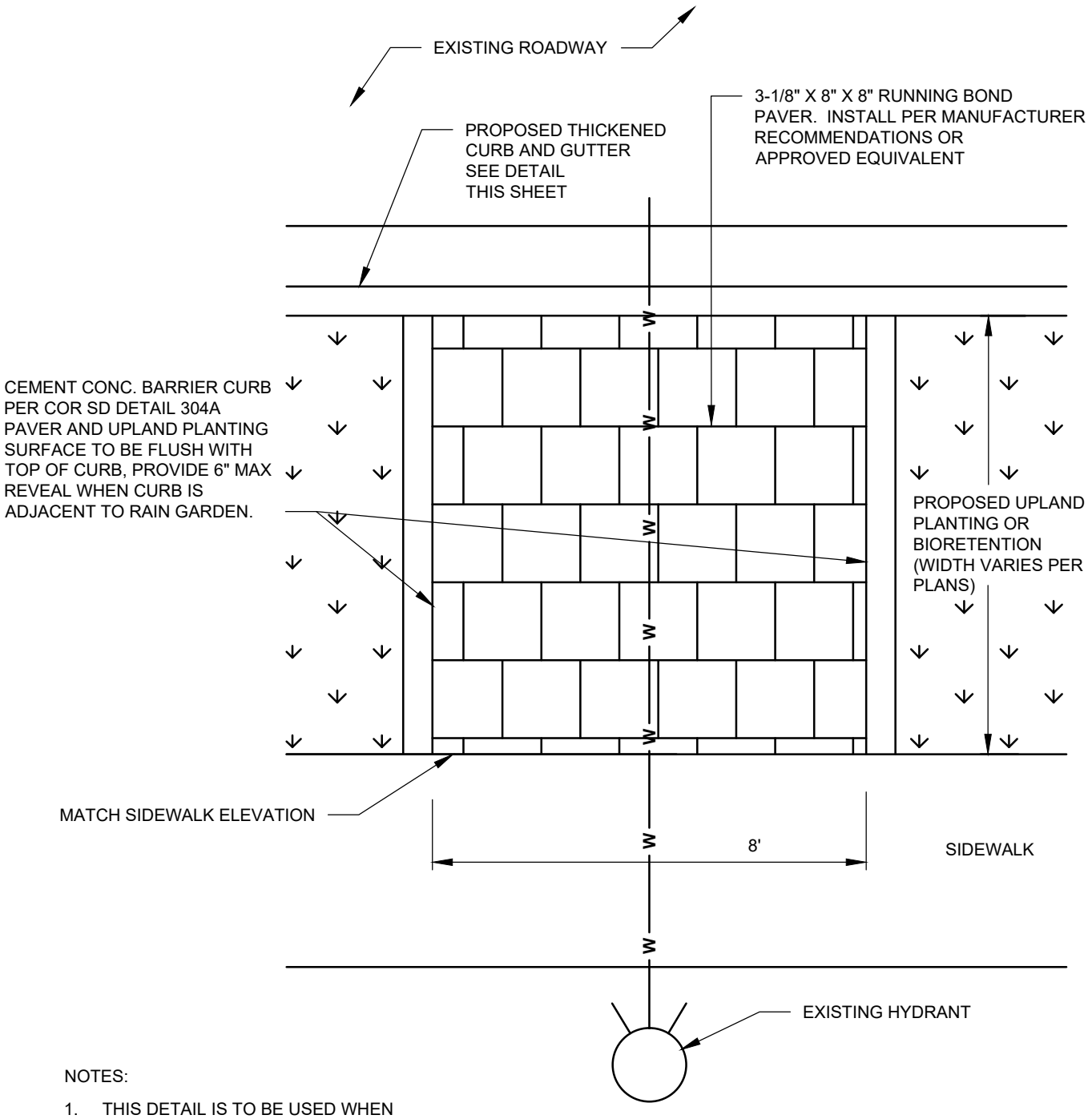
STANDARD DETAILS

BIORETENTION CLEANOUT

FILE NAME: SD669.DWG

DETAIL NUMBER: **669**

DocuSign Envelope ID: F681597A-CCE8-405B-ACDB-A8564C559739



NOTES:

1. THIS DETAIL IS TO BE USED WHEN BIORETENTION IS ON BOTH SIDES OF THE STREET, OTHERWISE LOCATE FIRE HYDRANT ON OPPOSITE SIDE OF THE STREET FROM THE BIORETENTION CELL.

PLAN
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Gary M. Schimek

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ENVIRONMENTAL AND UTILITY SERVICES DIVISION MANAGER

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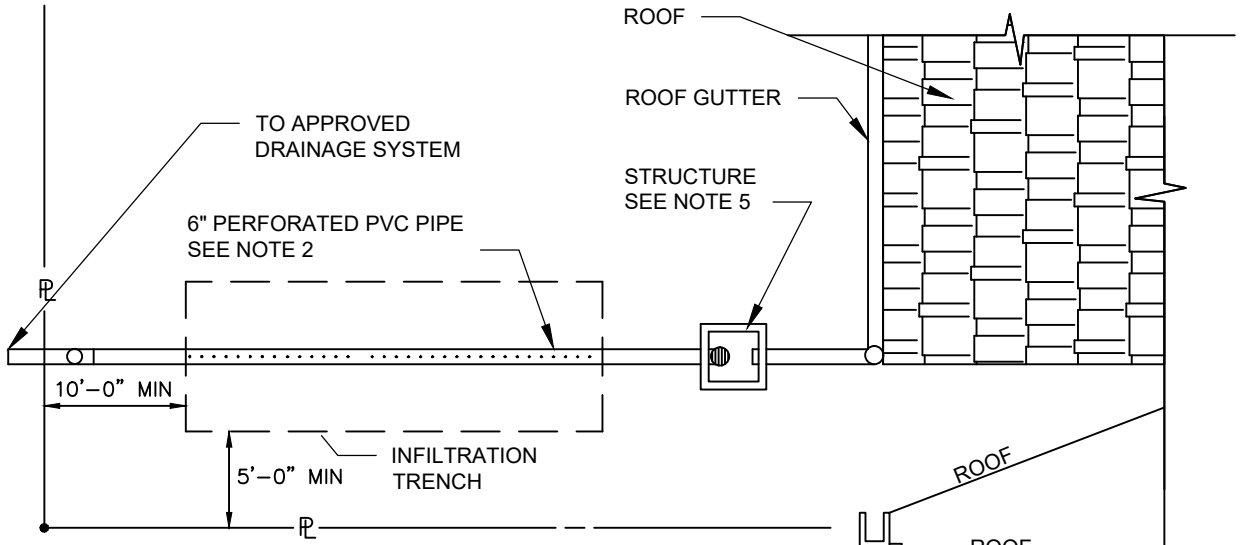
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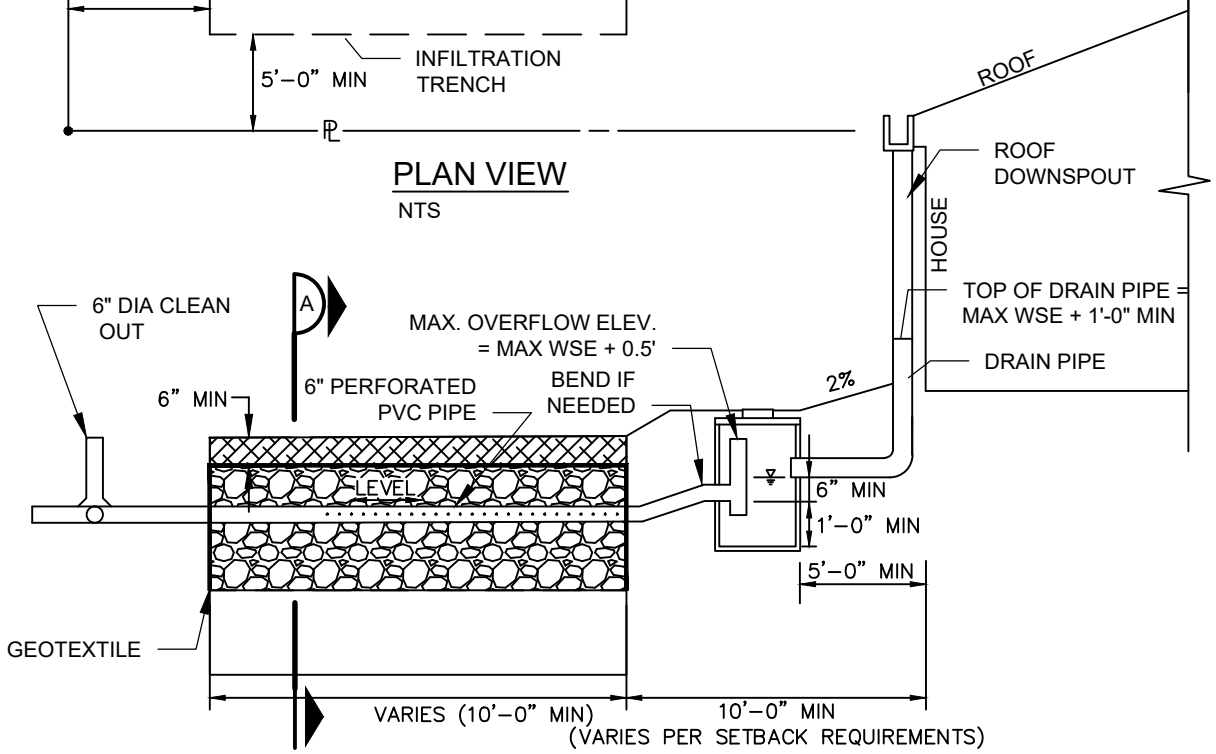
HYDRANT ACCESS AT PLANTER OR BIORETENTION

FILE NAME: SD671.DWG | DETAIL NUMBER: **671**

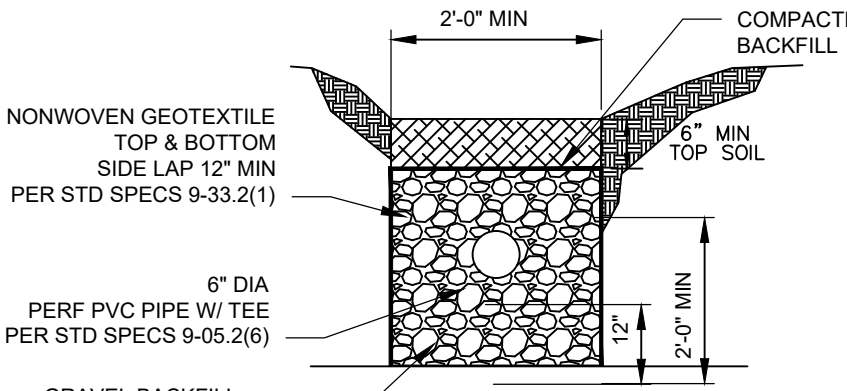
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PLAN VIEW
NTS



PROFILE VIEW
NTS



SECTION A
NTS

NOTES:

1. TRENCH SHALL NOT BE LOCATED WITHIN 100 FEET OF A WELL OR 30 FEET FROM ANY PART OF A SEPTIC SYSTEM.
2. CENTER PERFORATED PIPE HORIZONTALLY IN TRENCH.
3. REMOVE SEDIMENT AND FLOATABLES FROM TYPE 1 CATCH BASIN AT LEAST ANNUALLY
4. KEEP 5 FOOT SEPARATION BETWEEN EDGE OF TRENCH AND OTHERS UTILITIES
5. TYPE 1 CATCHBASIN IF LOCATED IN DRIVEWAY. YARD DRAIN IF LOCATED IN LANDSCAPE- 18" NDS MODEL 1882 OR EQUAL

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STANDARD DETAILS

ROOF DOWNSPOUT INFILTRATION TRENCH

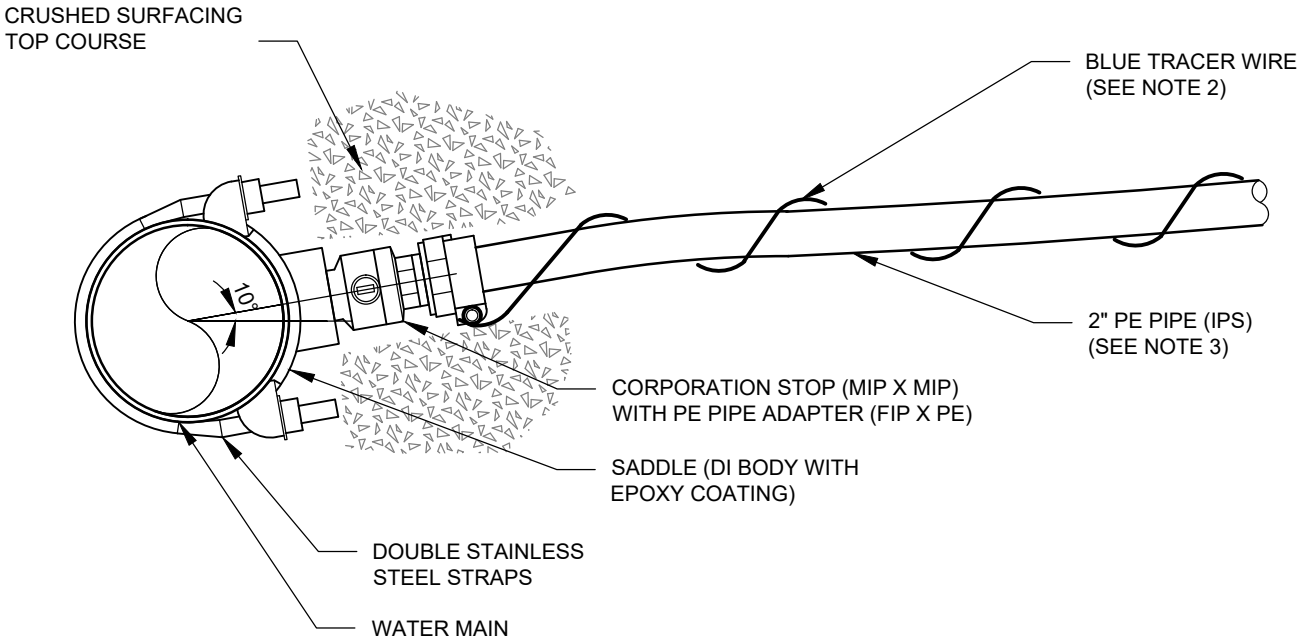
FILE NAME: SD673.DWG | DETAIL NUMBER: **673**

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SECTION 7

WATER

DocuSign Envelope ID: F681597A-CCE8-405B-ACDB-A8564C559739



SECTION

NTS

IPS = IRON PIPE SIZE
FIP = FEMALE IRON PIPE THREAD
MIP = MALE IRON PIPE THREAD

NOTES:

1. CORPORATION STOP SERVICE CONNECTIONS SHALL BE USED FOR ALL SERVICE LINES 2 INCH AND SMALLER.
2. ATTACH 12 GAUGE TRACER WIRE (BLUE) TO WATER MAIN TO MAKE ELECTRICALLY CONTINUOUS.
3. SERVICE PIPE SHALL BE BURIED IN CRUSHED SURFACING TOP COURSE.
4. DIRECT TAPPING OF WATER MAIN IS NOT ALLOWED.

Gary M. Schimek

APPROVED BY: GARY M. SCHIMEK
ENVIRONMENTAL AND UTILITY SERVICES DIVISION MANAGER

REVISION DATE: MARCH 01, 2020

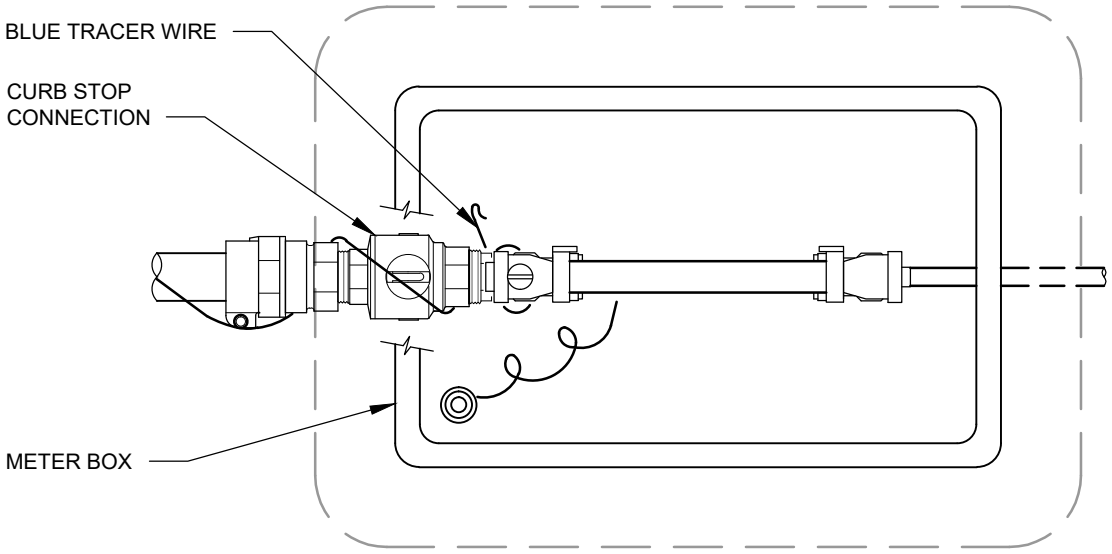
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STANDARD DETAILS

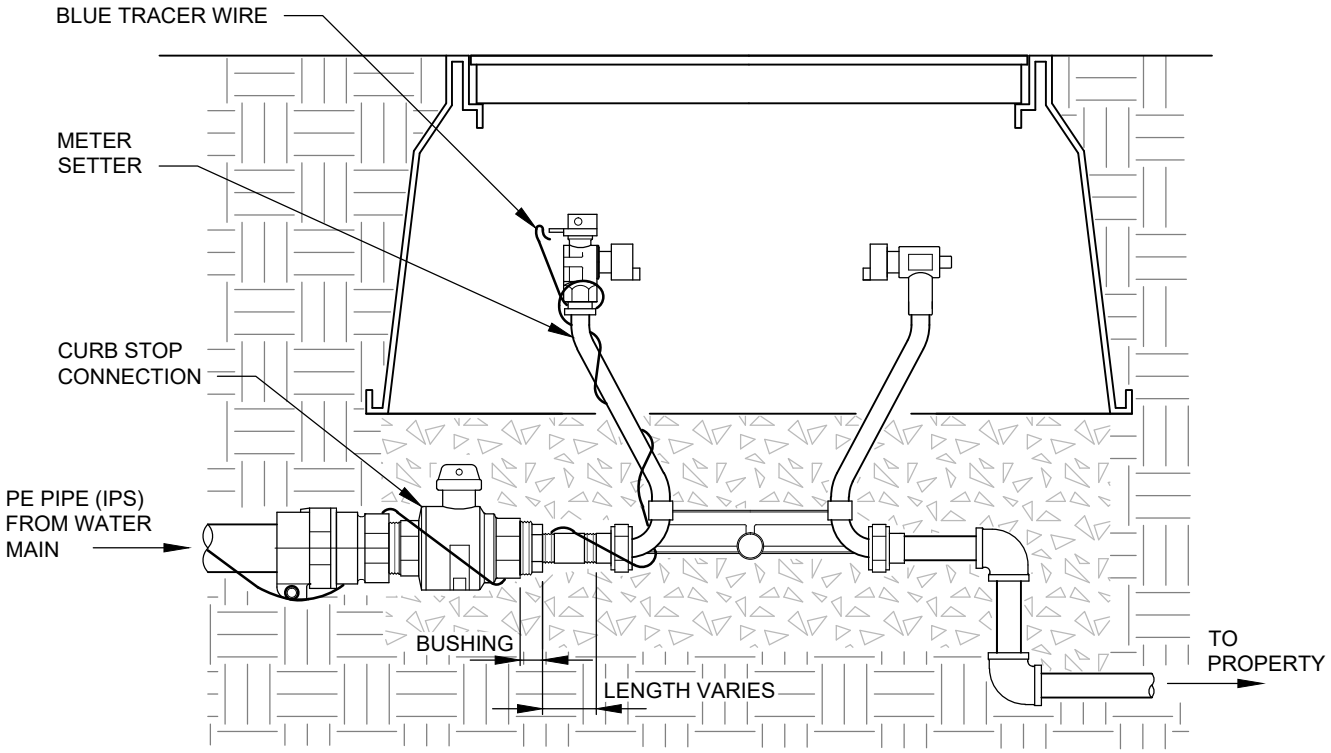
CORPORATION STOP SERVICE CONNECTION

FILE NAME: SD701A.DWG | DETAIL NUMBER: **701A**

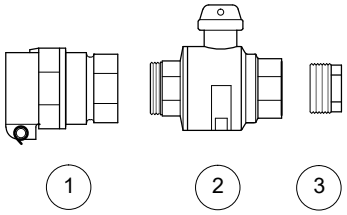
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PLAN
NTS



ELEVATION
NTS



PARTS LIST			
1	2 INCH PACK JOINT	FORD PJC-703701 C16-77 MUELLER 682558	2 INCH FIP X 2 INCH IPS
2	2 INCH BALLCORP	FORD #FB1700-7-NL MUELLER B-20276N	2 INCH MIP X 2 INCH FIP 2 INCH MIP X 2 INCH FIP
3	BUSHING		2 INCH X SETTER SIZE

Gary M. Schimek

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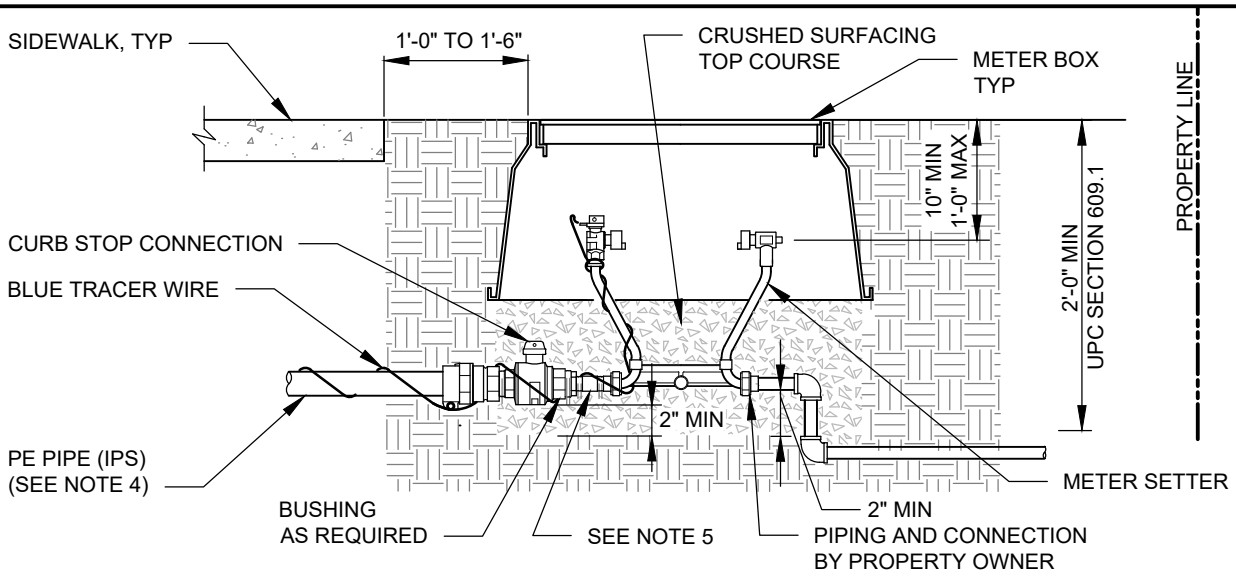
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STANDARD DETAILS

CURB STOP CONNECTION

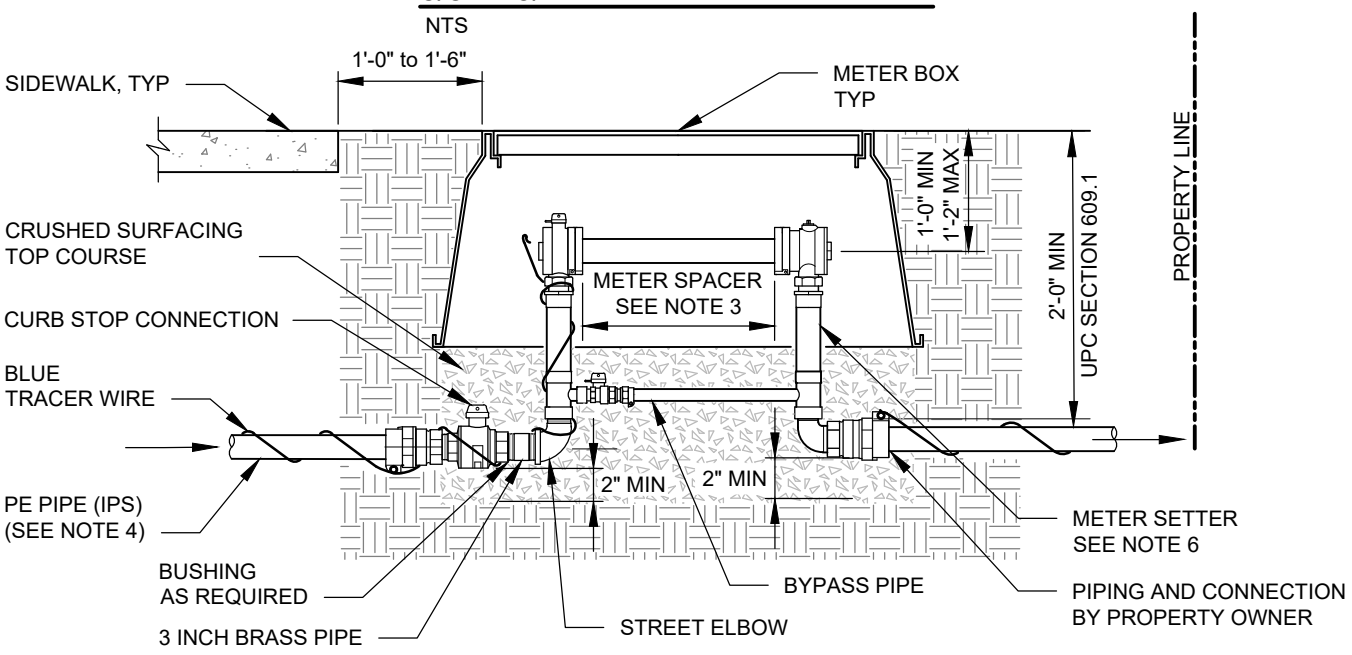
FILE NAME: SD701C.DWG | DETAIL NUMBER: **701C**

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5/8" X 3/4" AND 1" WATER METER

NTS



1- 1/2" AND 2" WATER METER

NTS

NOTES:

1. SEE STANDARD DETAIL 701A, 701C, 703, 703A, 703B AND 703C FOR ADDITIONAL DETAILS.
2. SET METER BOX FLUSH WITH SIDEWALK OR CURB ELEVATION IF LOCATED IN LAWN AREA. SET METER BOX 2 INCHES ABOVE FINISHED GRADE IF LOCATED IN NON-LAWN AREA.
3. SPACER FOR A 1- 1/2 INCH METER IS 13- 1/4 INCHES IN LENGTH. SPACER FOR A 2 INCH METER IS 17- 1/4 INCHES IN LENGTH. SPACER PROVIDED BY CONTRACTOR.
4. SERVICE CONNECTION PIPE SIZE SHALL BE 2 INCH DIAMETER.
5. FOR 5/8 INCH X 3/4 INCH OR 1 INCH METER SETTERS, INSTALL A 3 INCH LONG BRASS PIPE BETWEEN THE BUSHING AND THE METER SETTER. DIAMETER SIZE OF BRASS PIPE TO MATCH METER SETTER SIZE.
6. 1- 1/2 INCH AND 2 INCH METER SETTERS MAY BE HORIZONTAL OR VERTICAL INLETS AND OUTLETS.
7. ALL FITTINGS SHALL BE BRASS.
8. TOUCHREAD PAD HOLE TO BE DRILLED BY CITY.
9. METER SETTERS SHALL BE INSTALLED LEVEL.

Gary M. Schimek

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ENVIRONMENTAL AND UTILITY SERVICES DIVISION MANAGER

REVISION DATE: MARCH 01, 2020

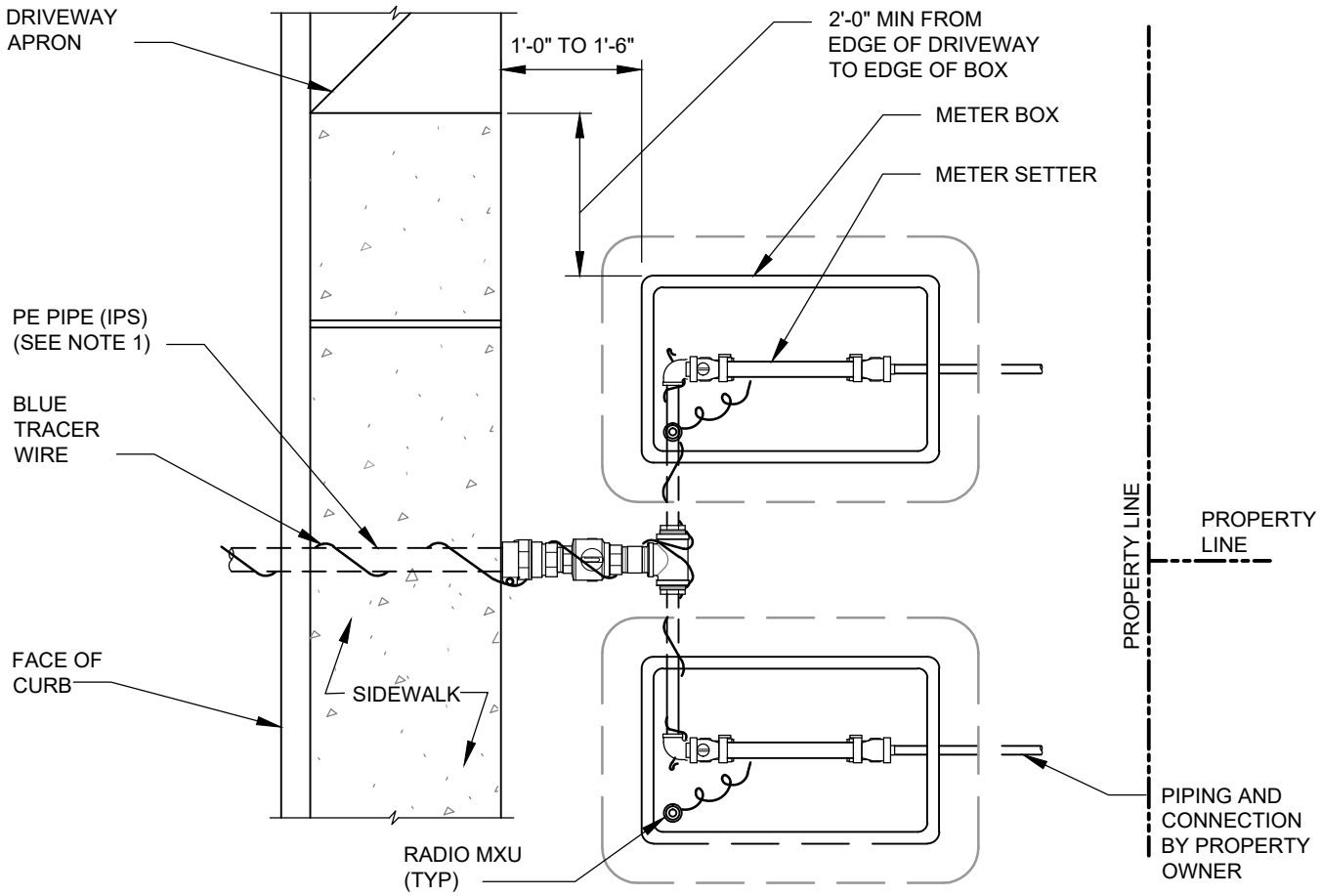
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STANDARD DETAILS

5/8" X 3/4" TO 2"
METER SETTER DETAILS

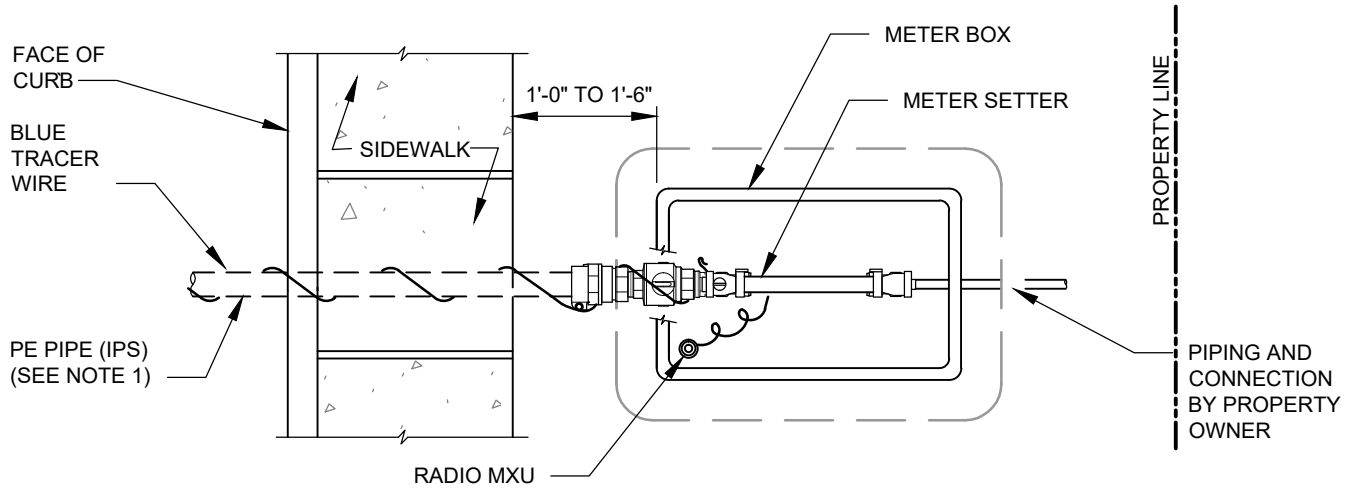
FILE NAME: SD702.DWG | DETAIL NUMBER: **702**

DocuSign Envelope ID: F681597A-CCE8-405B-ACDB-A8564C559739



DOUBLE SERVICE

NTS



SINGLE SERVICE

NTS

NOTES:

1. SERVICE CONNECTION PIPE SIZE SHALL BE 2 INCH DIAMETER.
2. SEE STANDARD DETAILS 701A, 701C, 702, 703A ,703B AND 703C FOR ADDITIONAL DETAILS.
3. SEE STANDARD DETAIL 703C FOR TYPICAL PLACEMENT IN PLANTER STRIP.
4. MINIMUM 8 FOOT CLEARANCE FROM EDGE OF METER BOX TO TREES.

Gary M. Schimek

APPROVED BY: GARY M. SCHIMEK
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REVISION DATE: MARCH 01, 2020

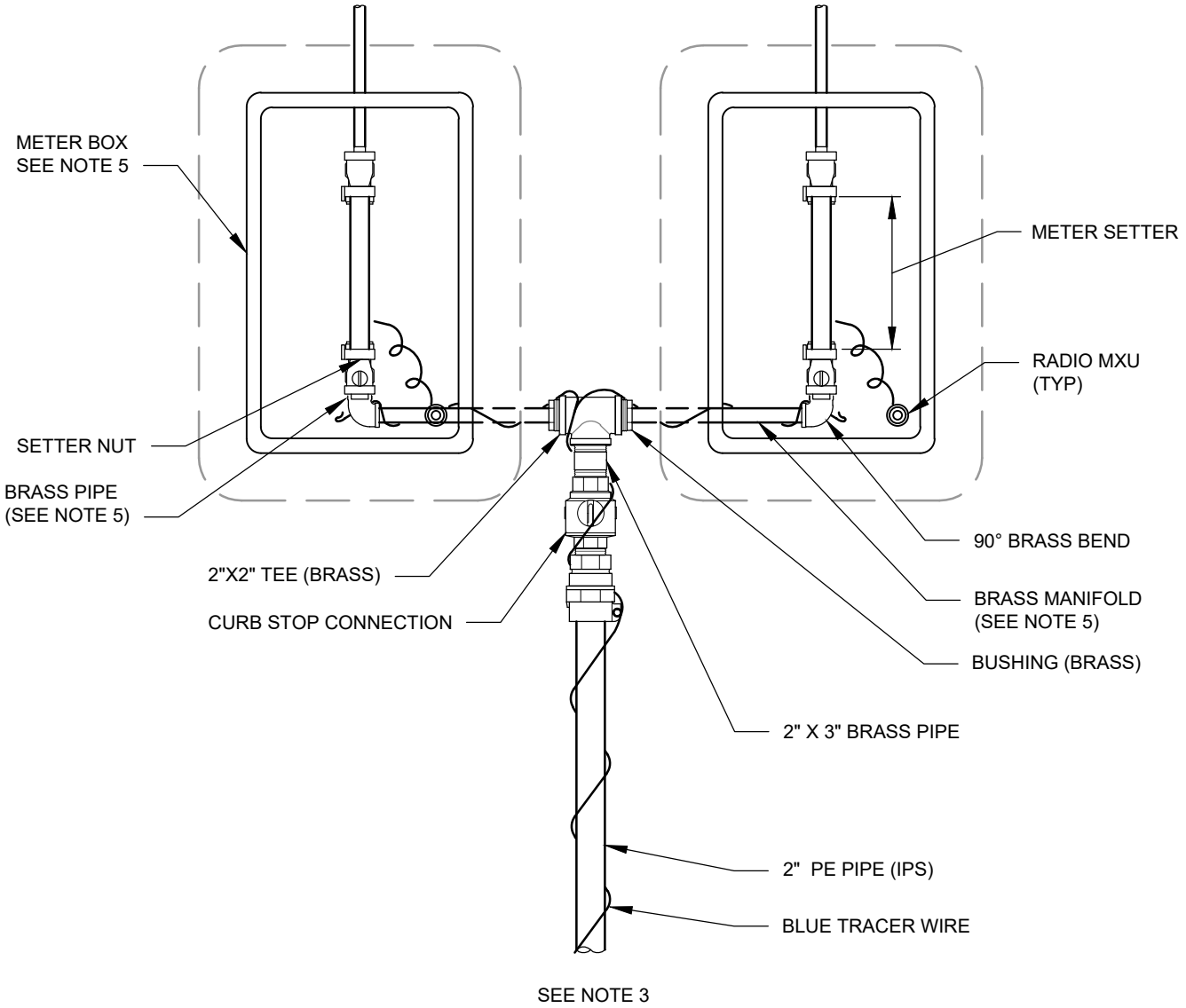
CityofRedmond WASHINGTON

STANDARD DETAILS

STANDARD METER LOCATIONS 5/8" X 3/4" TO 2" METERS

FILE NAME: SD703.DWG | DETAIL NUMBER: **703**

DocuSign Envelope ID: F681597A-CCE8-405B-ACDB-A8564C559739



PLAN

NTS

NOTES:

1. ALL METERS SHALL BE INSTALLED IN LANDSCAPE AREAS.
2. DOUBLE SERVICE MANIFOLD SHALL BE USED FOR THE FOLLOWING USES:
   A. ALL 5/8 INCH X 3/4 INCH AND 1 INCH METERS
   B. 1- 1/2 INCH SINGLE FAMILY RESIDENTIAL DUAL PURPOSE (DOMESTIC AND FIRE) METERS.
3. USE CORPORATION STOP SERVICE CONNECTION AND CURB STOP CONNECTION. SEE STANDARD DETAILS 701A AND 701C.
4. CENTER METER BOX OVER METER SETTER ASSEMBLY AS SHOWN.
5.

METER SETTER	BRASS MANIFOLD		BRASS BEND	BRASS PIPE		BOX SIZE
	DIA	LENGTH		DIA	LENGTH	
5/8" X 3/4"	3/4"	12"	3/4"	3/4"	3"	13" X 24"
1"	1"	12"	1"	1"	3"	13" X 24"
1-1/2"	1-1/2"	12"	1-1/2"	1-1/2"	3"	17" X 30"

Gary M. Schimek

APPROVED BY: GARY M. SCHIMEK
ENVIRONMENTAL AND UTILITY SERVICES DIVISION MANAGER

REVISION DATE: MARCH 01, 2020

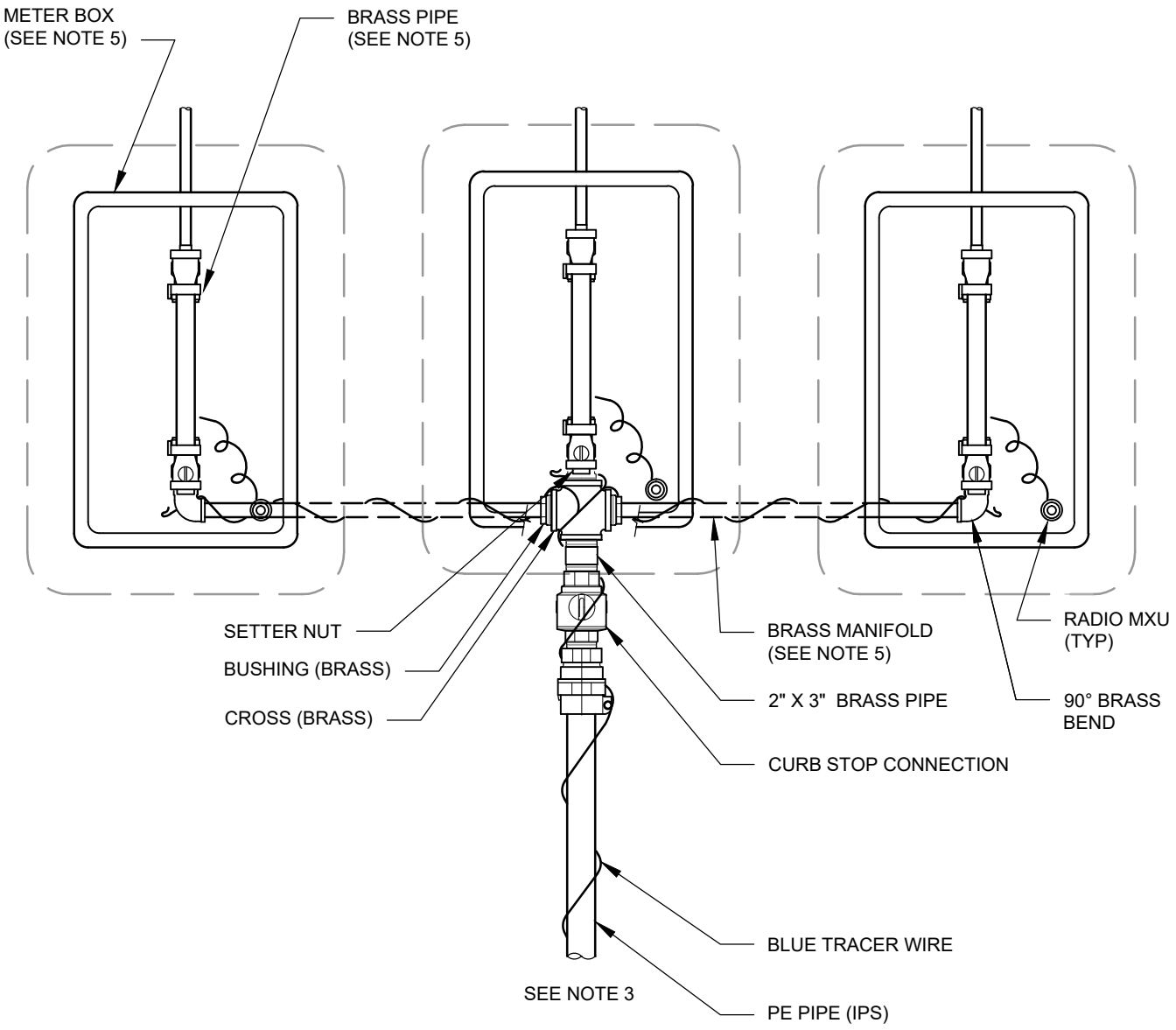
CityofRedmond WASHINGTON

STANDARD DETAILS

DOUBLE SERVICE MANIFOLD

FILE NAME: SD703A.DWG | DETAIL NUMBER: **703A**

DocuSign Envelope ID: F681597A-CCE8-405B-ACDB-A8564C559739



PLAN
NTS

NOTES:

1. ALL METERS SHALL BE INSTALLED IN LANDSCAPE AREAS.
2. TRIPLE SERVICE MANIFOLD SHALL BE USED FOR THE FOLLOWING USES:
   A. ALL 5/8 INCH X 3/4 INCH AND 1 INCH METERS
   B. 1- 1/2 INCH SINGLE FAMILY RESIDENTIAL DUAL PURPOSE (DOMESTIC AND FIRE) METERS.
3. USE CORPORATION STOP SERVICE CONNECTION AND CURB STOP CONNECTION. SEE STANDARD DETAILS 701A AND 701C.
4. CENTER METER BOX OVER METER SETTER ASSEMBLY AS SHOWN.
5.

METER SETTER	BRASS MANIFOLD		BRASS BEND	BRASS PIPE		BOX SIZE
	DIA	LENGTH		DIA	LENGTH	
5/8" X 3/4"	3/4"	24"	3/4"	3/4"	3"	13" X 24"
1"	1"	24"	1"	1"	3"	13" X 24"
1-1/2"	1-1/2"	24"	1-1/2"	1-1/2"	3"	17" X 30"

Gary M. Schimek

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ENVIRONMENTAL AND UTILITY SERVICES DIVISION MANAGER

REVISION DATE: MARCH 01, 2020

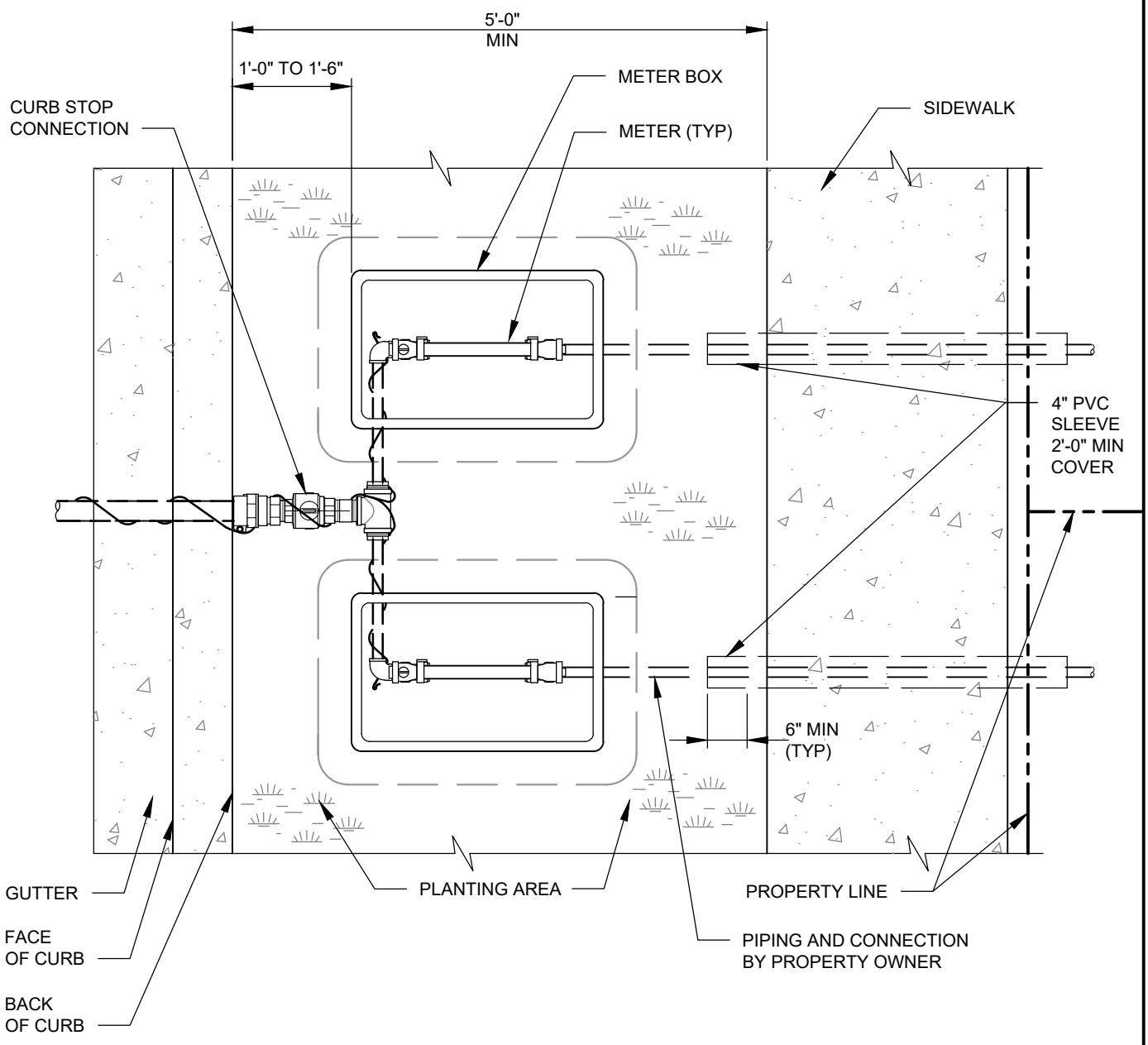
CityofRedmond
WASHINGTON

STANDARD DETAILS

TRIPLE SERVICE MANIFOLD

FILE NAME: SD703B.DWG | DETAIL NUMBER: **703B**

DocuSign Envelope ID: F681597A-CCE8-405B-ACDB-A8564C559739



METER BOXES

NTS

NOTES:

1. SERVICE CONNECTION PIPE SIZE SHALL BE 2 INCH DIAMETER.
2. SEE STANDARD DETAILS 701A, 701C, 702, 703A AND 703B FOR ADDITIONAL DETAILS.
3. MINIMUM 8 FOOT CLEARANCE FROM EDGE OF METER BOX TO TREES.

Gary M. Schimek

APPROVED BY: GARY M. SCHIMEK
ENVIRONMENTAL AND UTILITY SERVICES DIVISION MANAGER

REVISION DATE: MARCH 01, 2020

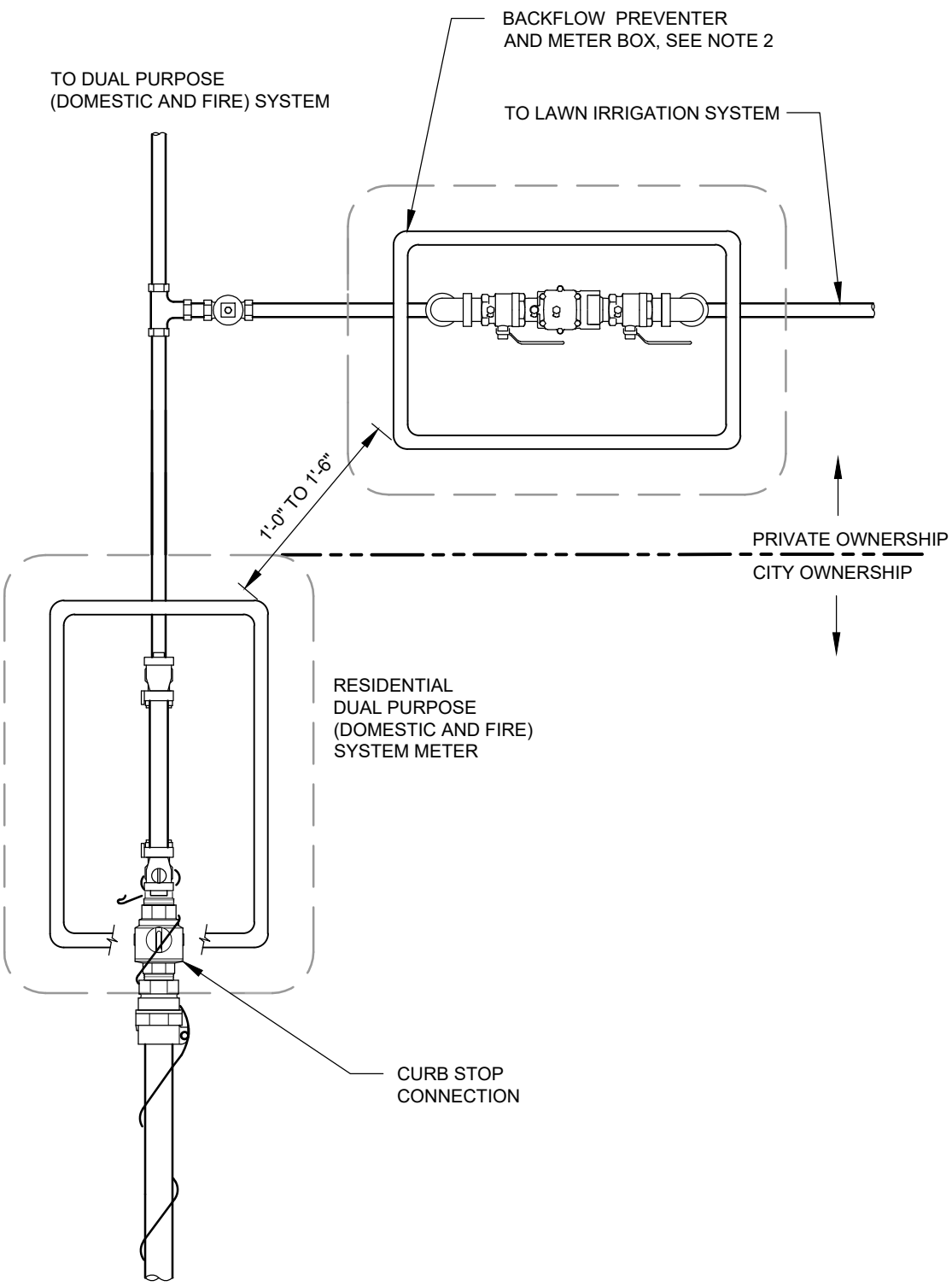
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STANDARD DETAILS

METER BOX LOCATION WITHIN PLANTING AREA

FILE NAME: SD703C.DWG | DETAIL NUMBER: **703C**

DocuSign Envelope ID: F681597A-CCE8-405B-ACDB-A8564C559739



SINGLE METER

NTS

NOTES:

1. SEE STANDARD DETAILS 701A, 701C, 702, AND 703 FOR ADDITIONAL DETAILS.
2. SEE STANDARD DETAIL 711 FOR ADDITIONAL INFORMATION ON BACKFLOW PREVENTERS (BFP).

Gary M. Schimek

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REVISION DATE: MARCH 01, 2020

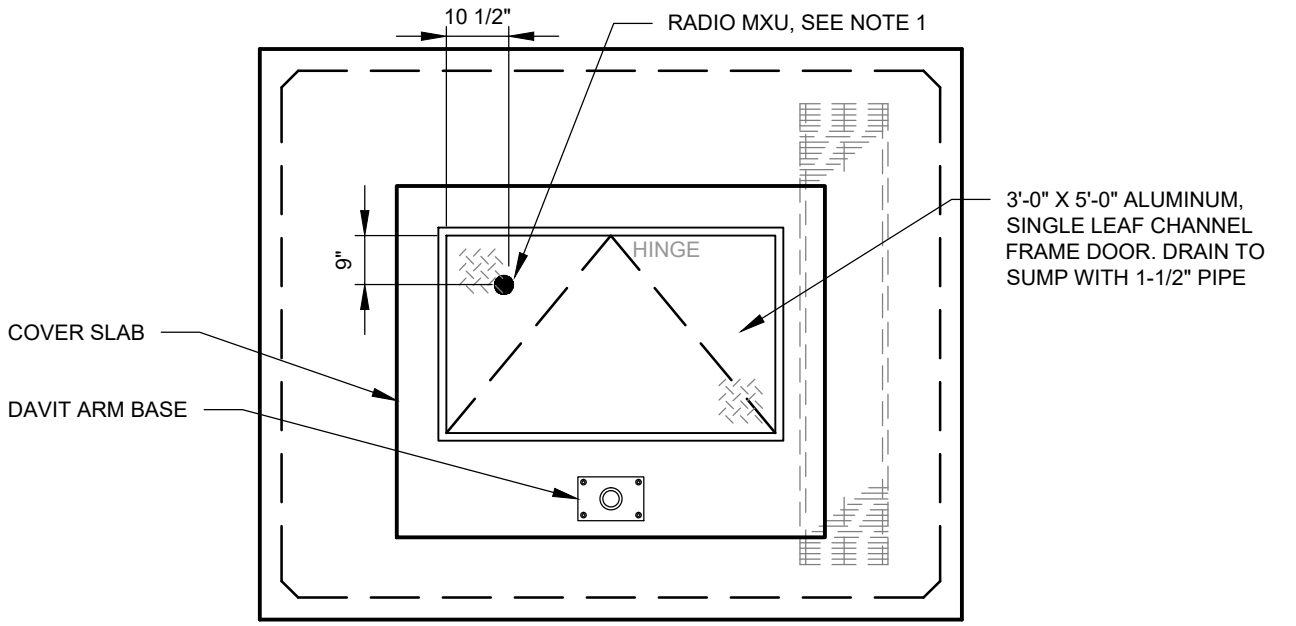
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STANDARD DETAILS

RESIDENTIAL FIRE SPRINKLER DETAILS

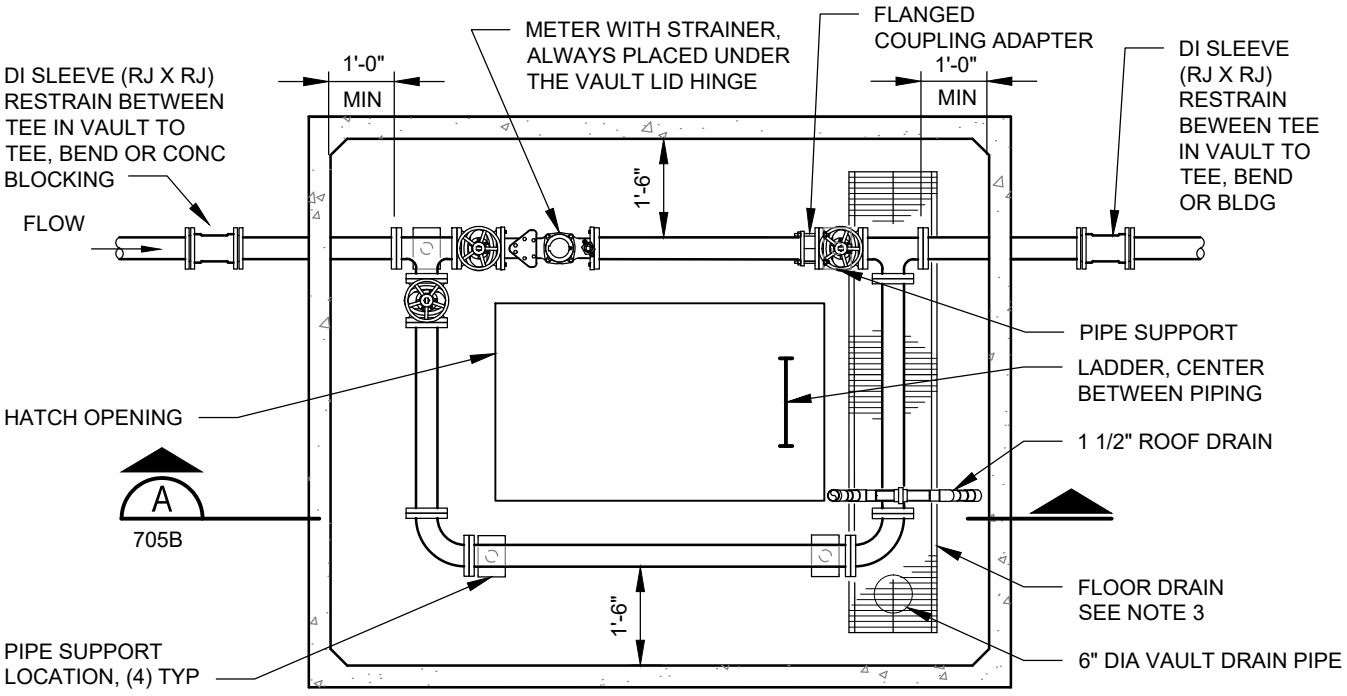
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PLAN VIEW WITH COVER SLAB

NTS



PLAN VIEW OF VAULT WITH 3 INCH METER

NTS

NOTES:

1. VAULT ACCESS HATCH SHALL BE DRILLED FOR INSTALLATION OF RADIO MXU BY THE CONTRACTOR.
2. METER SHALL BE OBTAINED BY THE CONTRACTOR FROM THE SUPPLIER AND DELIVERED TO CITY MAINTENANCE OPERATIONS CENTER FOR STORAGE UNTIL INSTALLATION. WHEN METER APPLICATION IS APPROVED FOR INSTALLATION, INCLUDING PAYMENT OF CONNECTION FEES, THE CONTRACTOR SHALL RETRIEVE AND INSTALL METER.
3. A GRAVITY VAULT DRAIN (DI) SHALL BE CONNECTED TO STORM SYSTEM AS SHOWN ON THE DRAWINGS.
4. PAINT ALL EXPOSED PIPING AND FITTINGS INSIDE VAULT, EXCEPT METER BODY.

Gary M. Schimek

APPROVED BY: GARY M. SCHIMEK
ENVIRONMENTAL AND UTILITY SERVICES DIVISION MANAGER

REVISION DATE: MARCH 01, 2019

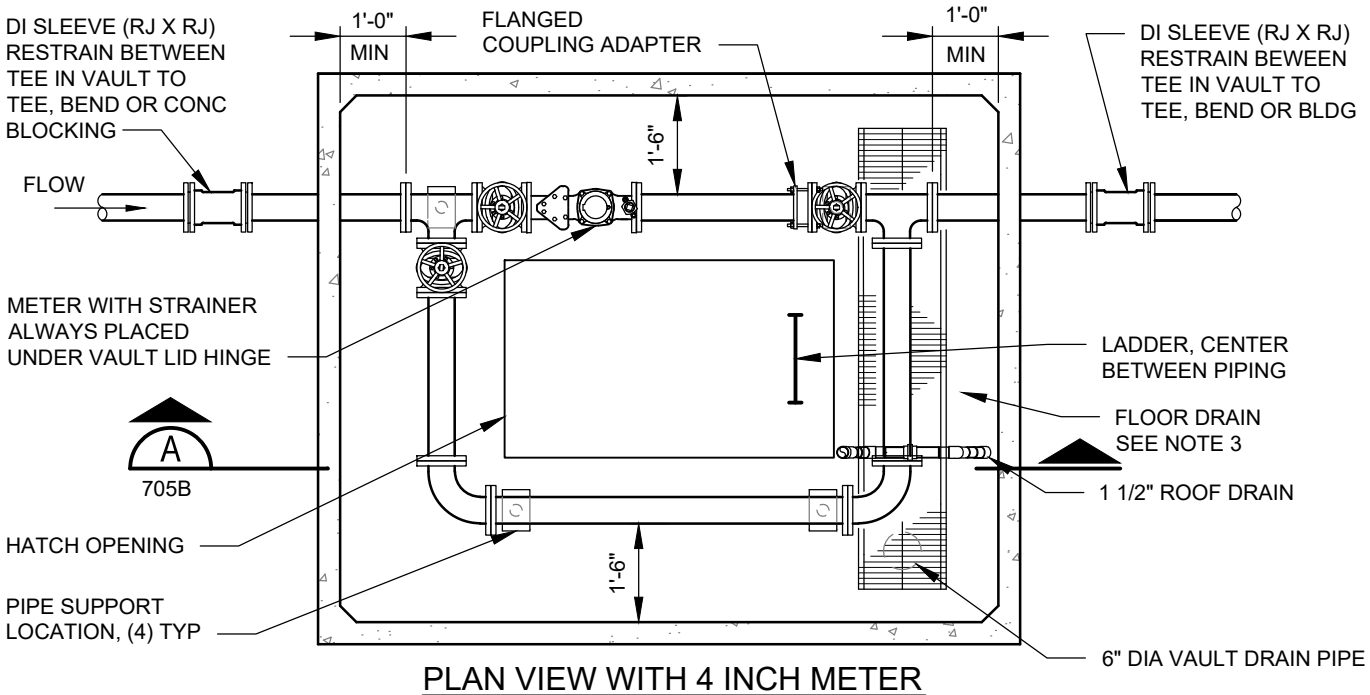
CityofRedmond WASHINGTON

STANDARD DETAILS

WATER METER VAULT WITH 3 INCH METER

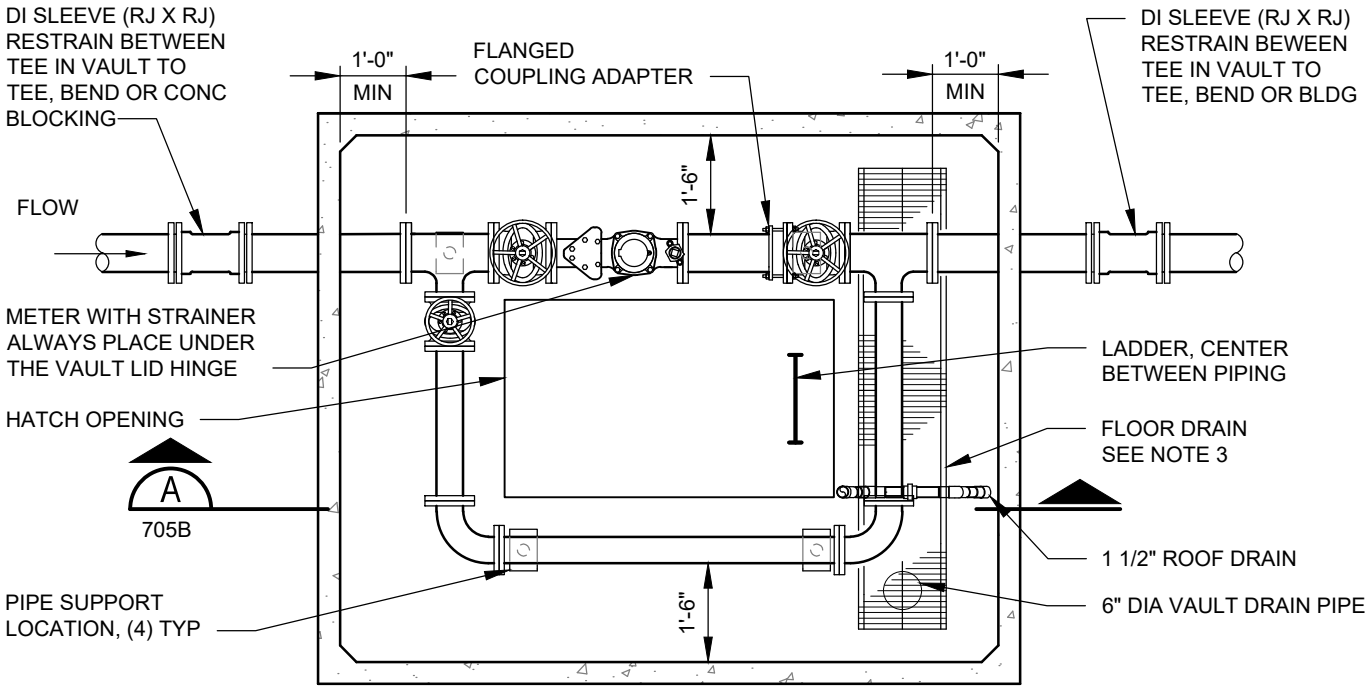
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DocuSign Envelope ID: F681597A-CCE8-405B-ACDB-A8564C559739



PLAN VIEW WITH 4 INCH METER

NTS



PLAN VIEW WITH 6 INCH METER

NTS

NOTES:

1. VAULT ACCESS HATCH SHALL BE DRILLED FOR INSTALLATION OF RADIO MXU BY CONTRACTOR.
2. METER SHALL BE OBTAINED BY THE CONTRACTOR FROM THE SUPPLIER AND DELIVERED TO CITY MAINTENANCE OPERATIONS CENTER FOR STORAGE UNTIL INSTALLATION. WHEN METER APPLICATION IS APPROVED FOR INSTALLATION, INCLUDING PAYMENT OF CONNECTION FEES, THE CONTRACTOR SHALL RETRIEVE AND INSTALL METER.
3. A GRAVITY VAULT DRAIN (DI) SHALL BE CONNECTED TO STORM SYSTEM AS SHOWN ON THE DRAWINGS.
4. PAINT ALL EXPOSED PIPING AND FITTINGS INSIDE VAULT, EXCEPT METER BODY.

Gary M. Schimek

APPROVED BY: GARY M. SCHIMEK
ENVIRONMENTAL AND UTILITY SERVICES DIVISION MANAGER

REVISION DATE: MARCH 01, 2019

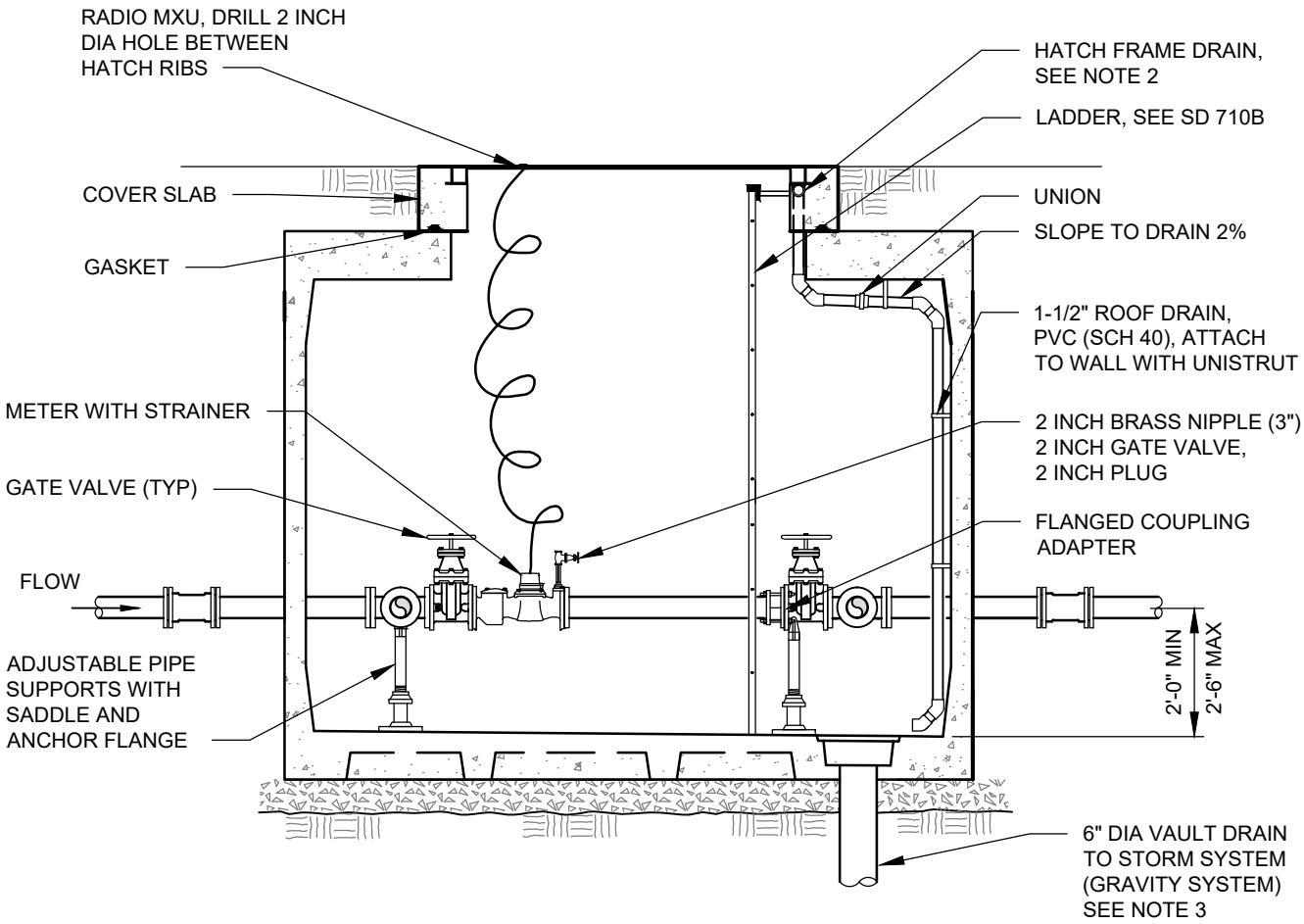
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STANDARD DETAILS

WATER METER VAULTS WITH 4 AND 6 INCH METERS

FILE NAME: SD705A.DWG | DETAIL NUMBER: **705A**

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TYPICAL SECTION OF EQUIPMENT FOR METER VAULT

NTS

VAULT, FITTINGS AND PIPING SIZING REQUIREMENTS						UTILITY VAULT NO. *
METER SIZE	BYPASS VALVES AND PIPING	BYPASS TEE (FL X FL)	MIN INSIDE VAULT DIM LEN	WIDTH	HT	
3"	3"	3" X 3"	10 FT	6 FT	6 FT	810 - LA
4"	4"	4" X 4"	10 FT	6 FT	6 FT	810 - LA
6"	4"	6" X 4"	10 FT	6 FT	6 FT	810 - LA

* OR APPROVED EQUAL

NOTES:

1. SET COVER SLAB FLUSH WITH SIDEWALK OR CURB ELEVATION IF LOCATED IN LAWN AREA. SET COVER SLAB APPROXIMATELY 2 INCHES ABOVE FINISHED GRADE IF LOCATED IN LANDSCAPING AREA.

2. HATCH FRAME DRAIN CAST IN CONCRETE SHALL BE 1 -1/2 INCH BRASS. REMAINDER OF HATCH FRAME DRAIN SHALL BE 1 - 1/2 INCH SCH 40 PVC IN VAULT. USE 45 DEGREE BENDS WHERE POSSIBLE AND PROVIDE UNIONS TO ALLOW DISASSEMBLY OF PIPING. ATTACH TO VAULT WITH STAINLESS STEEL HARDWARE ON UNISTRUT.

3. VAULT SHALL DRAIN BY GRAVITY TO STORM SYSTEM WHENEVER POSSIBLE. IF GRAVITY CAN NOT BE ACHIEVED, CITY MAY ALLOW THE USE OF A SUMP PUMP (STANDARD SPEC 7-20.3). THE VAULT SHALL BE DESIGNED WITH AN INTEGRATED SUMP. SHOP DRAWINGS FOR THE VAULT WITH SUMP SHALL BE APPROVED PRIOR TO INSTALLATION (STANDARD DETAILS 705C, 705D).

Gary M. Schimek

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ENVIRONMENTAL AND UTILITY SERVICES DIVISION MANAGER

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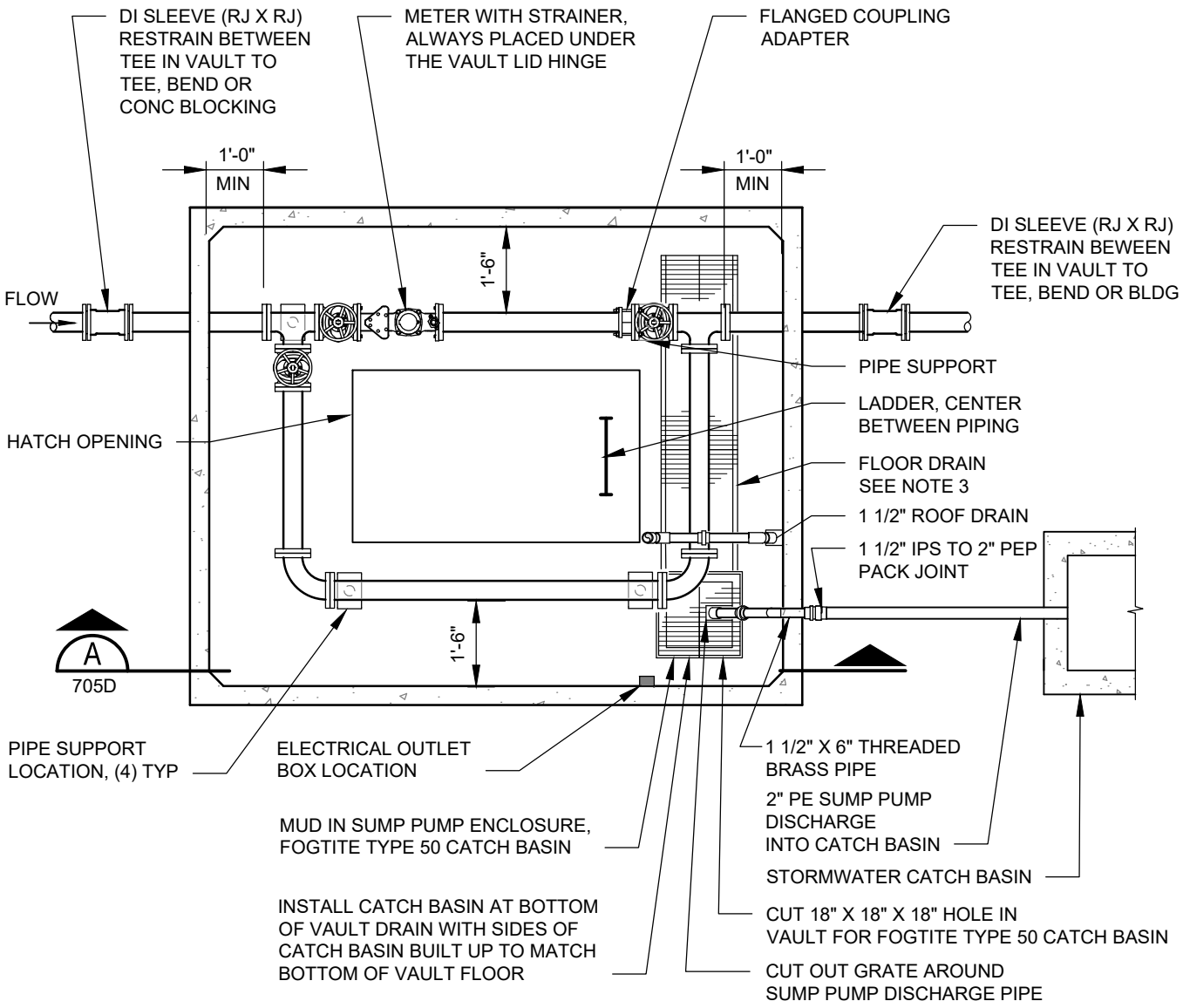
CityofRedmond WASHINGTON

STANDARD DETAILS

WATER METER VAULT SECTION WITH 3 INCH METER

FILE NAME: SD705B.DWG | DETAIL NUMBER: **705B**

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PLAN VIEW OF VAULT WITH SUMP PUMP

NTS

NOTES:

1. VAULT ACCESS HATCH SHALL BE DRILLED FOR INSTALLATION OF RADIO MXU BY THE CONTRACTOR.
2. METER SHALL BE OBTAINED BY THE CONTRACTOR FROM THE SUPPLIER AND DELIVERED TO CITY MAINTENANCE OPERATIONS CENTER FOR STORAGE UNTIL INSTALLATION. WHEN METER APPLICATION IS APPROVED FOR INSTALLATION, INCLUDING PAYMENT OF CONNECTION FEES, THE CONTRACTOR SHALL RETRIEVE AND INSTALL METER.
3. SUMP PUMP DISCHARGE PIPE SHALL BE CONNECTED TO STORM SYSTEM AS SHOWN ON THE DRAWINGS.
4. PAINT ALL EXPOSED PIPING AND FITTINGS INSIDE VAULT, EXCEPT METER BODY.
5. REFER TO PLAN VIEW WITH COVER SLAB, STANDARD DETAIL 705, FOR ADDITIONAL INFORMATION.

Gary M. Schimek

APPROVED BY: GARY M. SCHIMEK
ENVIRONMENTAL AND UTILITY SERVICES DIVISION MANAGER

REVISION DATE: MARCH 01, 2020

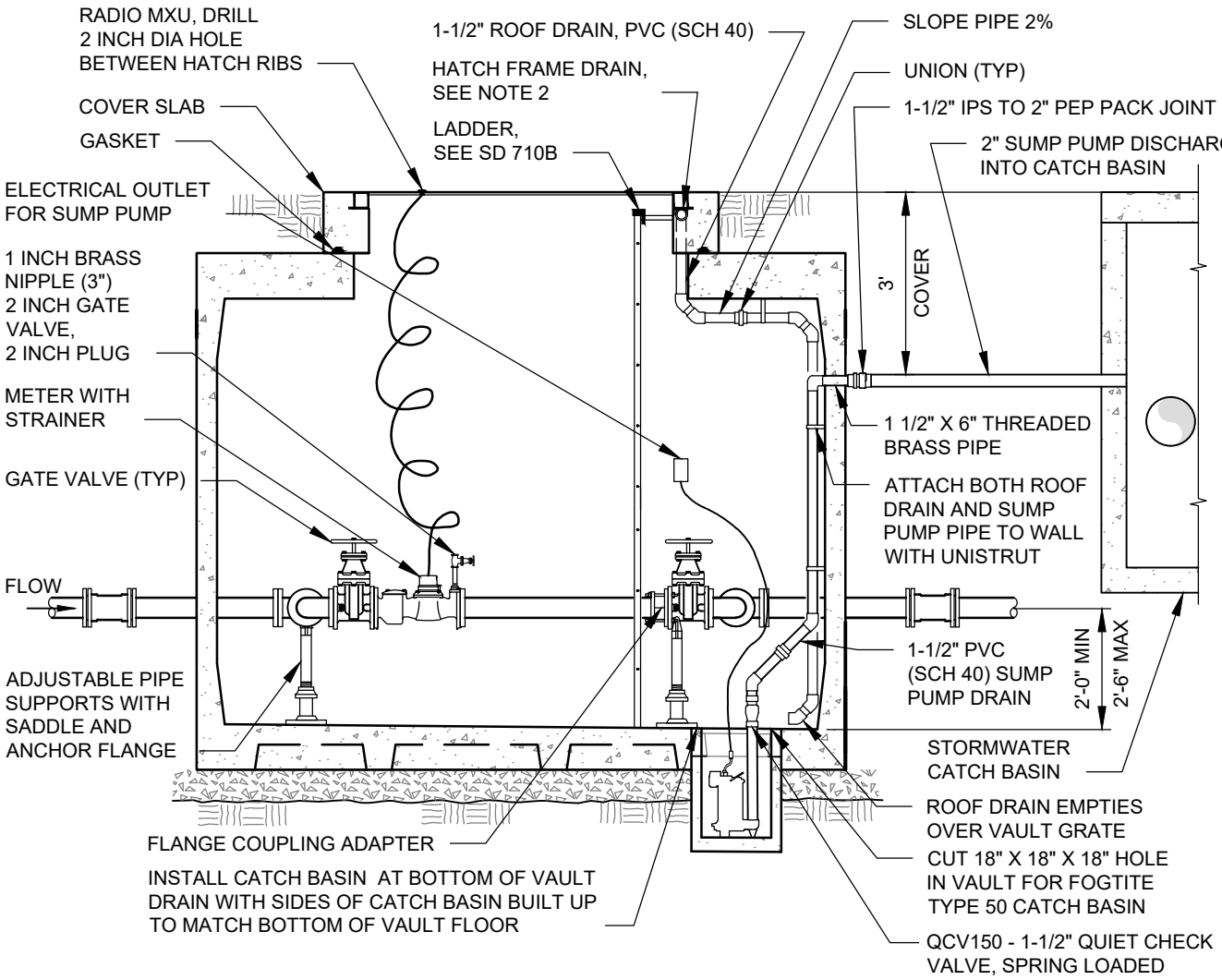
CityofRedmond WASHINGTON

STANDARD DETAILS

WATER METER VAULT PLAN VIEW WITH SUMP PUMP

FILE NAME: SD705C.DWG | DETAIL NUMBER: **705C**

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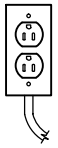


SECTION VIEW OF VAULT WITH SUMP PUMP

NTS

NOTES:

1. SET COVER SLAB FLUSH WITH SIDEWALK OR CURB ELEVATION IF LOCATED IN LAWN AREA. SET COVER SLAB APPROXIMATELY 2 INCHES ABOVE FINISHED GRADE IF LOCATED IN LANDSCAPING AREA.
2. HATCH FRAME DRAIN CAST IN CONCRETE SHALL BE 1-1/2 INCH BRASS. REMAINDER OF HATCH FRAME DRAIN AND SUMP PUMP DRAIN SHALL BE 1-1/2 INCH SCH 40 PVC IN VAULT. USE 45 DEGREE BENDS WHERE POSSIBLE AND PROVIDE UNIONS TO ALLOW DISASSEMBLY OF PIPING. ATTACH TO VAULT WITH STAINLESS STEEL HARDWARE ON UNISTRUT.
3. INSTALLATION OF A SUMP PUMP AND ASSOCIATED ELECTRICAL WIRING REQUIRES AN ELECTRICAL PERMIT.
4. OUTLET BOX LOCATION SHALL BE SHOWN ON THE CONSTRUCTION DRAWINGS AND CONFIRMED WITH THE CITY INSPECTOR PRIOR TO INSTALLATION IN THE VAULT.
5. ELECTRICAL SUPPLY FROM BREAKER TO OUTLET BOX SHALL BE INSTALLED IN PGRS CONDUIT. LOCATION OF CONDUIT IN VAULT SHALL BE SHOWN ON CONSTRUCTION DRAWING. CONDUIT SHALL BE ATTACHED TO VAULT WALL USING UNISTRUT.
6. BREAKER BOX LOCATION AND BREAKER # FOR THE ELECTRICAL SUPPLY TO THE SUMP PUMP SHALL BE IDENTIFIED AND SHOWN ON THE CONSTRUCTION DRAWING.
7. INSTALL A 4 INCH X 6 INCH PHENOLIC PLASTIC SIGN ADJACENT TO THE ELECTRICAL OUTLET. SIGN SHALL BE 1/16 INCH THICK MACHINE ENGRAVED LAMINATED PHENOLIC HAVING BLACK LETTERS, NOT LESS THAN 1/2 INCH HIGH ON YELLOW BACKGROUND. EDGES OF SIGN SHALL BE BEVELED. SIGN SHALL IDENTIFY BREAKER LOCATION.



BREAKER # LOCATED IN BLDG # ADDRESS

SIGN TO BE PLACED NEXT TO OUTLET BOX

Gary M. Schimek

APPROVED BY: GARY M. SCHIMEK
ENVIRONMENTAL AND UTILITY SERVICES DIVISION MANAGER

REVISION DATE: MARCH 01, 2020

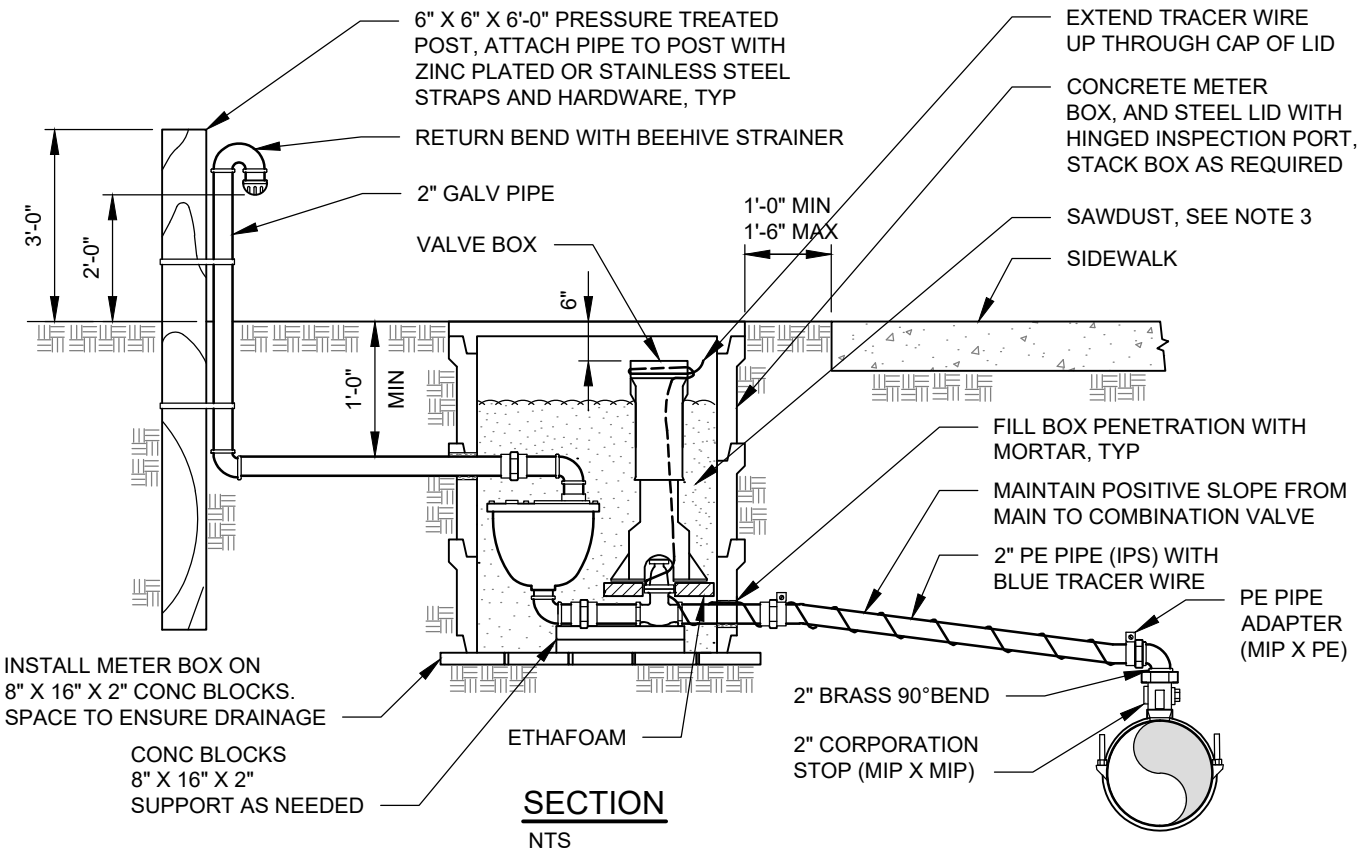
CityofRedmond WASHINGTON

STANDARD DETAILS

WATER METER VAULT SECTION VIEW (SUMP PUMP)

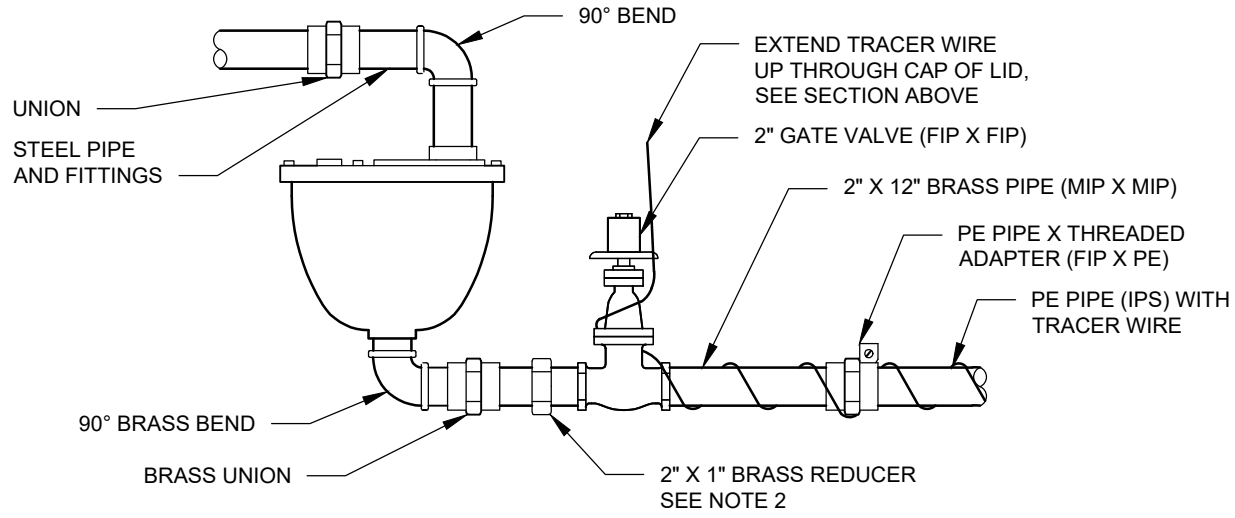
FILE NAME: SD705C.DWG | DETAIL NUMBER: **705D**

DocuSign Envelope ID: F681597A-CCE8-405B-ACDB-A8564C559739



SECTION

NTS



VALVE ASSEMBLY DETAIL

NTS

NOTES:

1. COMBINATION AIR RELEASE AND VACUUM VALVE SHALL BE A 2 INCH SIZE MINIMUM - UNLESS OTHERWISE SHOWN ON THE CONSTRUCTION DRAWINGS.
2. FOR 1 INCH COMBINATION VALVE, INSTALL 2 INCH X 1 INCH REDUCER BETWEEN GATE VALVE AND UNION.
3. FILL METER BOX WITH SAWDUST AFTER TESTING AND INSPECTION.
4. INSTALL STANDARD MARKER POST IDENTIFYING VALVE LOCATION (NOT SHOWN).
5. SET METER BOX FLUSH WITH SIDEWALK OR CURB ELEVATION IF LOCATED IN LAWN AREA. SET METER BOX APPROXIMATELY 2 INCHES ABOVE FINISHED GRADE IF IN LANDSCAPED AREA.

Gary M. Schimek

APPROVED BY: GARY M. SCHIMEK
ENVIRONMENTAL AND UTILITY SERVICES DIVISION MANAGER

REVISION DATE: MARCH 01, 2019

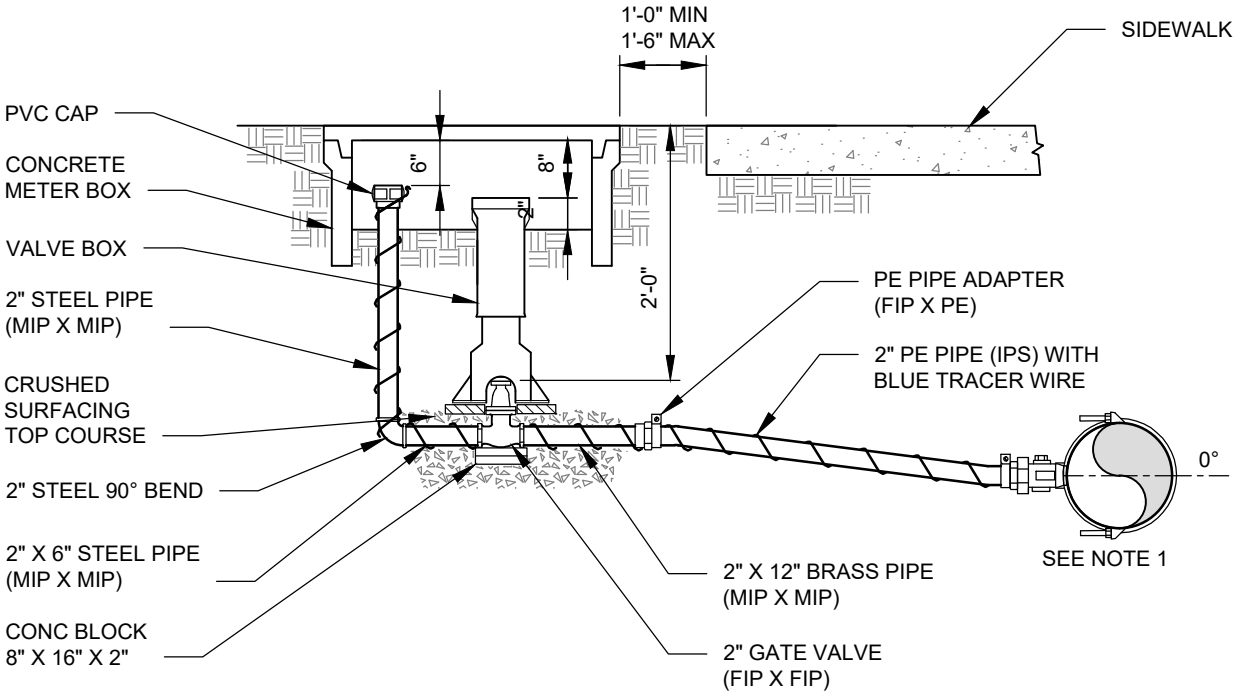
CityofRedmond WASHINGTON

STANDARD DETAILS

COMBINATION AIR RELEASE AND VACUUM VALVE ASSEMBLY

FILE NAME: SD706.DWG | DETAIL NUMBER: **706**

DocuSign Envelope ID: F681597A-CCE8-405B-ACDB-A8564C559739



SECTION

NTS

NOTES:

1. SEE STANDARD DETAIL 701A FOR CONNECTION TO MAIN.
2. SET METER BOX FLUSH WITH SIDEWALK OR CURB ELEVATION IF LOCATED IN LAWN AREA. SET METER BOX APPROXIMATELY 2 INCHES ABOVE FINISHED GRADE IF IN LANDSCAPING AREA.
3. INSTALL STANDARD MARKER POST IDENTIFYING BLOW-OFF LOCATION. (NOT SHOWN)
4. ANY ADDITIONAL FITTINGS FROM THE GATE VALVE TO THE MAIN SHALL BE BRASS.

Gary M. Schimek

APPROVED BY: GARY M. SCHIMEK
ENVIRONMENTAL AND UTILITY SERVICES DIVISION MANAGER

REVISION DATE: MARCH 01, 2020

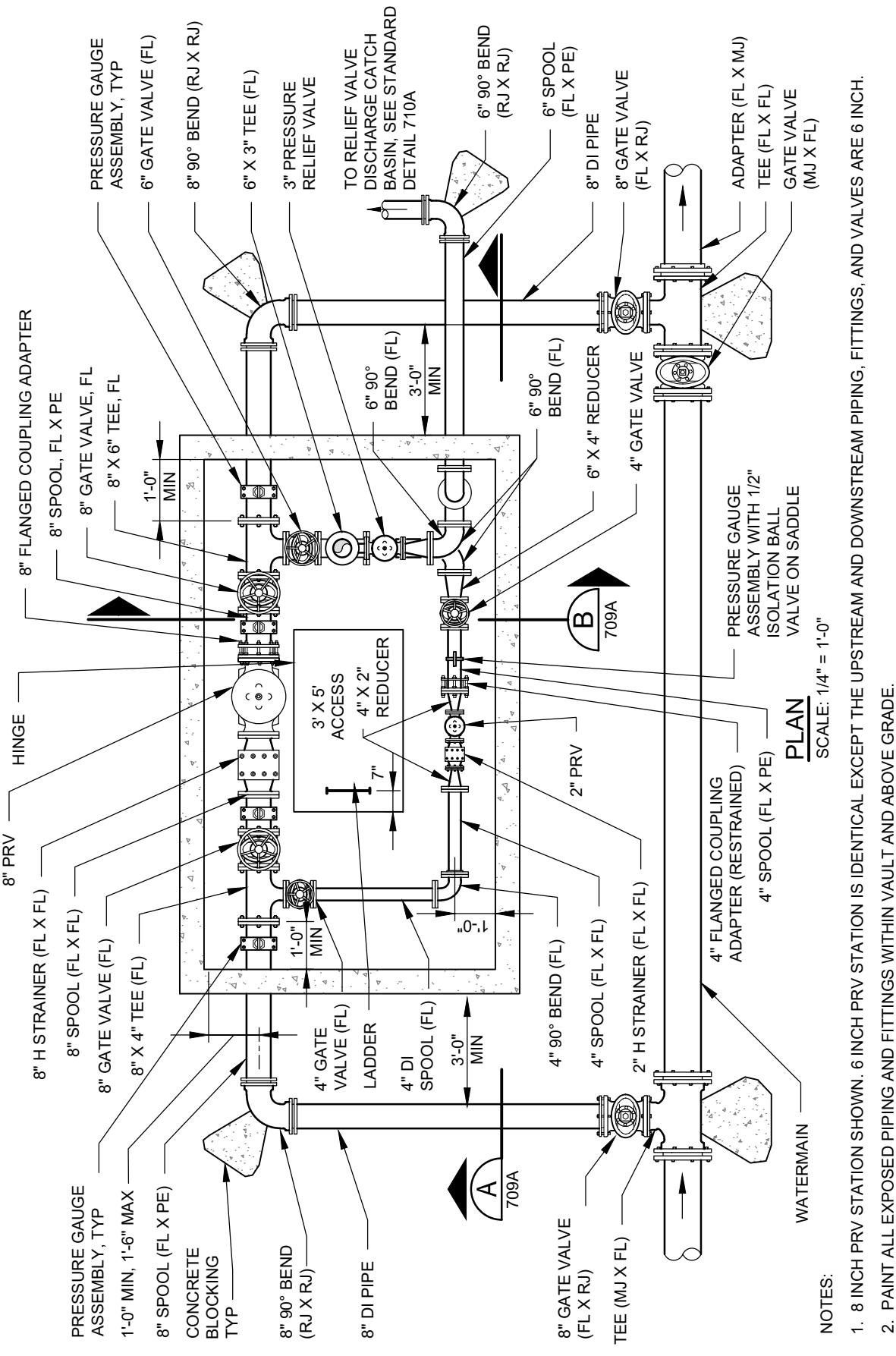
CityofRedmond WASHINGTON

STANDARD DETAILS

BLOW-OFF ASSEMBLY

FILE NAME: SD707.DWG | DETAIL NUMBER: **707**

DocuSign Envelope ID: F681597A-CCE8-405B-ACDB-A8564C559739



NOTES:

1. 8 INCH PRV STATION SHOWN. 6 INCH PRV STATION IS IDENTICAL EXCEPT THE UPSTREAM AND DOWNSTREAM PIPING, FITTINGS, AND VALVES ARE 6 INCH.
2. PAINT ALL EXPOSED PIPING AND FITTINGS WITHIN VAULT AND ABOVE GRADE.
3. ALL VALVES INSIDE VAULT TO HAVE HAND WHEEL OPERATORS.
4. PRV PILOT SYSTEM TO BE INSTALLED FACING INTERIOR OF VAULT.
5. VAULT SHALL HAVE MINIMUM INSIDE DIMENSIONS OF 14 FOOT IN LENGTH, 8 FOOT IN WIDTH, AND 8 FOOT IN HEIGHT.
6. SHOP DRAWINGS MUST BE APPROVED PRIOR TO VAULT INSTALLATION AND PIPE ASSEMBLY.

Gary M. Schimek

APPROVED BY: GARY M. SCHIMEK
ENVIRONMENTAL AND UTILITY SERVICES DIVISION MANAGER

REVISION DATE: MARCH 01, 2019

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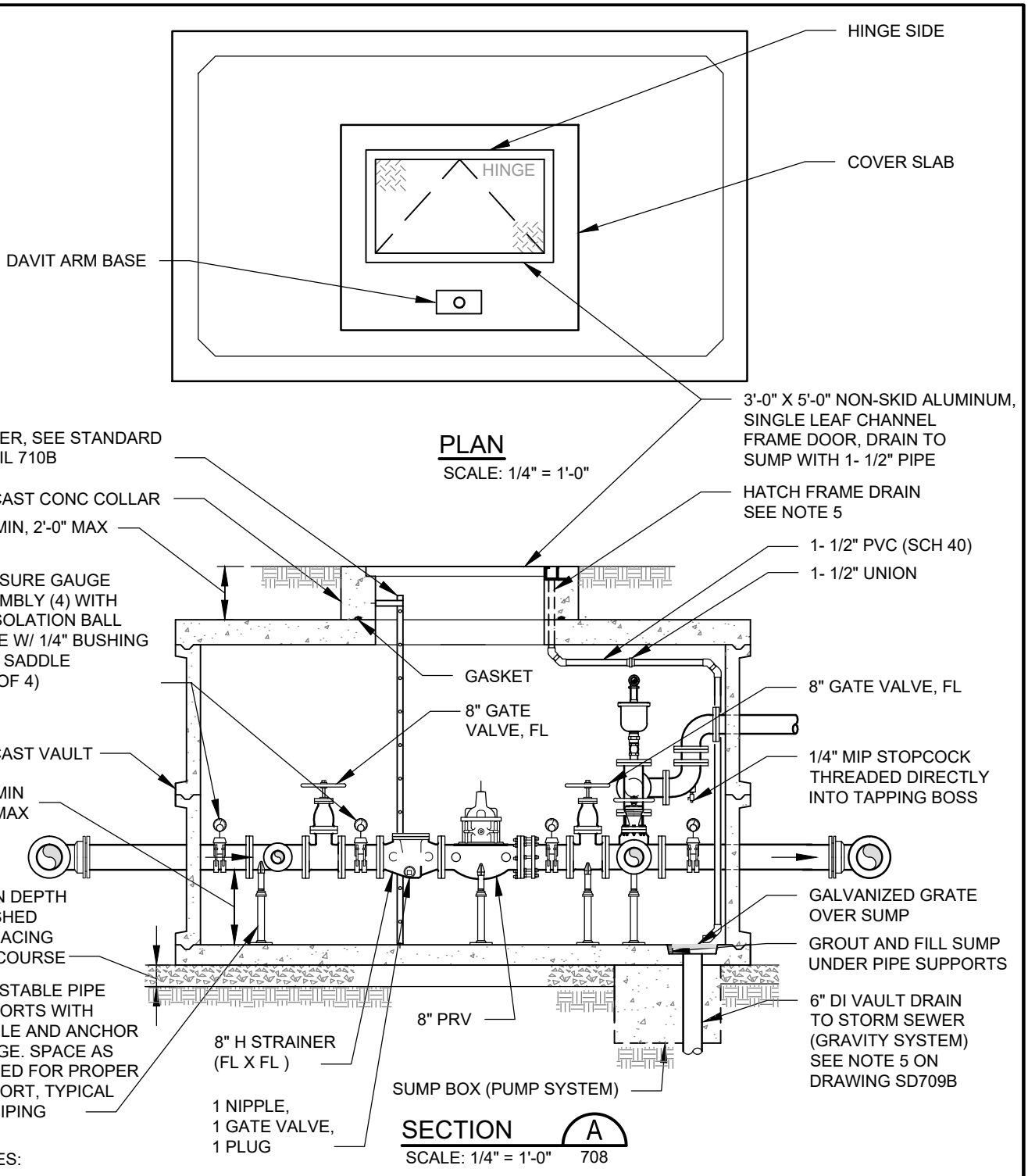
STANDARD DETAILS

6" AND 8" PRV STATION PLAN

FILE NAME: SD708.DWG

DETAIL NUMBER: **708**

DocuSign Envelope ID: F681597A-CCE8-405B-ACDB-A8564C559739



NOTES:

1. 8 INCH PRV STATION SHOWN. 6 INCH PRV STATION IS IDENTICAL EXCEPT THAT THE UPSTREAM AND DOWNSTREAM PIPING, FITTINGS, AND VALVES ARE 6 INCHES.
2. PAINT ALL EXPOSED PIPING AND FITTINGS WITHIN VAULT AND ABOVE GRADE.
3. ALL VALVES WITHIN VAULT TO HAVE HAND WHEEL OPERATORS.
4. SET COVER SLAB FLUSH WITH SIDEWALK OR CURB ELEVATION IF LOCATED IN LAWN AREA. SET COVER SLAB APPROXIMATELY 2 INCHES ABOVE FINISHED GRADE IF LOCATED IN LANDSCAPING AREA.
5. HATCH FRAME DRAIN CAST IN CONCRETE SHALL BE 1- 1/2 INCH BRASS. REMAINDER OF HATCH FRAME DRAIN SHALL BE 1-1/2 INCH SCH 40 PVC IN VAULT. USE 45° BENDS WHERE POSSIBLE AND PROVIDE UNIONS TO ALLOW DISASSEMBLY OF PIPING. ATTACH TO VAULT WITH STAINLESS STEEL HARDWARE.

Gary M. Schimek

APPROVED BY: GARY M. SCHIMEK
ENVIRONMENTAL AND UTILITY SERVICES DIVISION MANAGER

REVISION DATE: MARCH 01, 2019

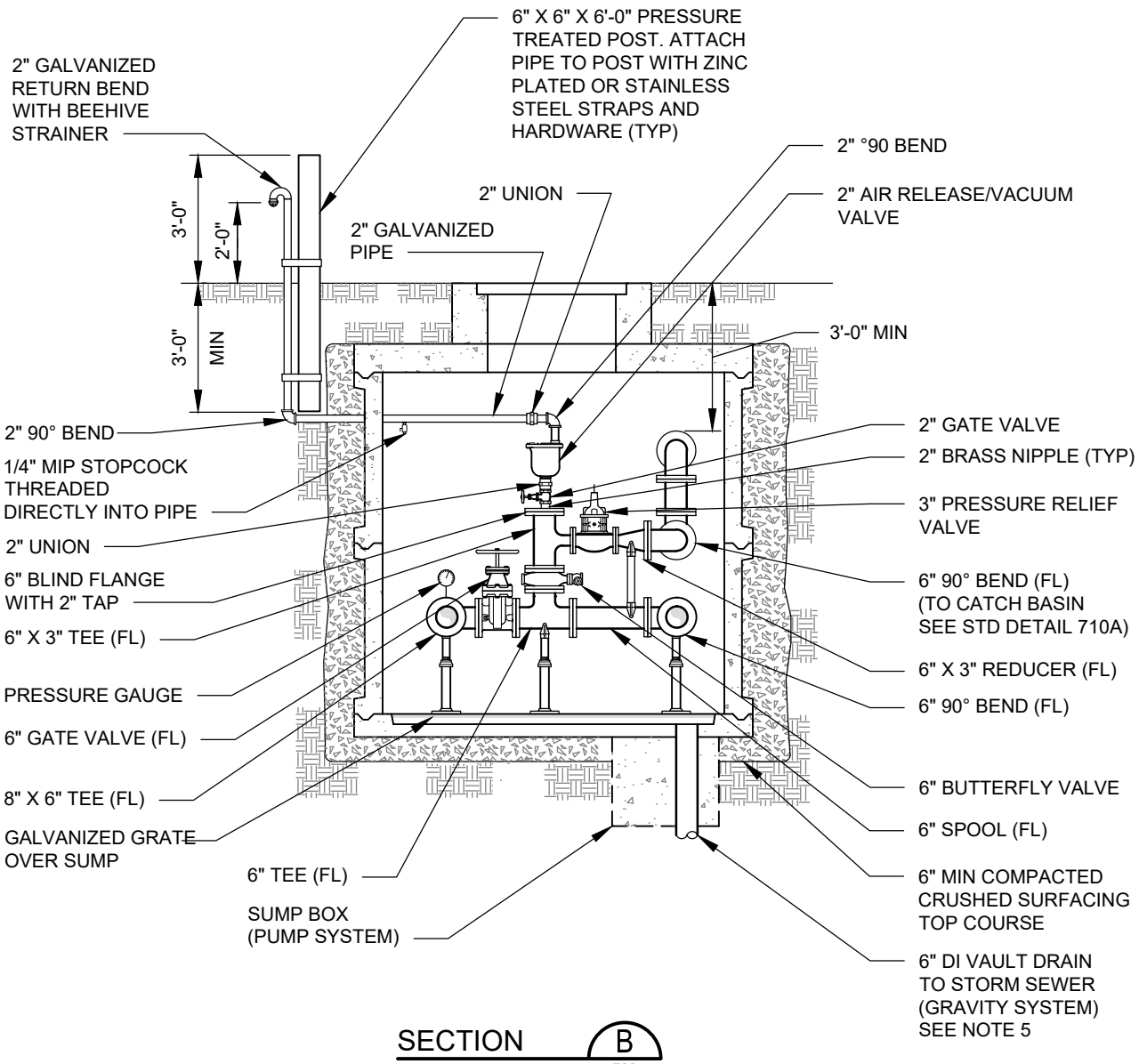
CityofRedmond WASHINGTON

STANDARD DETAILS

6" AND 8" PRV STATION

FILE NAME: SD709A.DWG | DETAIL NUMBER: **709A**

DocuSign Envelope ID: F681597A-CCE8-405B-ACDB-A8564C559739



SECTION B
708
SCALE: 1/4" = 1'-0"

NOTES:

1. 8 INCH PRV STATION SHOWN. 6 INCH PRV STATION IS IDENTICAL EXCEPT THE UPSTREAM AND DOWNSTREAM PIPING, FITTINGS, AND VALVES ARE 6 INCHES.
2. PAINT ALL EXPOSED PIPING AND FITTINGS WITHIN VAULT AND ABOVE GRADE.
3. ALL VALVES INSIDE VAULT TO HAVE HAND WHEEL OPERATORS.
4. SET COVER SLAB FLUSH WITH SIDEWALK OR CURB ELEVATION IF LOCATED IN LAWN AREA. SET COVER SLAB APPROXIMATELY 2 INCHES ABOVE FINISHED GRADE IF LOCATED IN LANDSCAPING AREA.
5. VAULT SHALL DRAIN BY GRAVITY TO STORM SYSTEM WHENEVER POSSIBLE. IF GRAVITY DRAINAGE CAN NOT BE ACHIEVED, THE CITY MAY ALLOW THE USE OF A SUMP PUMP (STANDARD SPEC 7-21.3). THE VAULT SHALL BE DESIGNED WITH AN INTEGRATED SUMP. SHOP DRAWINGS FOR THE VAULT WITH SUMP SHALL BE APPROVED PRIOR TO INSTALLATION.

Gary M. Schimek

APPROVED BY: GARY M. SCHIMEK
ENVIRONMENTAL AND UTILITY SERVICES DIVISION MANAGER

REVISION DATE: MARCH 01, 2019

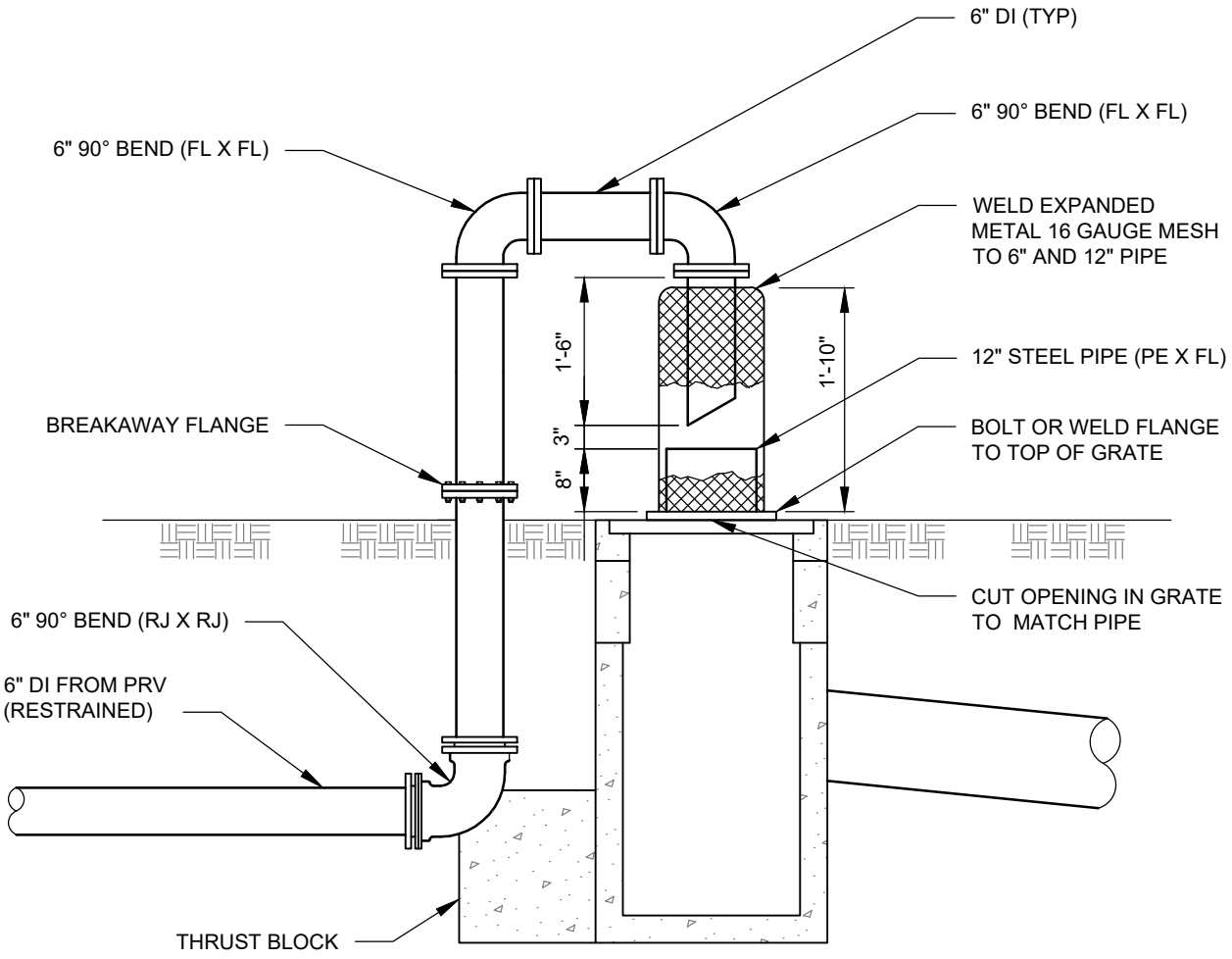
CityofRedmond WASHINGTON

STANDARD DETAILS

6" AND 8" PRV STATION SECTION

FILE NAME: SD709B.DWG | DETAIL NUMBER: **709B**

DocuSign Envelope ID: F681597A-CCE8-405B-ACDB-A8564C559739



CATCH BASIN DETAIL

NTS

NOTE:

1. PAINT ALL EXPOSED PIPING AND FITTINGS ABOVE GRADE.
2. CHANNEL BOTTOM OF CATCH BASIN

Gary M. Schimek

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ENVIRONMENTAL AND UTILITY SERVICES DIVISION MANAGER

REVISION DATE: MARCH 01, 2020

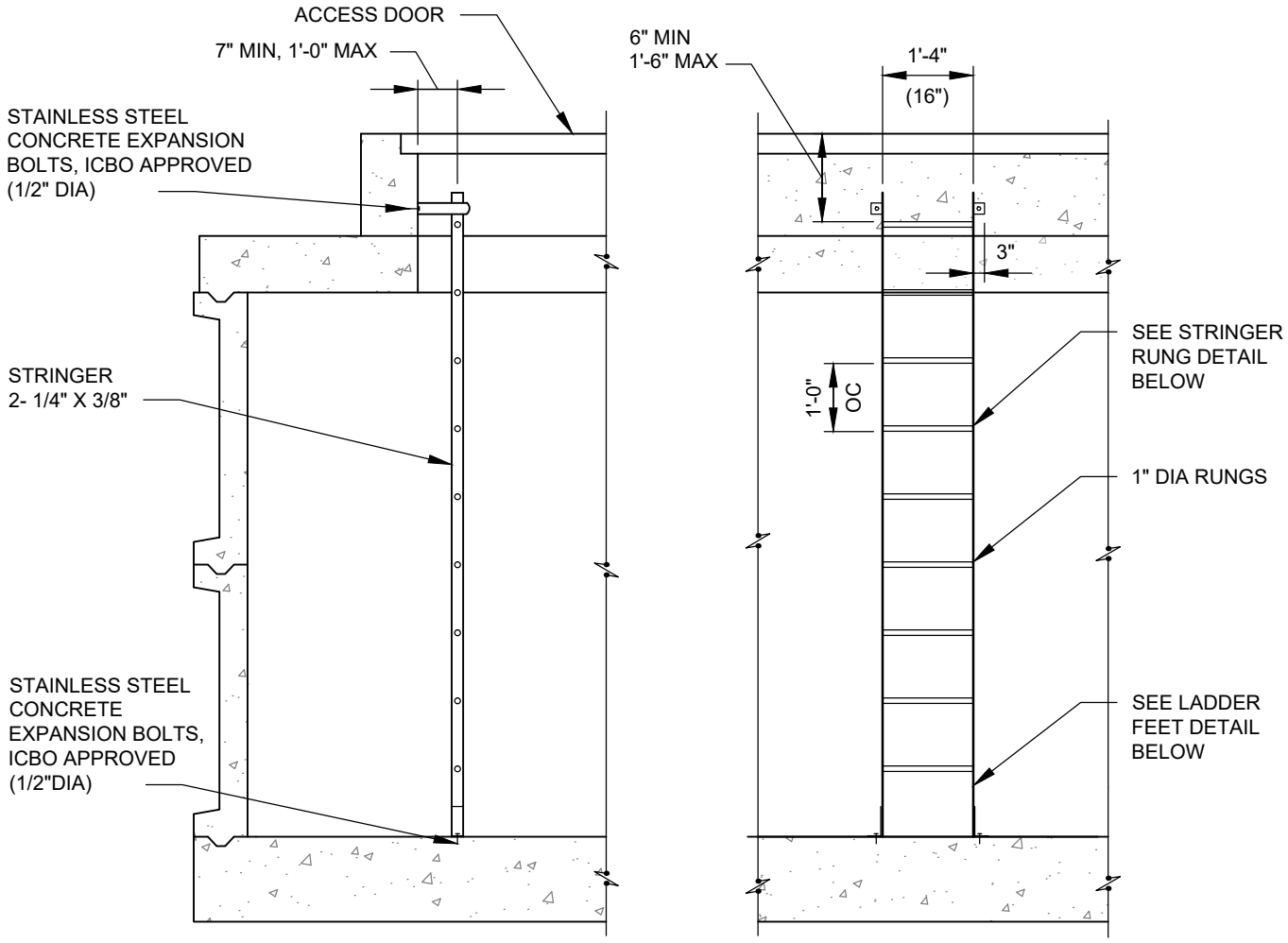
CityofRedmond WASHINGTON

STANDARD DETAILS

6" AND 8" PRV STATION MISC DETAILS

FILE NAME: SD710A.DWG | DETAIL NUMBER: **710A**

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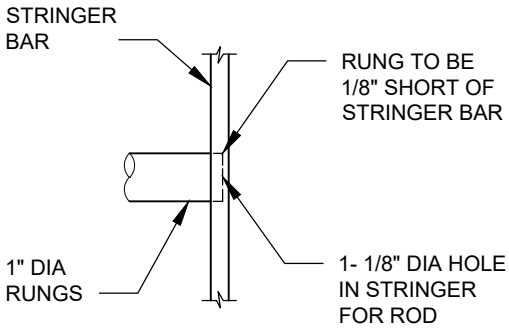


NOTES:

ALL RUNGS SHALL BE CORREGATED, KNURLED, DIMPLED, COATED WITH SKID-RESISTANT MATERIAL, OR OTHERWISE TREATED TO MINIMIZE SLIPPING.

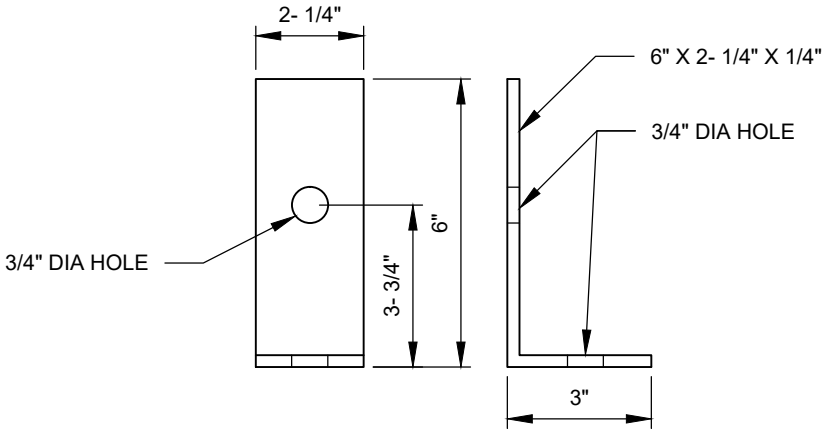
ALUMINUM LADDER SECTION

NTS



STRINGER / RUNG DETAIL

NTS



LADDER FEET DETAIL

NTS

Gary M. Schimek

APPROVED BY: GARY M. SCHIMEK
ENVIRONMENTAL AND UTILITY SERVICES DIVISION MANAGER

REVISION DATE: MARCH 01, 2019

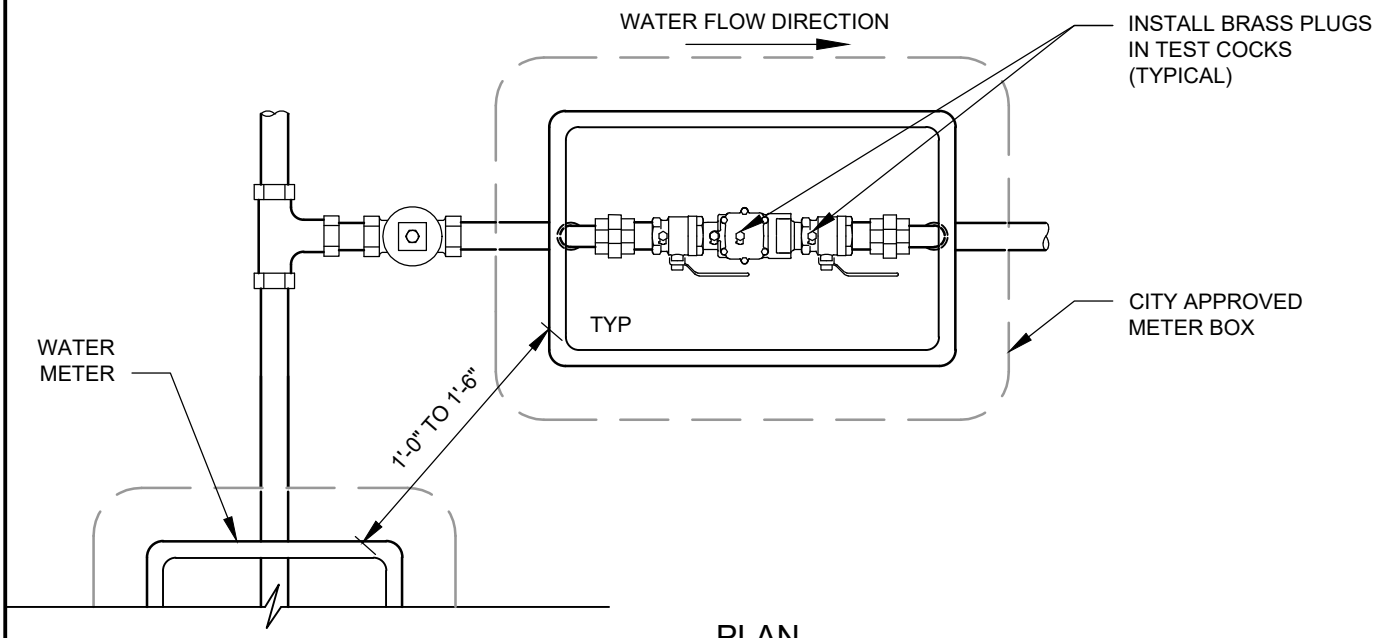
CityofRedmond WASHINGTON

STANDARD DETAILS

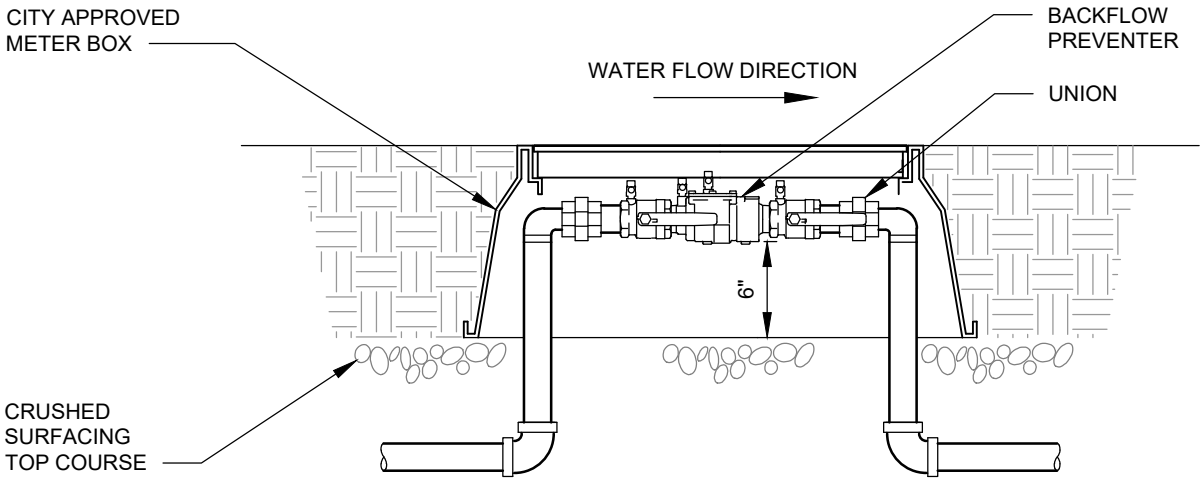
WATER METER VAULT AND PRV STATION LADDER DETAILS

FILE NAME: SD710B.DWG | DETAIL NUMBER: **710B**

DocuSign Envelope ID: F681597A-CCE8-405B-ACDB-A8564C559739



PLAN
NTS



ELEVATION
NTS

NOTES:

1. DOUBLE CHECK VALVE ASSEMBLY SHALL MEET REQUIREMENTS OF THE LATEST EDITION AWWA "ACCEPTED PROCEDURE AND PRACTICE IN CROSS-CONNECTION CONTROL" MANUAL.
2. DEVICES MUST BE ON THE LATEST EDITION OF THE WASHINGTON STATE HEALTH DEPARTMENT LIST OF APPROVED CROSS-CONNECTION CONTROL DEVICES.
3. METER BOX SIZE SHOULD BE THE SIZE SPECIFIED FOR THE METER SIZE EQUIVALENT TO THE BACKFLOW PREVENTOR SIZE.
4. IRRIGATION BLOW OUT CONNECTION FOR WINTERIZATION SHALL BE LOCATED DOWNSTREAM OF THE DOUBLE CHECK VALVE ASSEMBLY IN A SEPARATE IRRIGATION VALVE BOX.

Gary M. Schimek

APPROVED BY: GARY M. SCHIMEK
ENVIRONMENTAL AND UTILITY SERVICES DIVISION MANAGER

REVISION DATE: MARCH 01, 2020

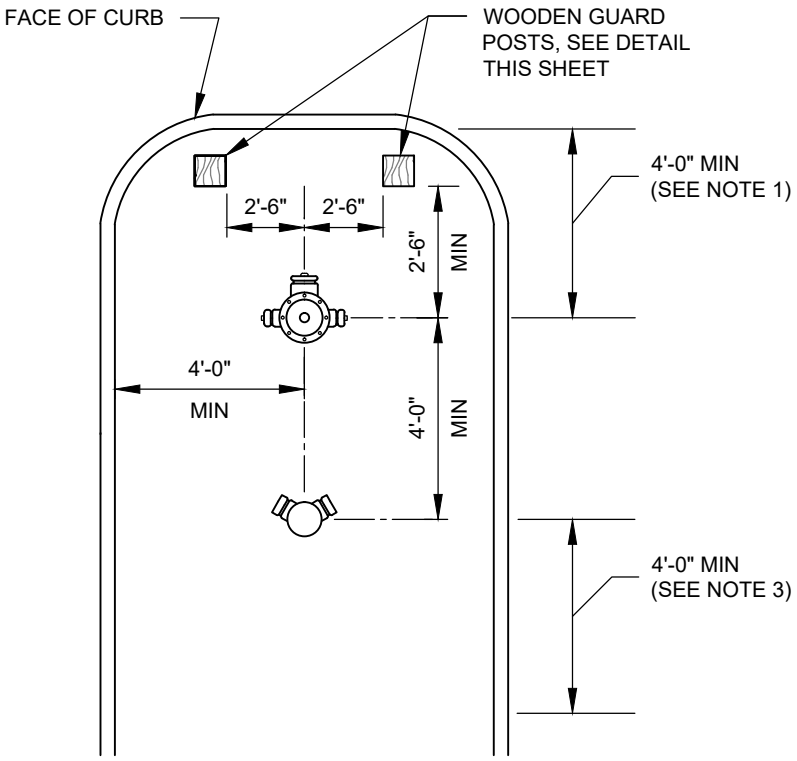
CityofRedmond WASHINGTON

STANDARD DETAILS

IRRIGATION BACKFLOW PREVENTER (3/4" - 2")

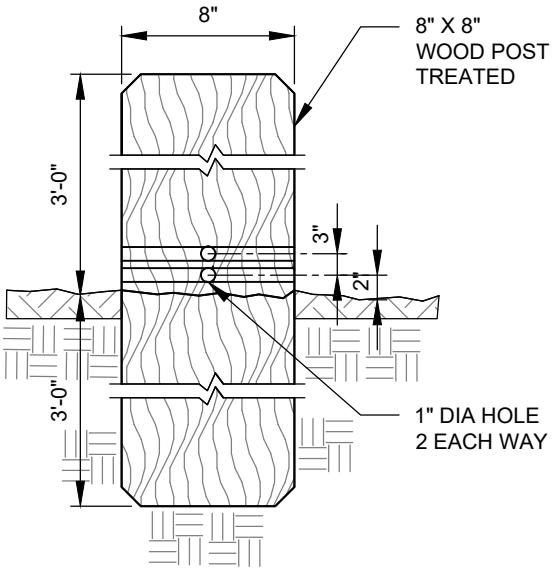
FILE NAME: SD711.DWG | DETAIL NUMBER: **711**

DocuSign Envelope ID: F681597A-CCE8-405B-ACDB-A8564C559739



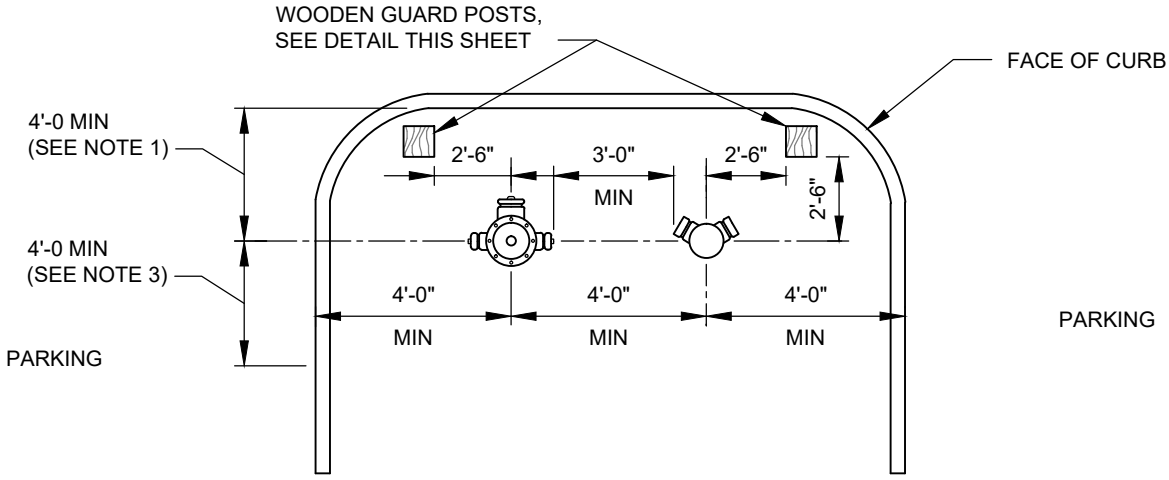
UNOBSTRUCTED ACCESS ROADWAY

NTS



GUARD POST DETAIL

NTS



UNOBSTRUCTED ACCESS ROADWAY

NTS

NOTES:

1. GUARD POSTS ARE REQUIRED IF HYDRANT AND/OR FIRE DEPARTMENT CONNECTION ARE LESS THAN 4 FEET FROM CURB LINE, OR WHEN OTHERWISE DETERMINED NECESSARY BY THE FIRE MARSHAL OR WATER DEPARTMENT.
2. ONLY GROUND COVER LANDSCAPING SHALL BE PLANTED WITHIN DIMENSIONED AREAS.
3. A 4 FOOT MINIMUM AREA SHALL BE FREE FROM PLANTS OR SHRUBS OR OTHER OBSTRUCTIONS.
4. A 8 FOOT MINIMUM AREA SHALL BE FREE FROM TREES.
5. INSTALL 3/4 INCH VIKING AUTOMATIC BALL DRIP VALVE IN ACCORDANCE WITH NFPA STANDARDS. PLACE SADDLE ON HORIZONTAL PIPING (FDC LINE) 2 FEET FROM FITTING TO FDC.

Gary M. Schimek

APPROVED BY: GARY M. SCHIMEK
ENVIRONMENTAL AND UTILITY SERVICES DIVISION MANAGER

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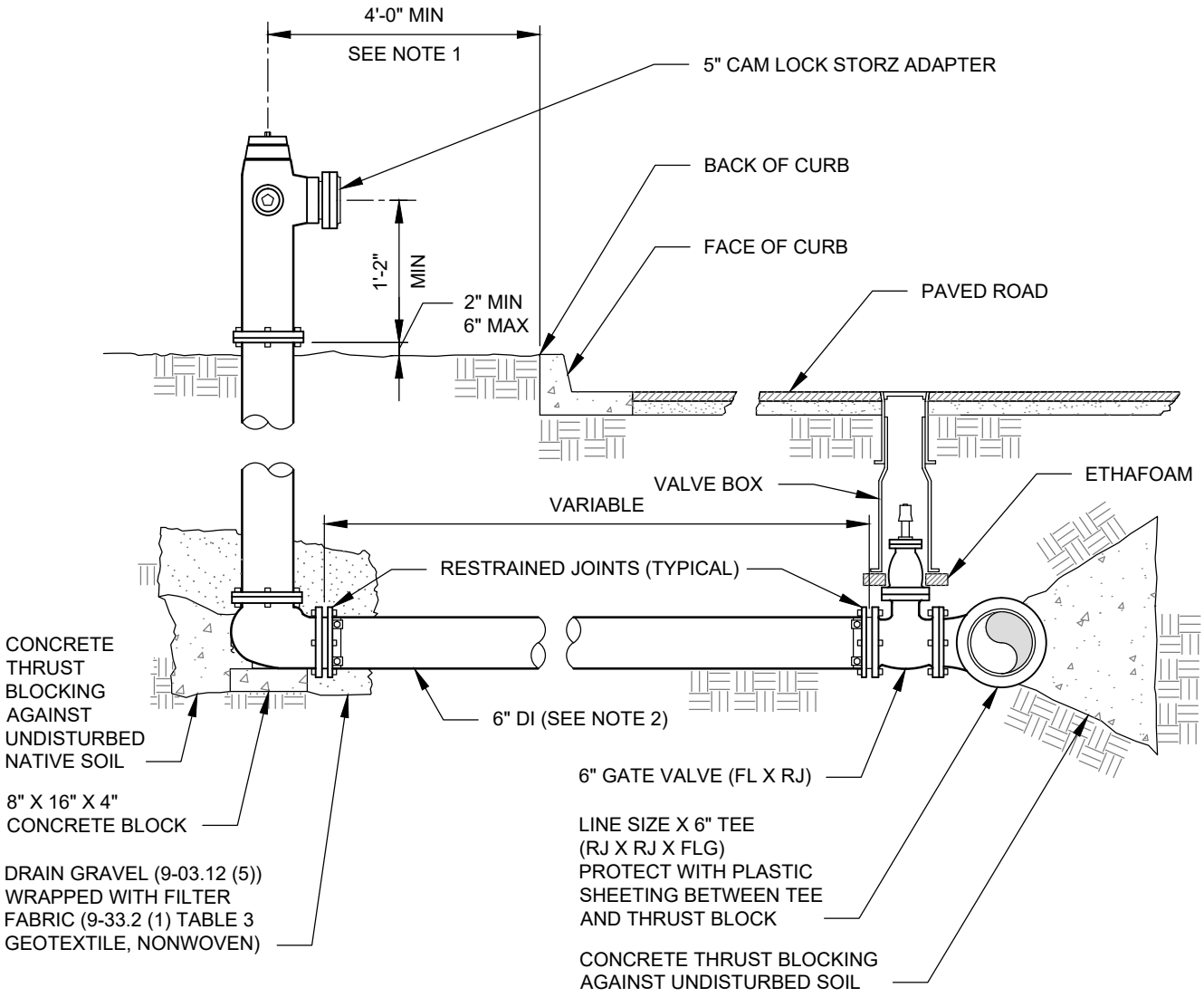
STANDARD DETAILS

FIRE HYDRANT AND STANDPIPE LOCATION

FILE NAME: SD712.DWG | DETAIL NUMBER: **712**

Xref G:\Pw\Standard Details\2010\Resource\Block Library\8.5x11 Redmond BorderBlackLOGO.dwg

DocuSign Envelope ID: F681597A-CCE8-405B-ACDB-A8564C559739



NOTES:

1. WHERE FIRE HYDRANT IS SHOWN BEHIND SIDEWALK, SET CENTER OF HYDRANT 2 FEET BEHIND WALK.
2. WHERE FIRE HYDRANT IS LOCATED WITHIN CONCRETE SIDEWALK, PROVIDE 4 REMOVABLE PANELS, EACH MEASURING APPROXIMATELY 4 FEET X 4 FEET, CENTERED AROUND THE HYDRANT. REMOVABLE PANELS SHALL HAVE FULL DEPTH 3/8 INCH EXPANSION JOINTS ON THE EDGES AND SHALL BE INCORPORATED IN THE SIDEWALK DESIGN WHEREVER POSSIBLE.
3. FIRE HYDRANT LINE SIZE SHALL BE A MINIMUM OF 8 INCH DIAMETER IF LENGTH IS GREATER THAN 50 FEET.

Gary M. Schimek

APPROVED BY: GARY M. SCHIMEK
WATER/WASTEWATER ENGINEERING MANAGER

REVISION DATE: MARCH 01, 2018

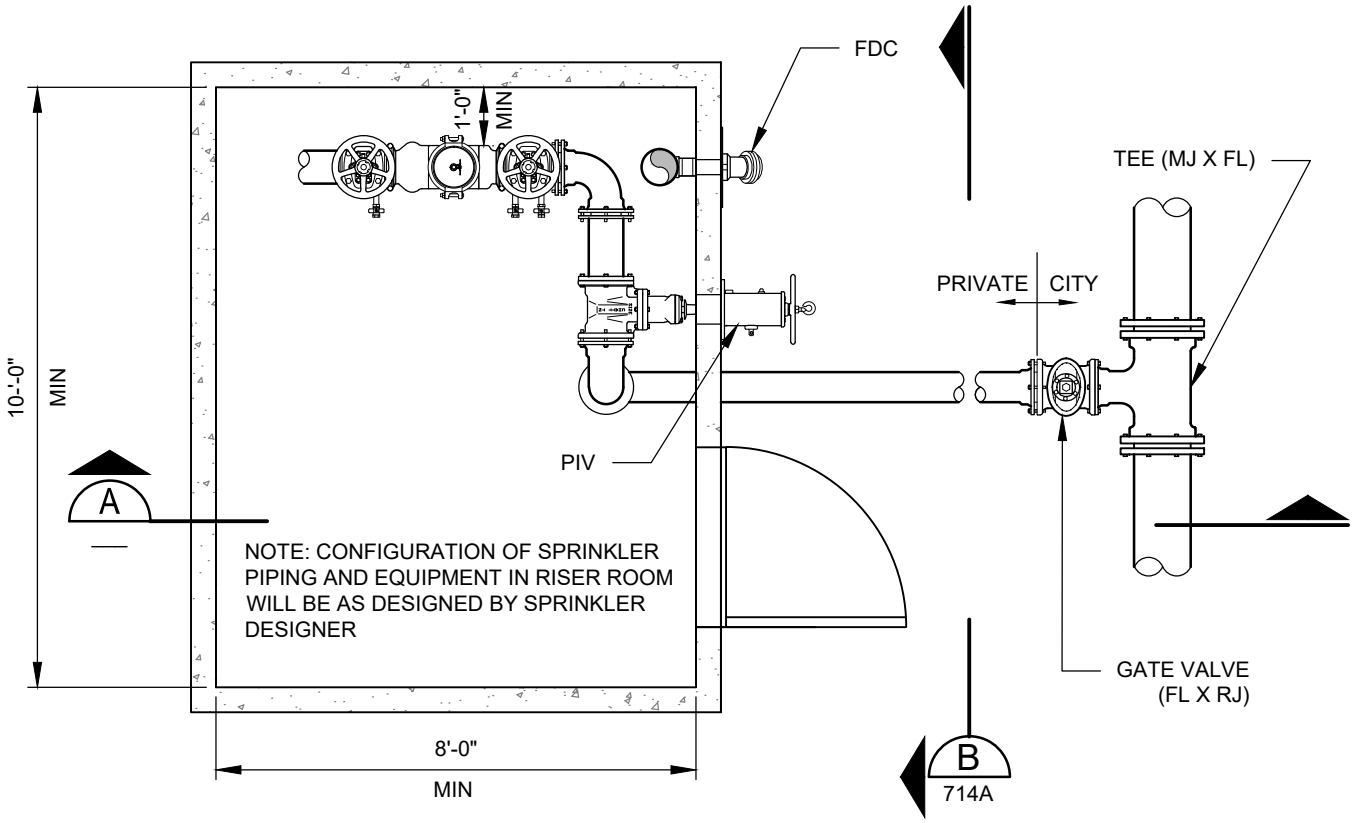
CityofRedmond
WASHINGTON

STANDARD DETAILS

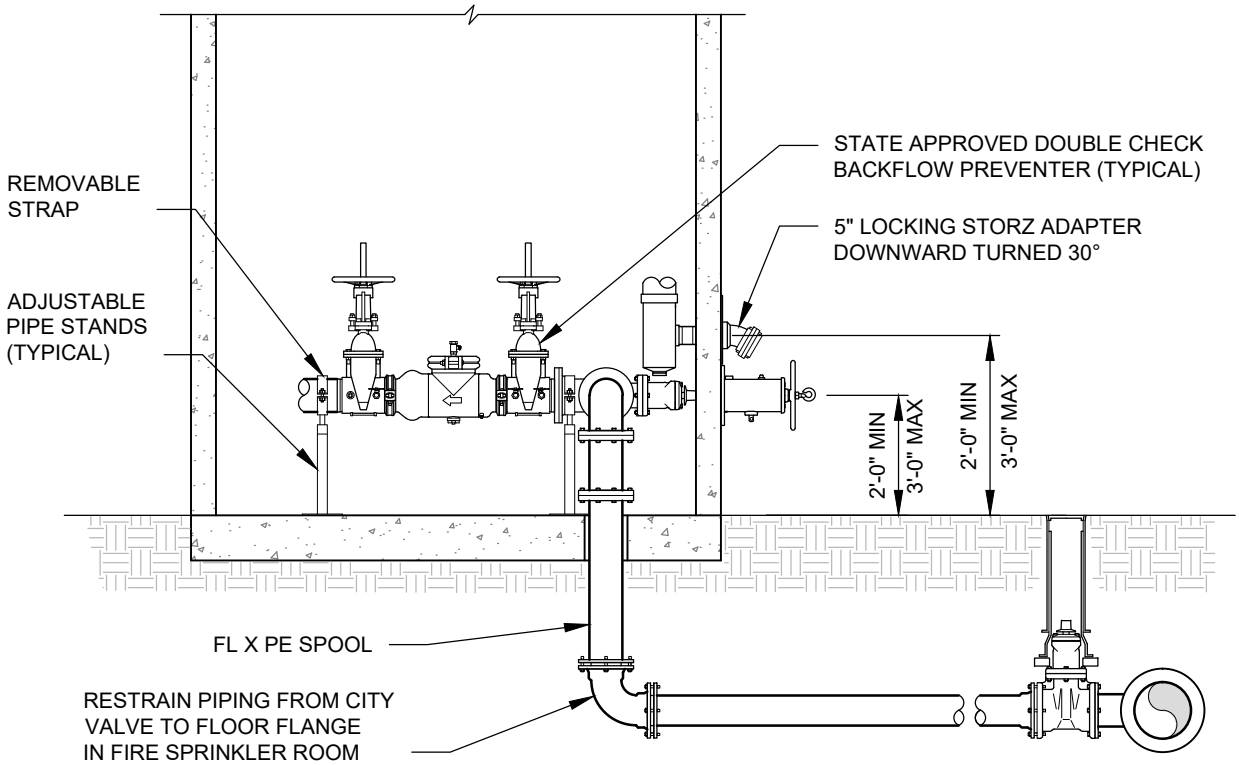
FIRE HYDRANT ASSEMBLY

FILE NAME: SD713.DWG | DETAIL NUMBER: **713**

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RISER ROOM PLAN
NTS



SECTION A
NTS

Gary M. Schimek

APPROVED BY: GARY M. SCHIMEK
ENVIRONMENTAL AND UTILITY SERVICES DIVISION MANAGER

REVISION DATE: MARCH 01, 2020

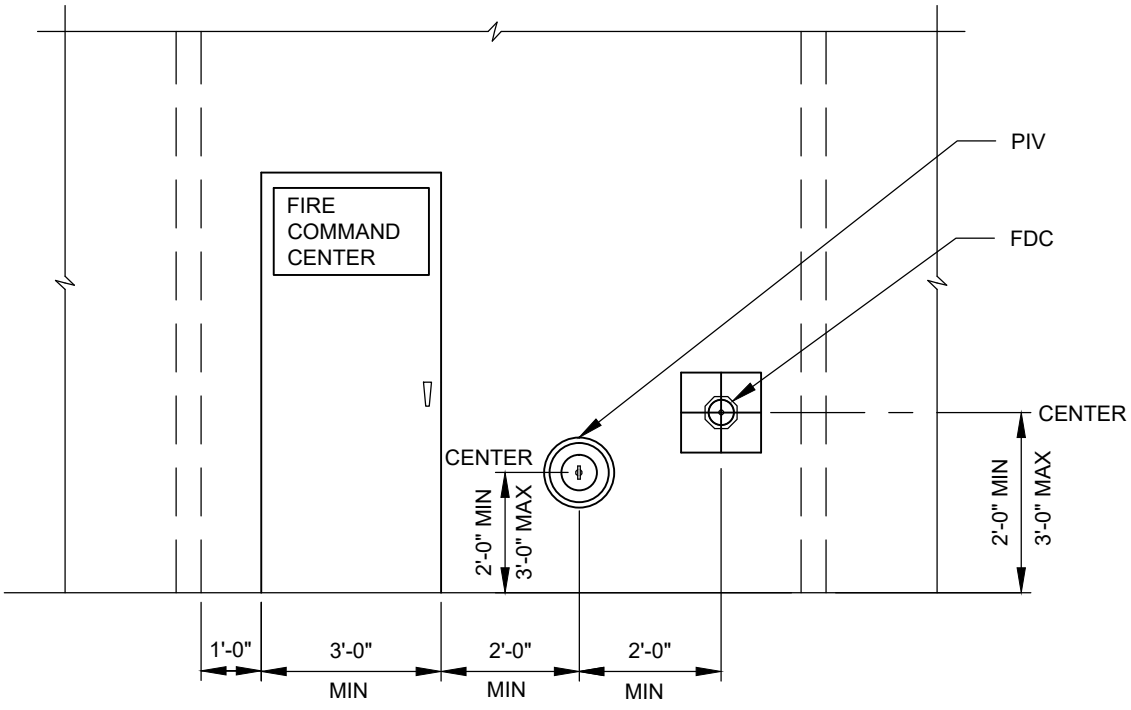
CityofRedmond WASHINGTON

STANDARD DETAILS

FIRE SPRINKLER SYSTEM BACKFLOW PREVENTER

FILE NAME: SD714.DWG | DETAIL NUMBER: **714**

DocuSign Envelope ID: F681597A-CCE8-405B-ACDB-A8564C559739



SECTION B
NTS 714

NOTES:

1. PIVs AND FDCs SHALL BE LOCATED AT LEAST 40 FEET FROM BUILDINGS WHERE SITE CONDITIONS ALLOW. WALL MOUNTED PIV'S AND FDC'S MAY BE USED WHEN APPROVED BY THE FIRE CODE OFFICIAL.

2. FDC CONNECTION SHOWN IS FOR A FOUR WAY SYSTEM. OTHER CONFIGURATIONS ARE ALLOWED. REFER TO APPROVED FIRE SYSTEM DRAWINGS FOR FDC SIZE AND TYPE.

Gary M. Schimek

APPROVED BY: GARY M. SCHIMEK
ENVIRONMENTAL AND UTILITY SERVICES DIVISION MANAGER

REVISION DATE: MARCH 01, 2020

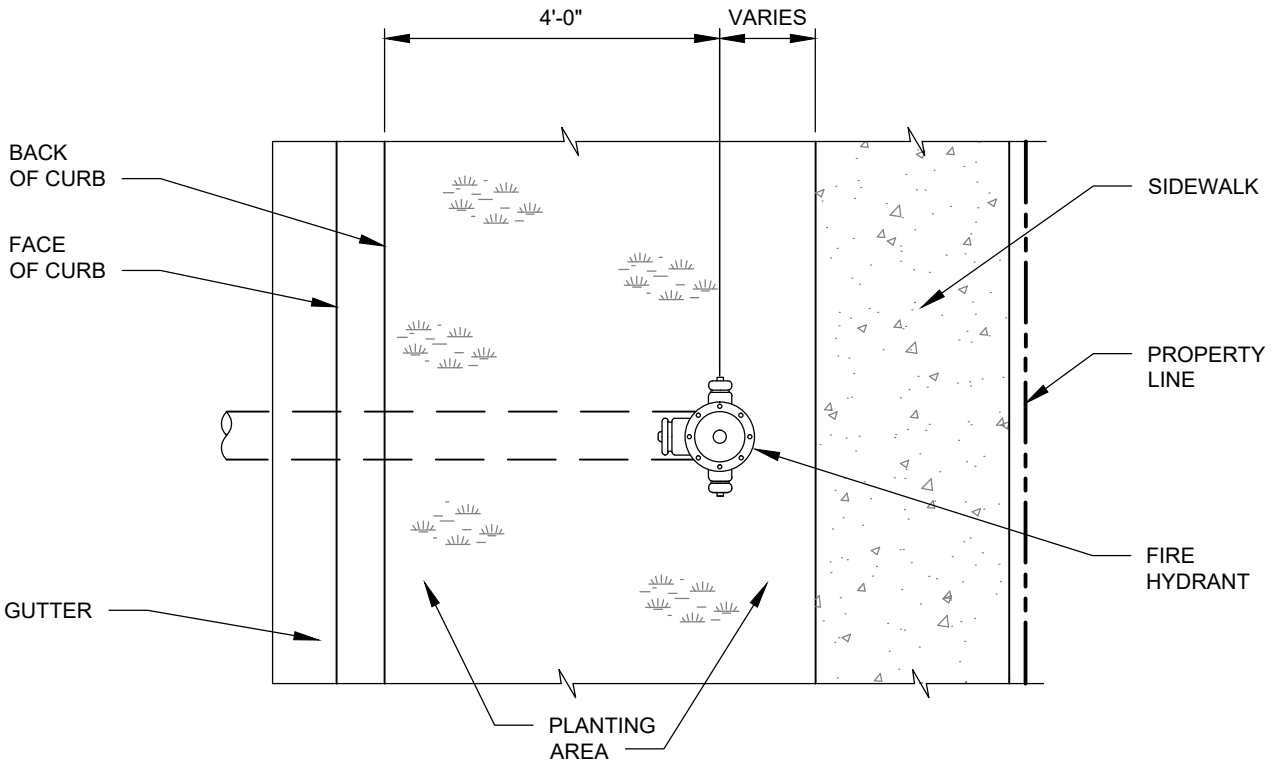
CityofRedmond WASHINGTON

STANDARD DETAILS

FIRE SPRINKLER SYSTEM BACKFLOW PREVENTER

FILE NAME: SD714.DWG | DETAIL NUMBER: **714A**

DocuSign Envelope ID: F681597A-CCE8-405B-ACDB-A8564C559739



FIRE HYDRANT

NTS

Gary M. Schimek

APPROVED BY: GARY M. SCHIMEK
ENVIRONMENTAL AND UTILITY SERVICES DIVISION MANAGER

REVISION DATE: MARCH 01, 2019

CityofRedmond
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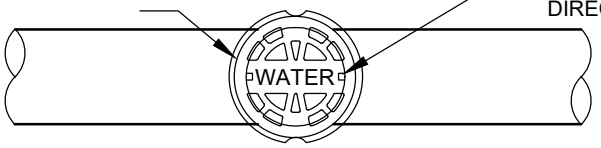
STANDARD DETAILS

HYDRANT LOCATION WITHIN PLANTING AREA

FILE NAME: SD716.DWG

DETAIL NUMBER: **716**

DocuSign Envelope ID: F681597A-CCE8-405B-ACDB-A8564C559739

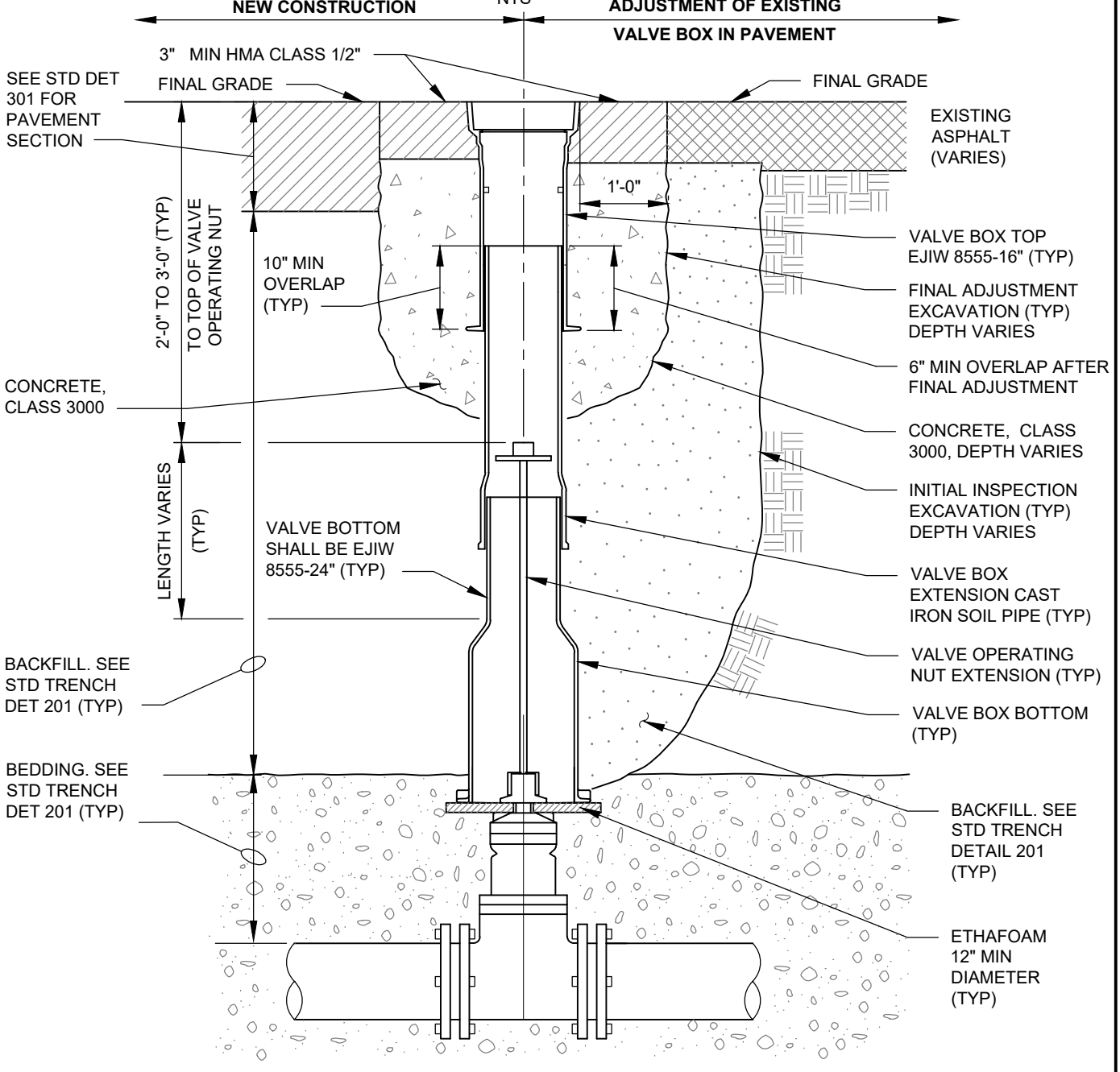


VALVE BOX COVER, EAST JORDAN IRON WORKS, EJIW 6800

ALIGN INTERNAL VALVE BOX NUBS IN THE DIRECTON OF THE WATER MAIN (AS SHOWN)

PLAN

NTS



SECTION

NTS

NOTES:

1. ALL EXISTING VALVE BOXES IN NEW PAVEMENT AREAS SHALL BE REPLACED WITH THE LATEST MODEL.
2. VALVE BOX LIDS SHALL BE INSTALLED FLUSH WITH FINISHED GRADE.
3. UTILITY ADJUSTMENTS TO FINAL GRADE SHALL BE DONE **AFTER** THE PAVING OPERATIONS ARE COMPLETE.

Gary M. Schimek

APPROVED BY: GARY M. SCHIMEK
ENVIRONMENTAL AND UTILITY SERVICES DIVISION MANAGER

REVISION DATE: MARCH 01, 2019

CityofRedmond WASHINGTON

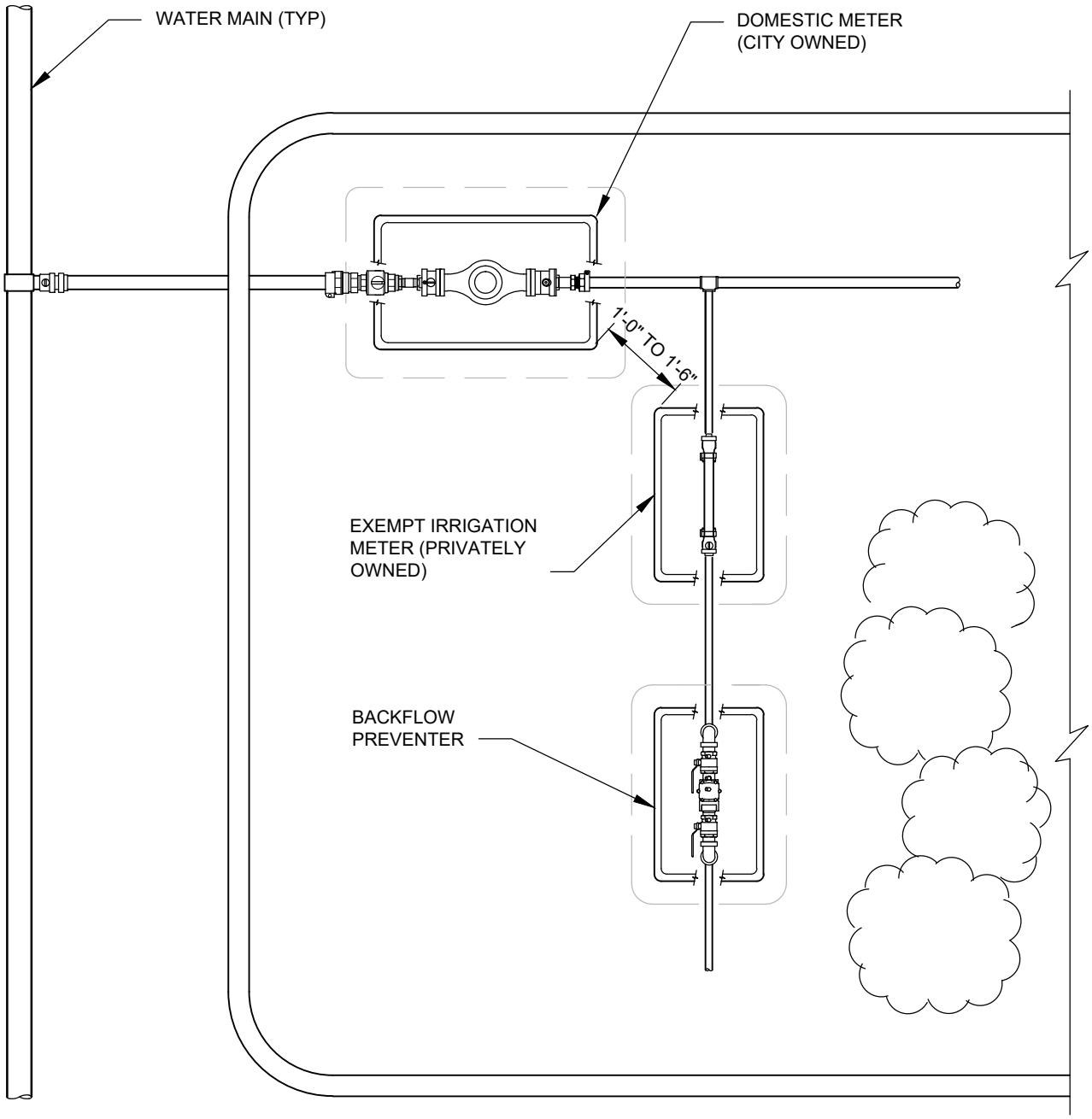
STANDARD DETAILS

VALVE BOX DETAIL

FILE NAME: SD718.DWG

DETAIL NUMBER: **718**

DocuSign Envelope ID: F681597A-CCE8-405B-ACDB-A8564C559739



IRRIGATION METER PLAN

NTS

NOTES:

1. EXEMPT METERS SHALL BE PLACED GENERALLY PARALLEL WITH THE CITY WATER MAIN AND PERPENDICULAR TO THE CITY METER.
2. EXEMPT METERS SHALL BE PLACED BETWEEN 1 FOOT TO 1 FOOT 6 INCHES FROM THE CITY WATER METER.
3. INSTALL EXEMPT METER SETTER IN ACCORDANCE WITH STANDARD DETAIL 702.

Gary M. Schimek

APPROVED BY: GARY M. SCHIMEK
ENVIRONMENTAL AND UTILITY SERVICES DIVISION MANAGER

REVISION DATE: MARCH 01, 2019

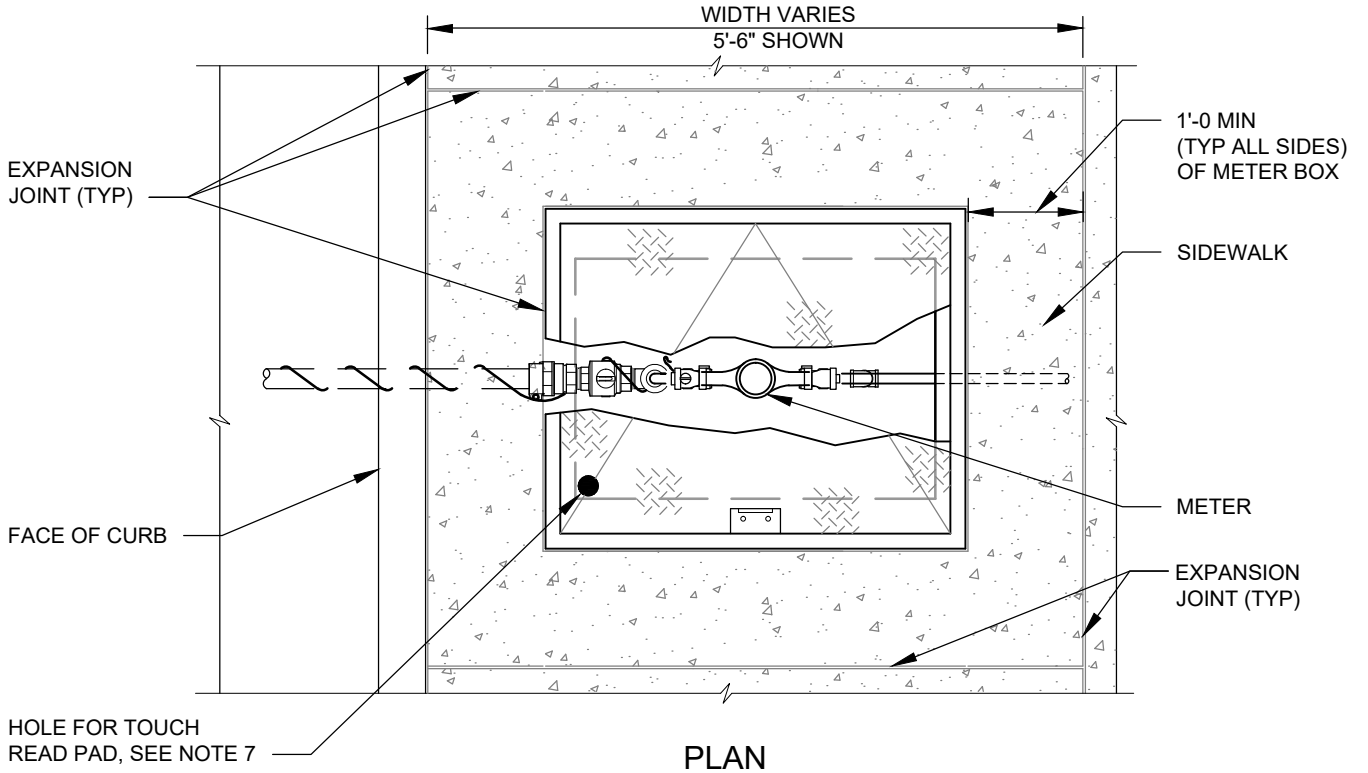
CityofRedmond
WASHINGTON

STANDARD DETAILS

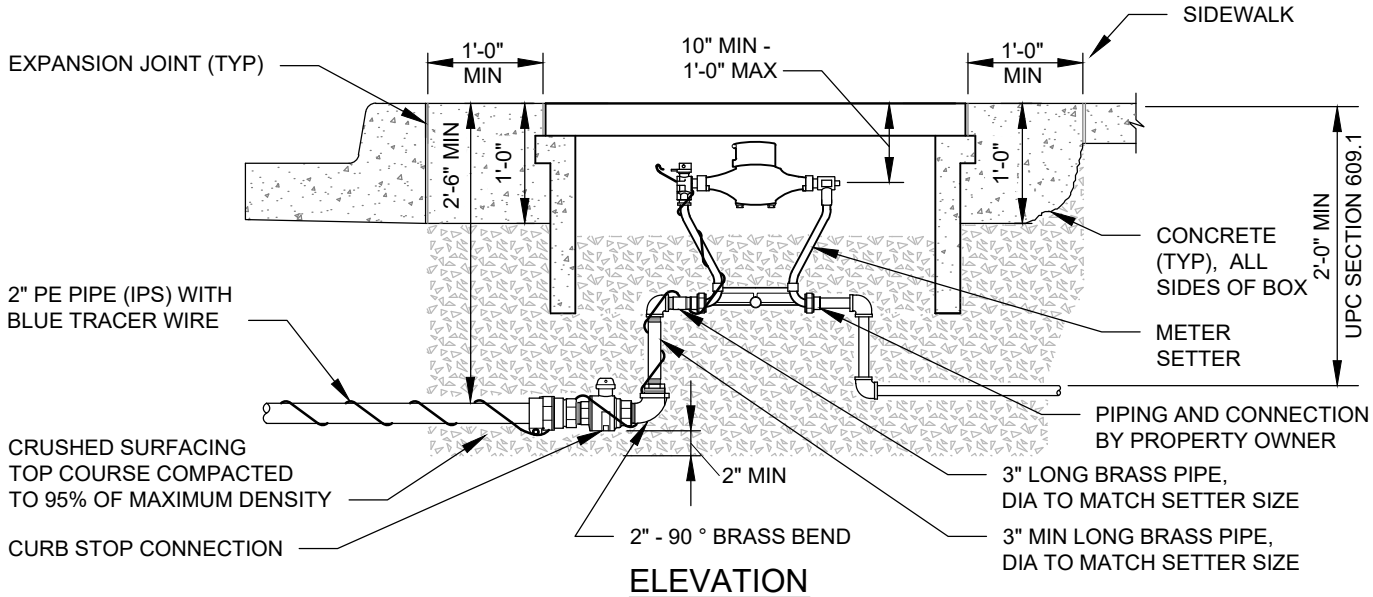
EXEMPT IRRIGATION METER LOCATION REQUIREMENTS

FILE NAME: SD719.DWG | DETAIL NUMBER: **719**

DocuSign Envelope ID: F681597A-CCE8-405B-ACDB-A8564C559739



PLAN
NTS



ELEVATION
NTS

NOTES:

1. THIS INSTALLATION SHALL ONLY BE USED IN URBAN STREETSCAPES WHERE LANDSCAPE AREAS ARE NOT AVAILABLE AND WHERE APPROVED BY THE CITY.
2. SEE STANDARD DETAIL 701A AND 701C FOR ADDITIONAL DETAILS.
3. SET METER BOX FLUSH WITH SIDEWALK.
4. SERVICE CONNECTION PIPE SIZE SHALL BE 2 INCH DIAMETER.
5. ALL FITTINGS SHALL BE BRASS.
6. METER(S) SHALL BE CENTERED IN THE BOX TO MAINTAIN EVEN CLEARANCE FROM EDGES OF BOX.
7. TOUCH READ PAD HOLE TO BE DRILLED BY THE CITY.

Gary M. Schimek

APPROVED BY: GARY M. SCHIMEK
ENVIRONMENTAL AND UTILITY SERVICES DIVISION MANAGER

REVISION DATE: MARCH 01, 2020

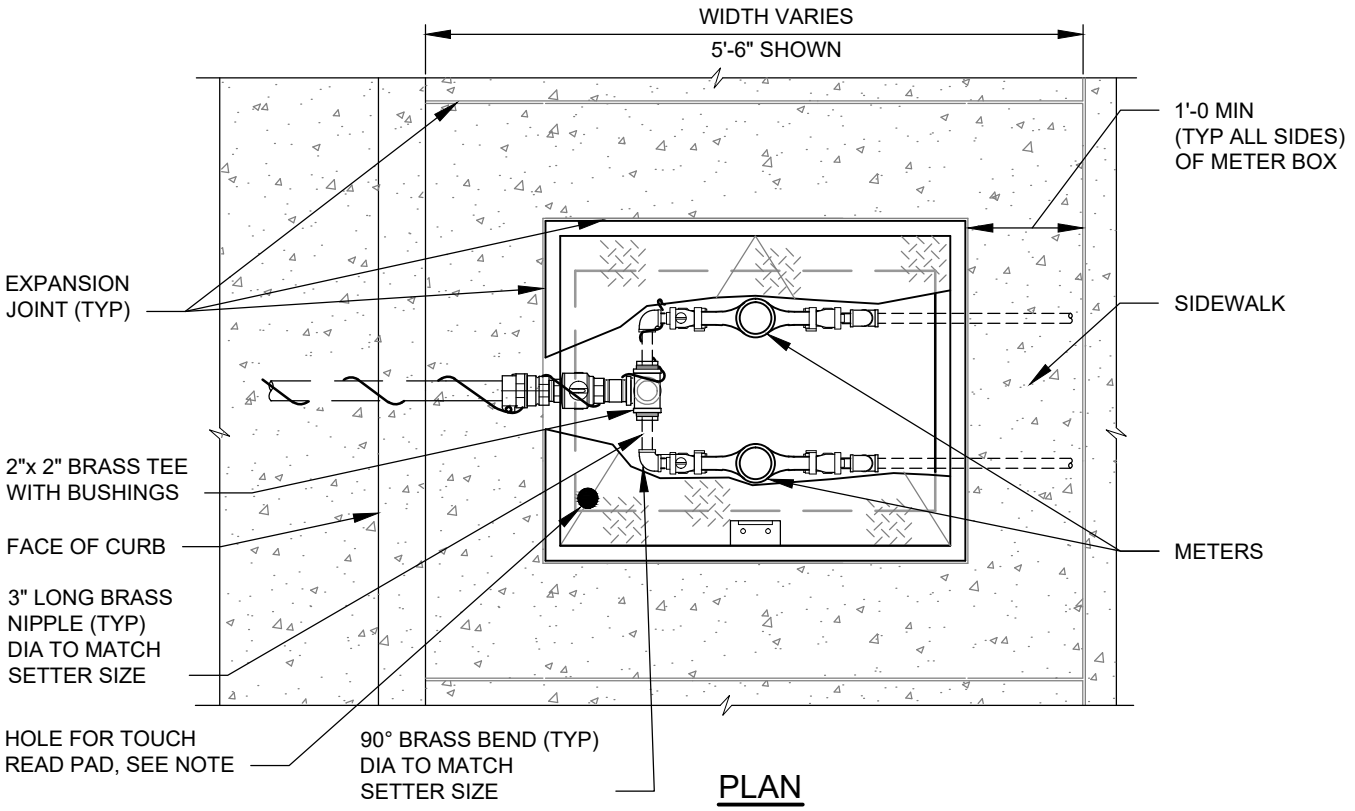
CityofRedmond WASHINGTON

STANDARD DETAILS

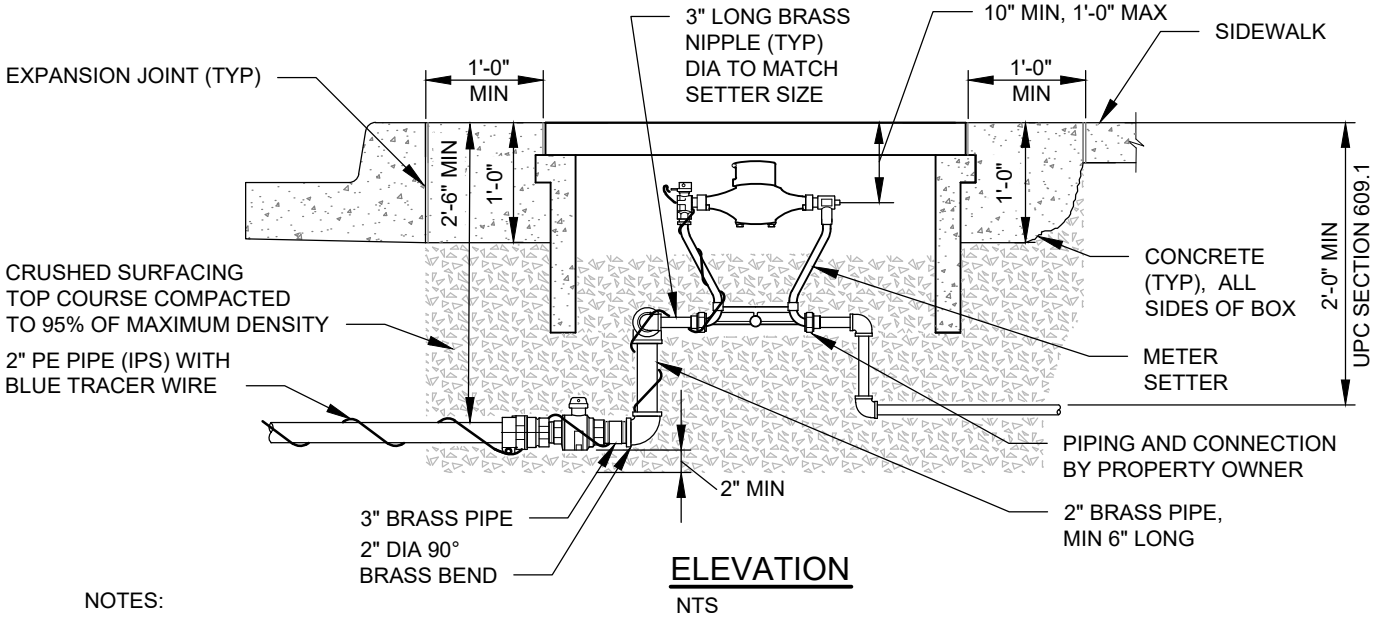
5/8" X 3/4" AND 1" METER IN SIDEWALK

FILE NAME: SD720.DWG | DETAIL NUMBER: **720**

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PLAN
NTS



ELEVATION
NTS

NOTES:

1. THIS INSTALLATION SHALL ONLY BE USED IN URBAN STREETSCAPES WHERE LANDSCAPE AREAS ARE NOT AVAILABLE AND WHERE APPROVED BY THE CITY.
2. SEE STANDARD DETAIL 701A AND 701C FOR ADDITIONAL DETAILS.
3. SET METER BOX FLUSH WITH SIDEWALK.
4. SERVICE CONNECTION PIPE SIZE SHALL BE 2 INCH DIAMETER.
5. ALL FITTINGS SHALL BE BRASS.
6. METER(S) SHALL BE CENTERED IN THE BOX TO MAINTAIN EVEN CLEARANCE FROM EDGES OF BOX.
7. TOUCH READ PAD HOLE TO BE DRILLED BY THE CITY.

Gary M. Schimek

APPROVED BY: GARY M. SCHIMEK
ENVIRONMENTAL AND UTILITY SERVICES DIVISION MANAGER

REVISION DATE: MARCH 01, 2020

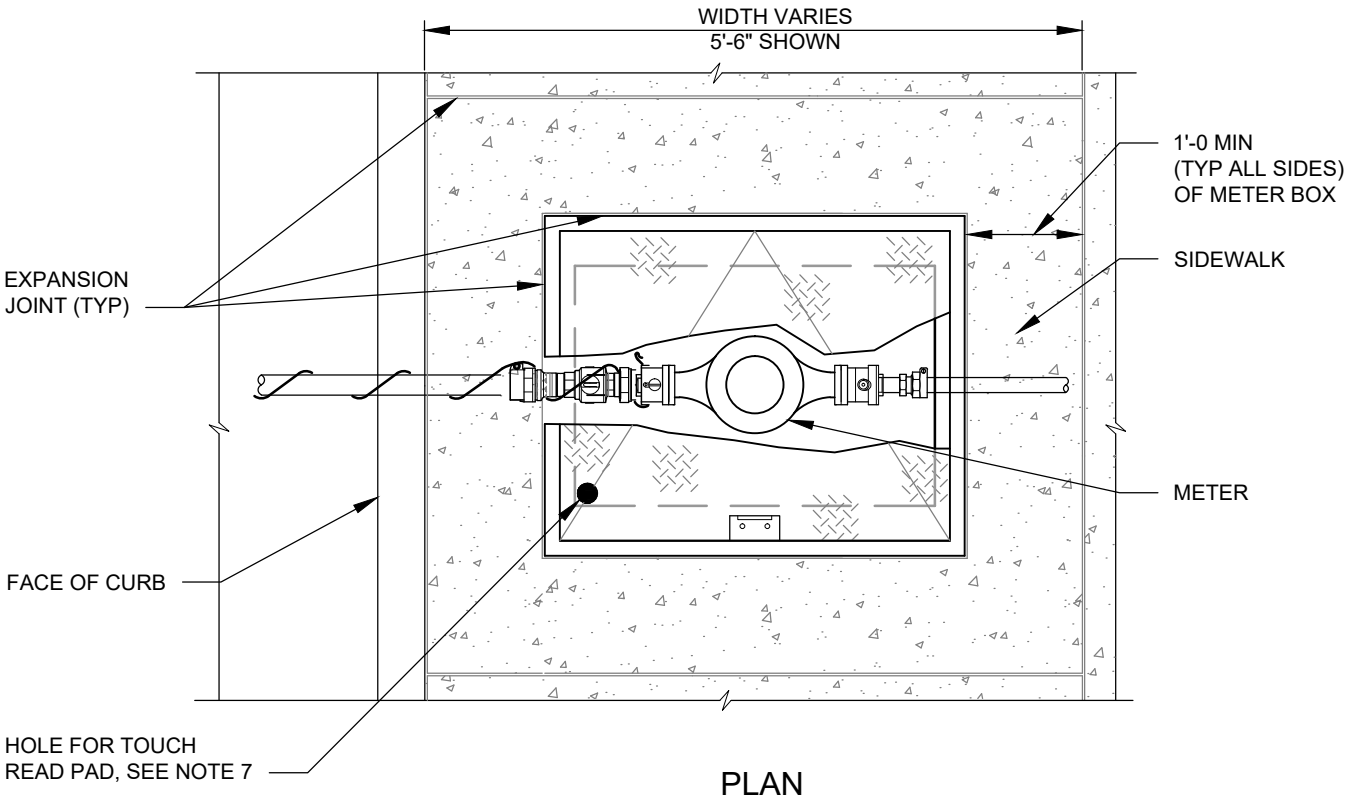
CityofRedmond
WASHINGTON

STANDARD DETAILS

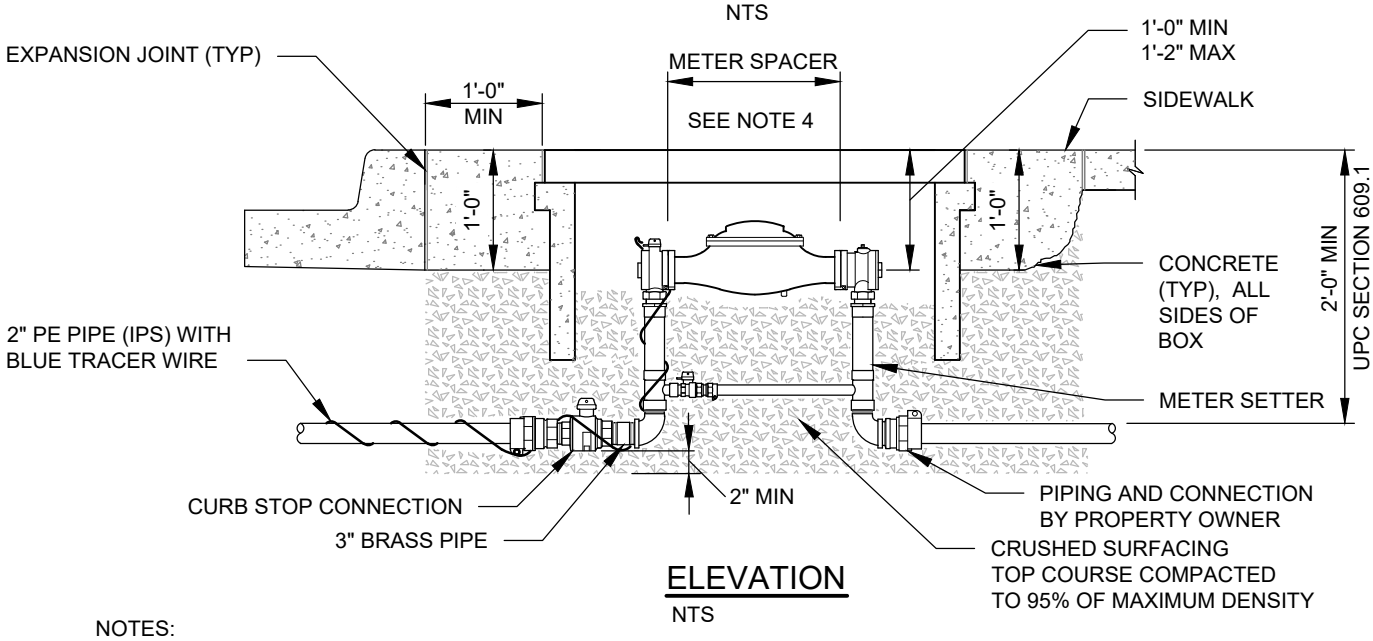
5/8" X 3/4" AND 1" DOUBLE METERS IN SIDEWALK

FILE NAME: SD721.DWG | DETAIL NUMBER: **721**

DocuSign Envelope ID: F681597A-CCE8-405B-ACDB-A8564C559739



PLAN
NTS



ELEVATION
NTS

NOTES:

1. THIS INSTALLATION SHALL ONLY BE USED IN URBAN STREETSCAPES WHERE LANDSCAPE AREAS ARE NOT AVAILABLE AND WHERE APPROVED BY THE CITY.
2. SEE STANDARD DETAIL 701A AND 701C FOR ADDITIONAL DETAILS.
3. SET METER BOX FLUSH WITH SIDEWALK.
4. SERVICE CONNECTION PIPE SIZE SHALL BE 2 INCH DIAMETER..
5. ALL FITTINGS SHALL BE BRASS.
6. METER(S) SHALL BE CENTERED IN THE BOX TO MAINTAIN EVEN CLEARANCE FROM EDGES OF BOX.
7. TOUCH READ PAD HOLE TO BE DRILLED BY THE CITY.

Gary M. Schimek

APPROVED BY: GARY M. SCHIMEK
WATER/WASTEWATER ENGINEERING MANAGER

REVISION DATE: MARCH 01, 2018

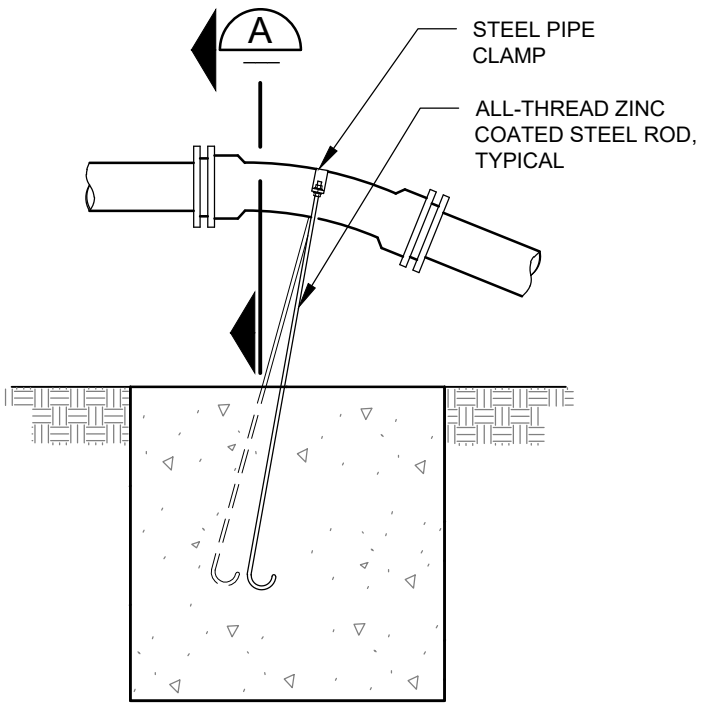
CityofRedmond
WASHINGTON

STANDARD DETAILS

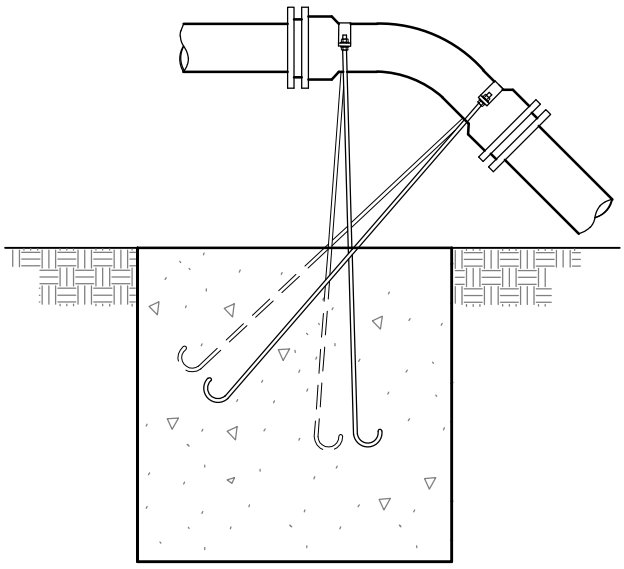
1 1/2" AND 2" METER IN SIDEWALK

FILE NAME: SD722.DWG | DETAIL NUMBER: **722**

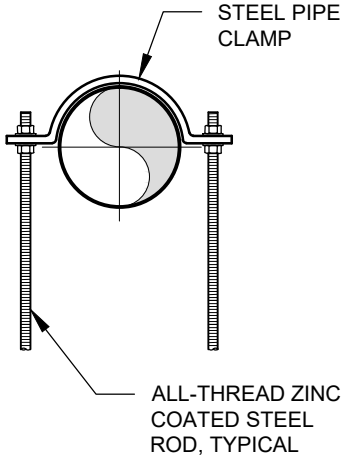
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BLOCKING FOR 11.25° OR 22.5° VERTICAL BENDS
NTS



BLOCKING FOR 45° VERTICAL BENDS
NTS



SECTION A
NTS

DIMENSION TABLE						
PIPE DIA	TEST PRESSURE (PSI)	BEND ANGLE	CONCRETE VOLUME (FT3)	CUBE SIZE (FT)	ALL THREAD ROD DIA	ROD EMBEDMENT
4"	250	11.25°	6	1.8	5/8"	17"
		22.5°	12	2.3		
		45°	22	2.8		
6"	250	11.25°	14	2.4	5/8"	17"
		22.5°	27	3.0		
		45°	50	3.7		
8"	250	11.25°	25	2.9	5/8"	17"
		22.5°	48	3.6		
		45°	89	4.5		
10"	250	11.25°	38	3.4	5/8"	17"
		22.5°	75	4.2		
		45°	139	5.2		
12"	250	11.25°	55	3.8	5/8"	17"
		22.5°	108	4.8		
		45°	200	5.8	7/8"	24"
14"	250	11.25°	75	4.2	5/8"	17"
		22.5°	147	5.3	3/4"	20"
		45°	272	6.5	1"	27"
16"	250	11.25°	98	4.6	5/8"	17"
		22.5°	192	5.8	7/8"	24"
		45°	355	7.1	1 1/8"	30"

NOTE: ALL-THREAD STEEL RODS SHALL BE ZINC COATED.

Gary M. Schimek

APPROVED BY: GARY M. SCHIMEK
ENVIRONMENTAL AND UTILITY SERVICES DIVISION MANAGER

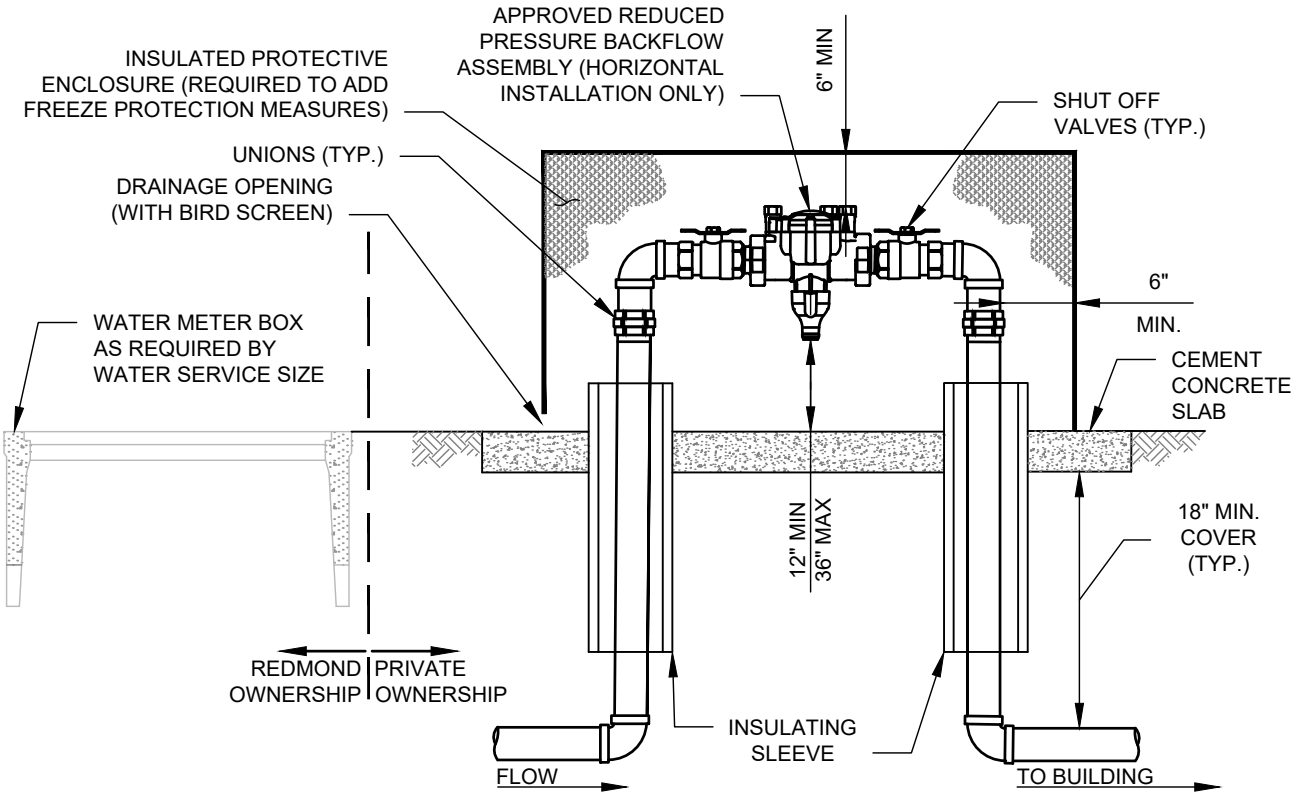
REVISION DATE: MARCH 01, 2020

CityofRedmond WASHINGTON

STANDARD DETAILS

VERTICAL THRUST BLOCK

FILE NAME: SD723.DWG | DETAIL NUMBER: **723**



REDUCED PRESSURE BACKFLOW ASSEMBLY (SECTION)

NTS

NOTES:

1. REDUCED PRESSURE BACKFLOW ASSEMBLIES ARE REQUIRED FOR CONNECTIONS WITH "SEVERE AND HIGH HEALTH CROSS-CONNECTION HAZARDS" AS LISTED IN TABLE 13 OF WASHINGTON ADMINISTRATIVE CODE (WAC) 246-290-490.
2. THE BACKFLOW ASSEMBLY SELECTION AND INSTALLATION THEREOF SHALL BE IN ACCORDANCE WITH THE LATEST EDITION OF THE MANUAL OF CROSS-CONNECTION CONTROL BY THE UNIVERSITY OF SOUTHERN CALIFORNIA, MANUFACTURER'S SPECIFICATIONS, AND THE MINIMUM STANDARDS OF THE UNIFORM PLUMBING CODE.
3. BACKFLOW ASSEMBLY SHALL BE CENTERED WITHIN THE ENCLOSURE AND PROVIDE MINIMUM HORIZONTAL AND VERTICAL CLEARANCE AS REQUIRED.
4. THIS DETAIL SHALL ONLY BE USED FOR OUTDOOR INSTALLATION OF AN RPBA FOR PREMISE ISOLATION.
5. RPBA SHALL BE LOCATED OUTSIDE OF PEDESTRIAN TRAVEL PATHS.

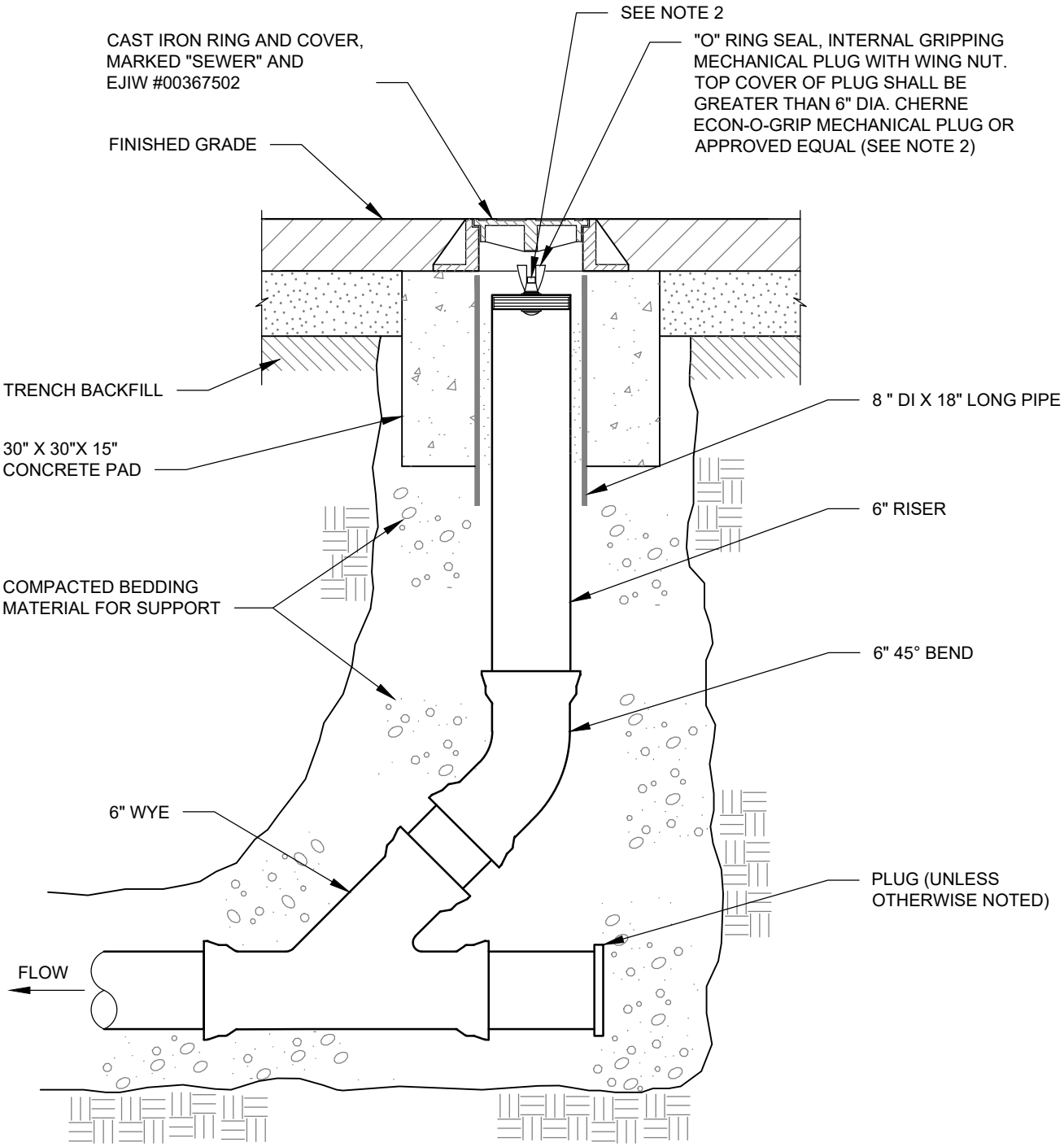
\EngineeringSignImages\Emily Flanagan.tif APPROVED BY: EMILY FLANAGAN UTILITIES ENGINEERING MANAGER	CityofRedmond WASHINGTON	STANDARD DETAILS **RPBA GENEREAL INSTALLATION GUIDELINES**
REVISION DATE: MARCH 11, 2024		FILE NAME: SD731.DWG | DETAIL NUMBER: **731**

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SECTION 8

SEWER

DocuSign Envelope ID: F681597A-CCE8-405B-ACDB-A8564C559739



SECTION

NTS

NOTES:

1. IN NON-SINGLE FAMILY RESIDENTIAL DEVELOPMENTS WHEN THE CLEANOUT IS LOCATED IN THE LANDSCAPE AREA, INSTALL A VALVE MARKER POST (NOT SHOWN), PAINTED FOREST GREEN (FARWEST PAINT, #388).
2. DEFORM END OF THREAD ON MECHANICAL PLUG BOLT TO SECURE WING NUT IN PLACE.
3. REFER TO STANDARD SPECIFICATION 7-19 SEWER CLEANOUTS.

Gary M. Schimek

APPROVED BY: GARY M. SCHIMEK
ENVIRONMENTAL AND UTILITY SERVICES DIVISION MANAGER

REVISION DATE: MARCH 01, 2019

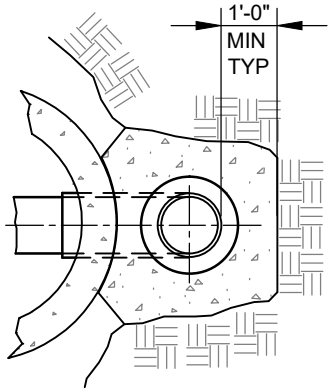
CityofRedmond WASHINGTON

STANDARD DETAILS

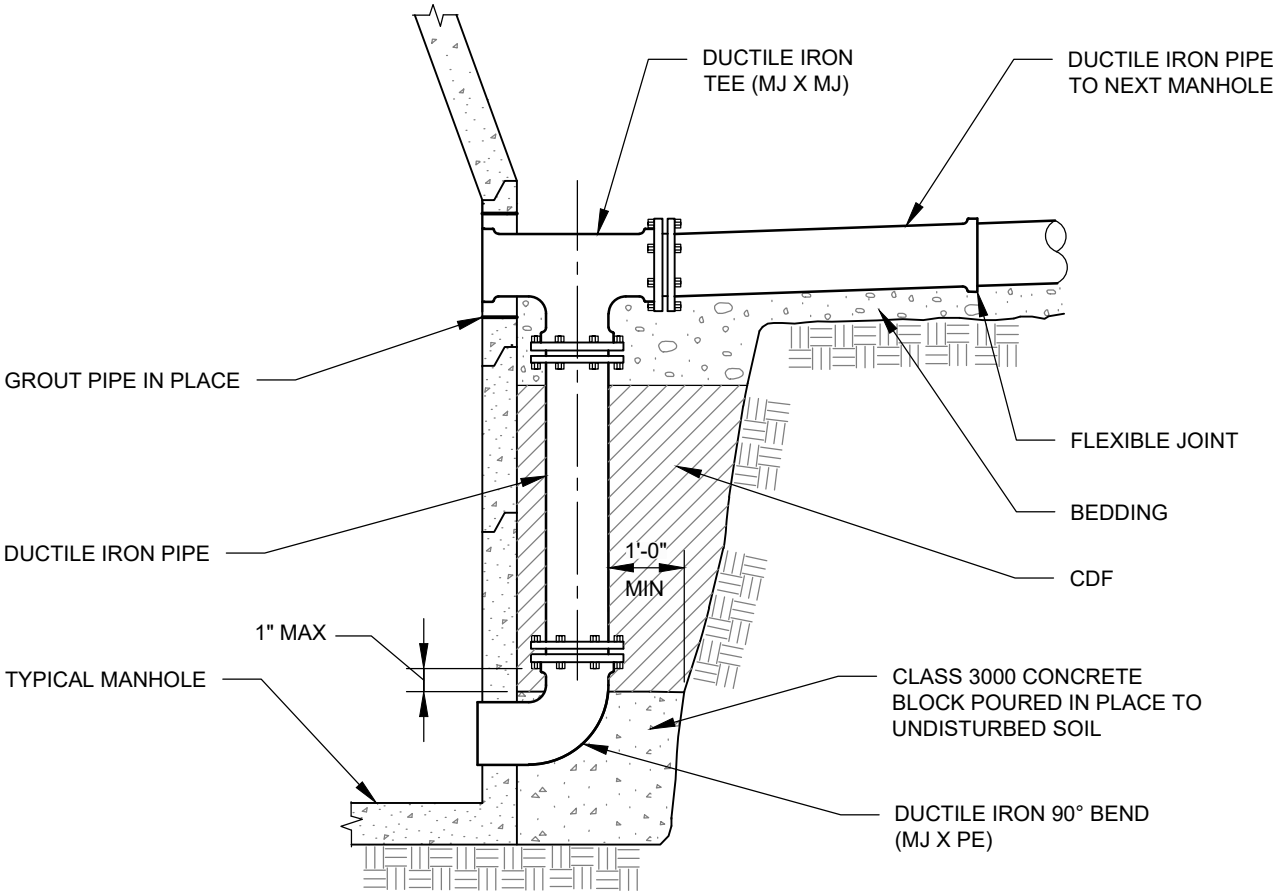
SIDE SEWER CLEANOUT

FILE NAME: SD810.DWG | DETAIL NUMBER: **810**

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PLAN
NTS



SECTION
NTS

NOTE:
FOR SIZE OF PIPE, REFER TO
CONSTRUCTION DRAWING.

Gary M. Schimek

APPROVED BY: GARY M. SCHIMEK
ENVIRONMENTAL AND UTILITY SERVICES DIVISION MANAGER

REVISION DATE: MARCH 01, 2019

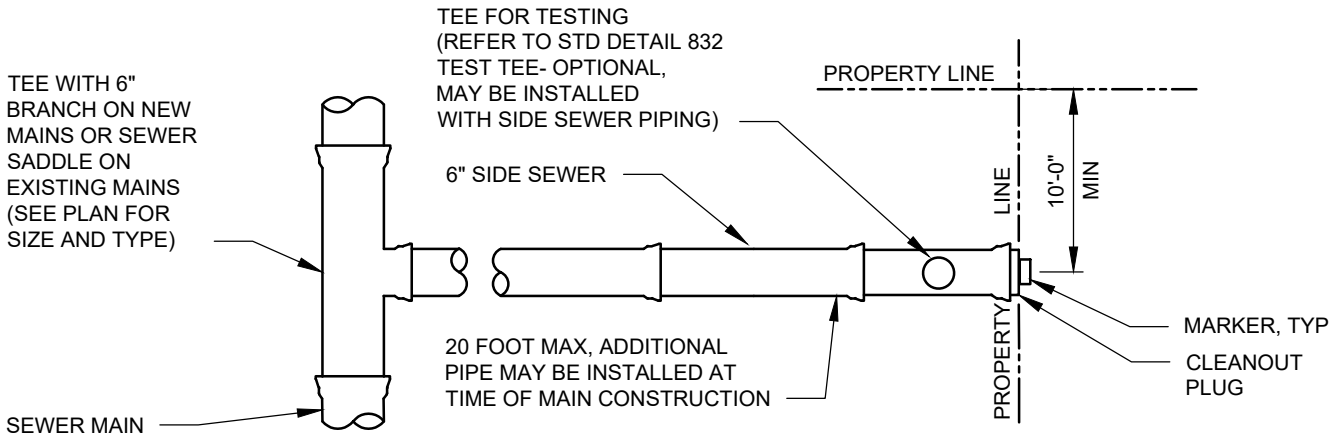
CityofRedmond
WASHINGTON

STANDARD DETAILS

DROP CONNECTION

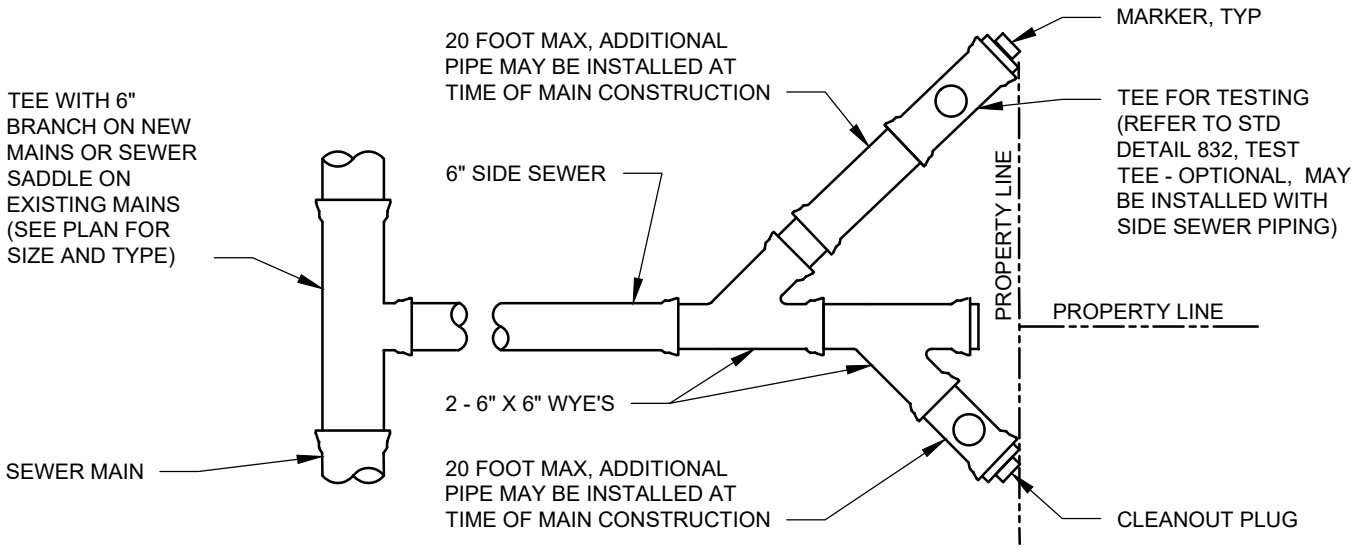
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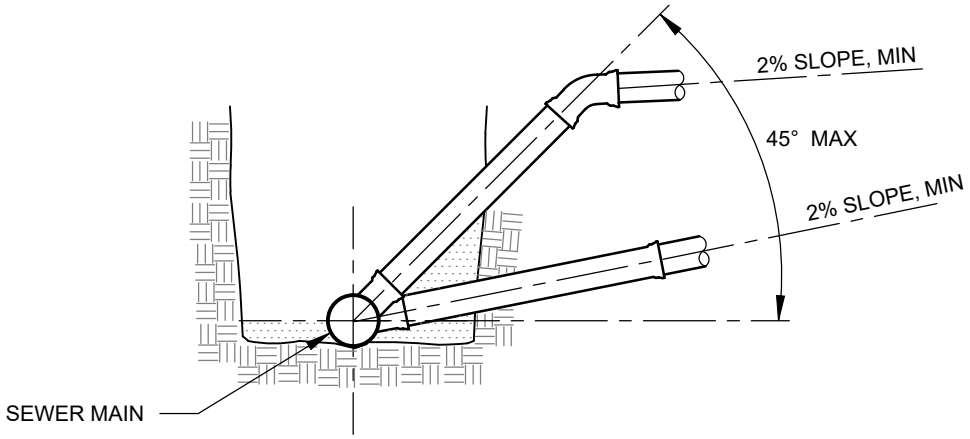
TYPICAL SINGLE SERVICE

NTS



TYPICAL DOUBLE SERVICE

NTS



CONNECTION AT SEWER MAIN

NTS

Gary M. Schimek

APPROVED BY: GARY M. SCHIMEK
ENVIRONMENTAL AND UTILITY SERVICES DIVISION MANAGER

REVISION DATE: MARCH 01, 2019

CityofRedmond
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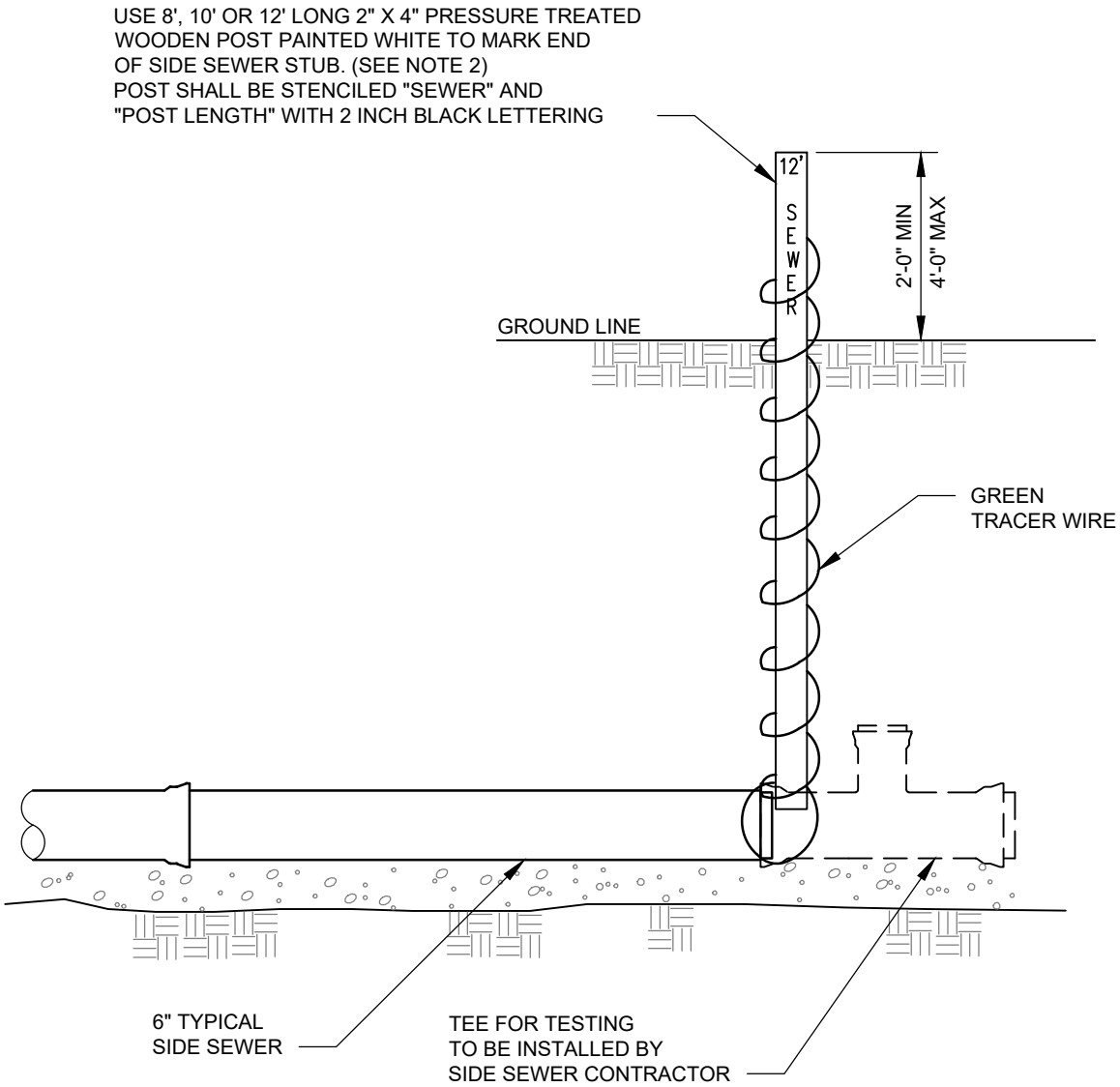
STANDARD DETAILS

SIDE SEWER

FILE NAME: SD830.DWG

DETAIL NUMBER: **830**

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SIDE SEWER MARKER

NTS

NOTES:

1. DISTANCE TO SIDE SEWER STUB IS MEASURED FROM TOP OF POST TO INVERT OF PIPE.
2. FOR STUBS GREATER THAN 10 FEET DEEP, SPLICE PRESSURE TREATED 2"X 4" POSTS WITH A MINIMUM OF A 2 FOOT OVERLAP.

Gary M. Schimek

APPROVED BY: GARY M. SCHIMEK
ENVIRONMENTAL AND UTILITY SERVICES DIVISION MANAGER

REVISION DATE: MARCH 01, 2019

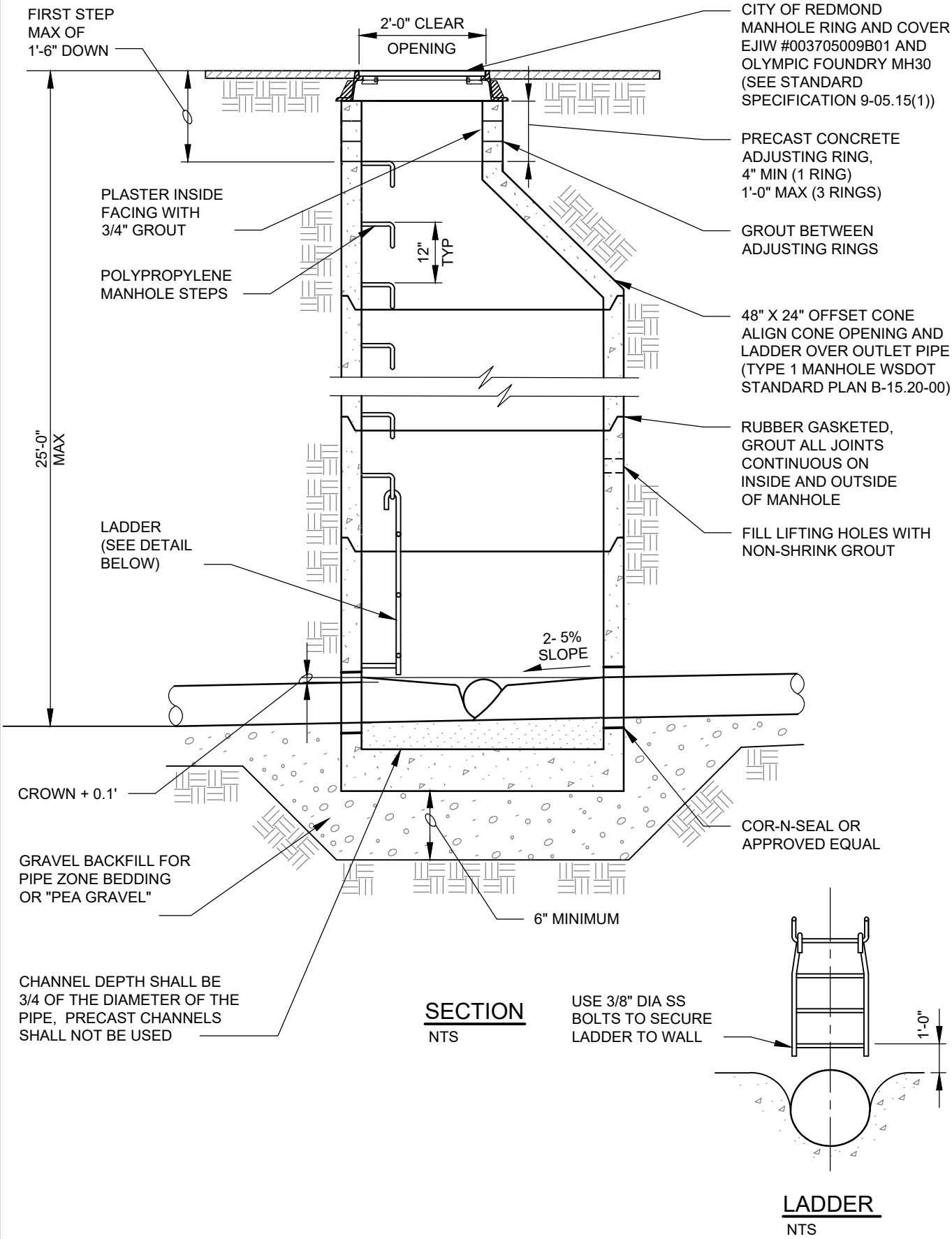
CityofRedmond WASHINGTON

STANDARD DETAILS

SIDE SEWER MARKER

FILE NAME: SD832.DWG | DETAIL NUMBER: **832**

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Gary M. Schimek

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ENVIRONMENTAL AND UTILITY SERVICES DIVISION MANAGER

REVISION DATE: MARCH 01, 2020

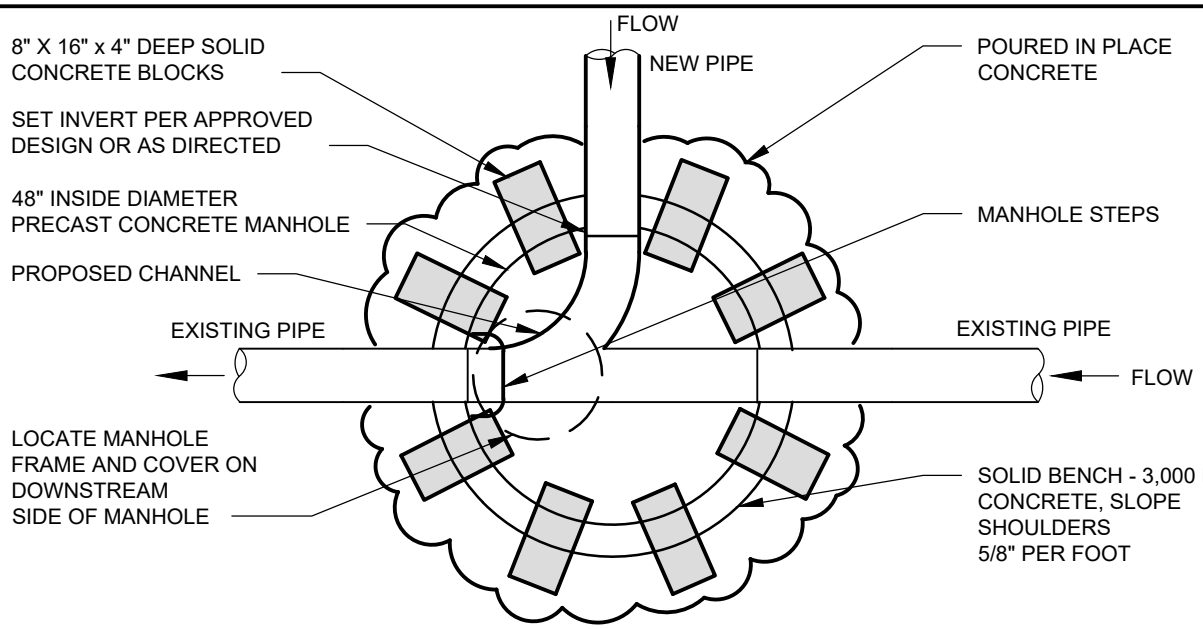
CityofRedmond
WASHINGTON

STANDARD DETAILS

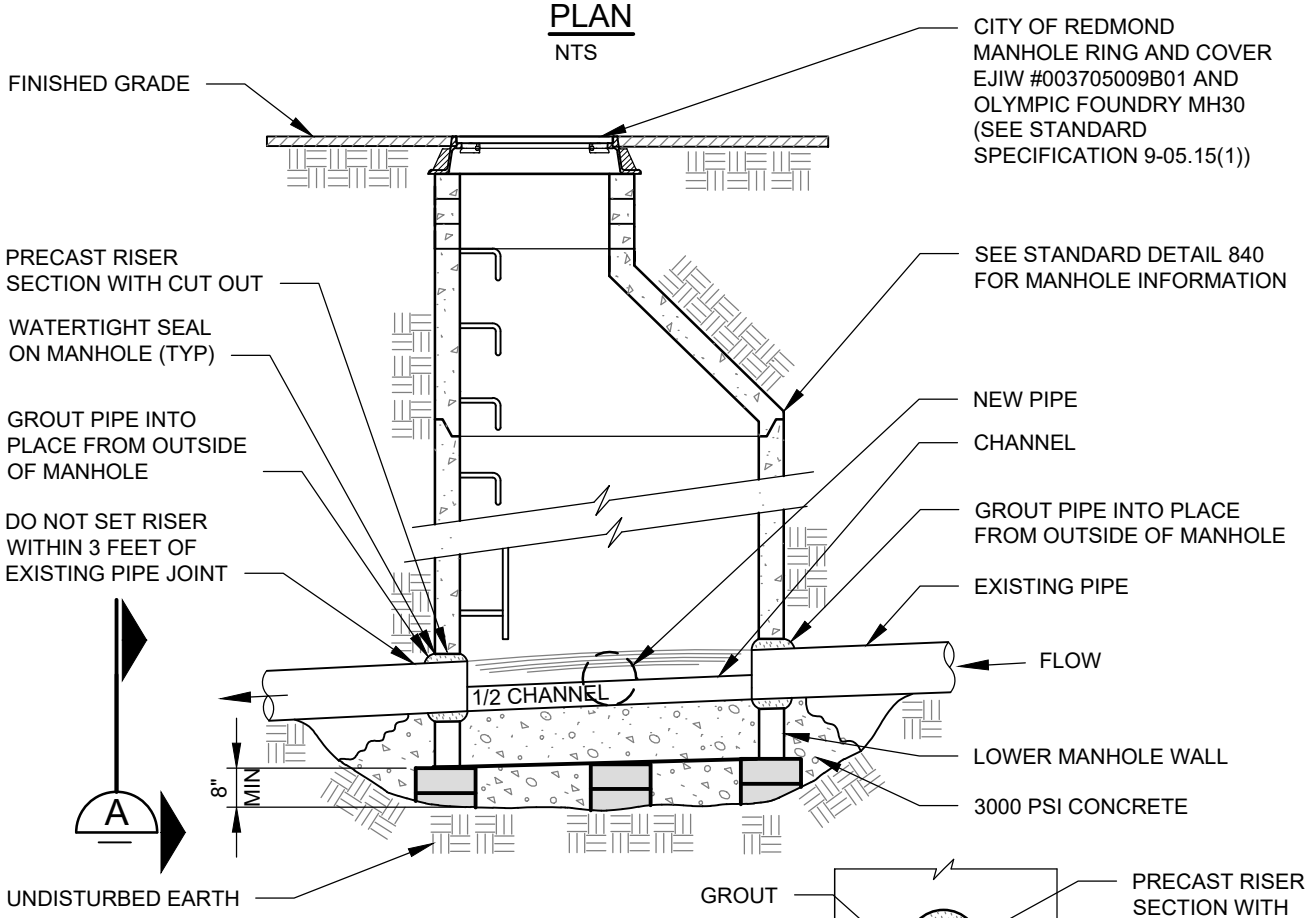
48" STANDARD SEWER MANHOLE

FILE NAME: SD840.DWG | DETAIL NUMBER: **840**

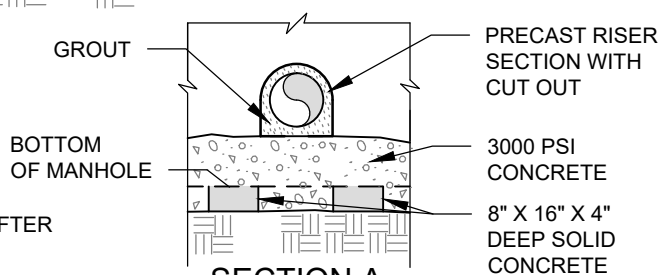
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PLAN
NTS



SECTION
NTS



SECTION A
NTS

NOTES:

1. MANHOLES SHALL BE WATERTIGHT.
2. TOP OF EXISTING PIPE SHALL BE CUT AND REMOVED ONLY AFTER NEW PIPE IS TESTED, CCTV'D, AND APPROVED BY THE CITY.
3. A SADDLE MANHOLE SHALL NOT BE PLACED OVER AC OR CONC PIPE.

Gary M. Schimek

APPROVED BY: GARY M. SCHIMEK
ENVIRONMENTAL AND UTILITY SERVICES DIVISION MANAGER

REVISION DATE: MARCH 01, 2020

CityofRedmond WASHINGTON

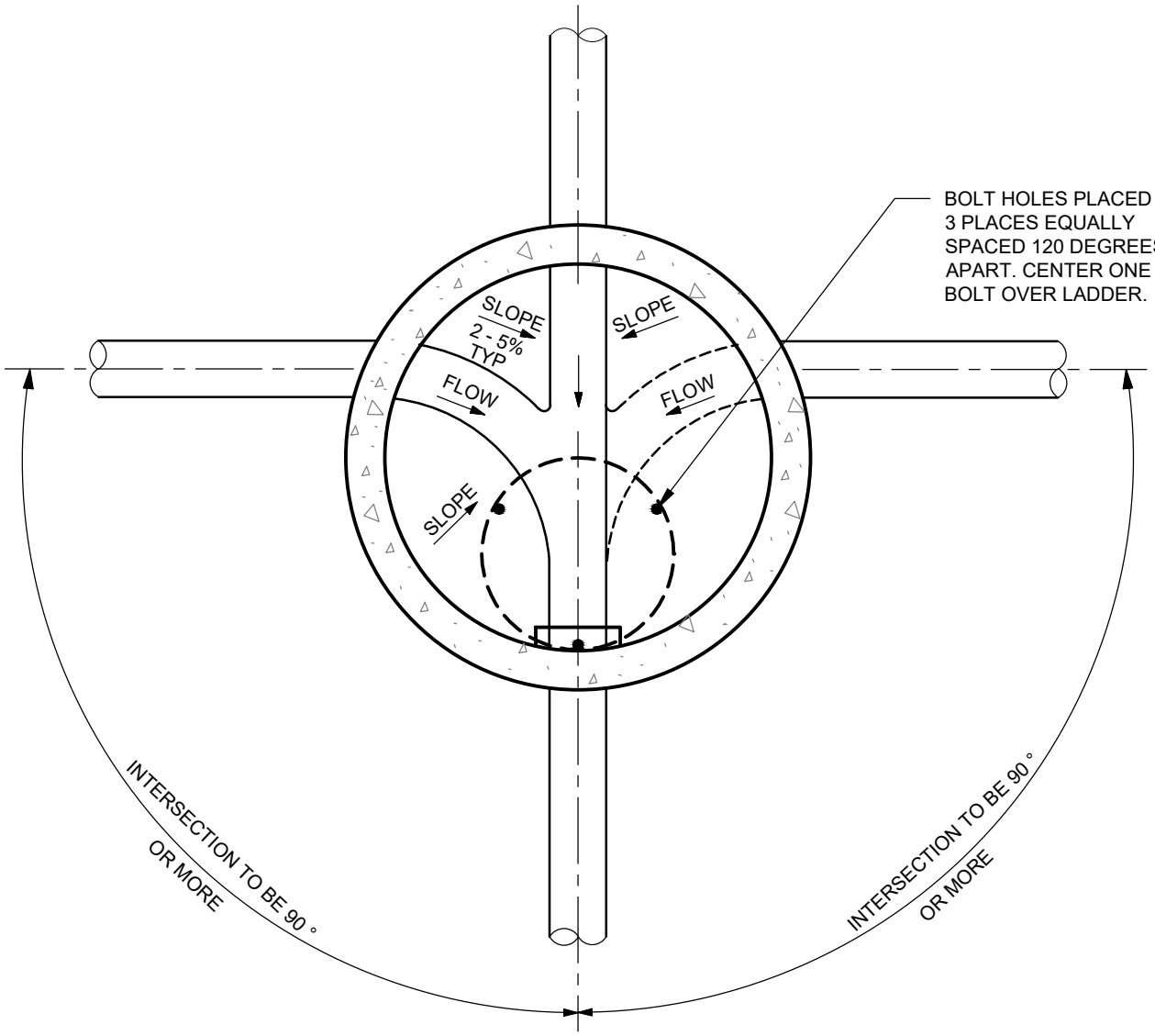
STANDARD DETAILS

48" SADDLE MANHOLE

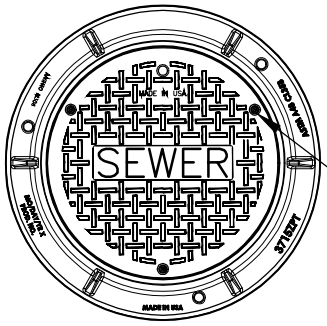
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DETAIL NUMBER: **841**

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PLAN
NTS



3 BOLT HOLES
SEE PLAN ABOVE

MANHOLE COVER
NTS

NOTE:

IN "TOP OF SYSTEM" MANHOLES WITH A 6 INCH LATERAL, PROVIDE CHANNELING TO THE UPSTREAM END OF MANHOLE. CHANNEL WIDTH SHALL BE EQUAL TO THE DOWNSTREAM SEWER MAIN DIAMETER.

Gary M. Schimek

APPROVED BY: GARY M. SCHIMEK
ENVIRONMENTAL AND UTILITY SERVICES DIVISION MANAGER

REVISION DATE: MARCH 01, 2019

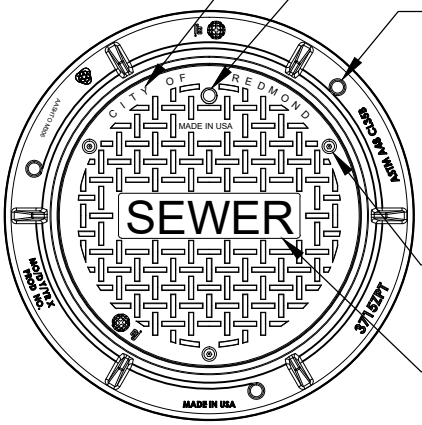
CityofRedmond
WASHINGTON

STANDARD DETAILS

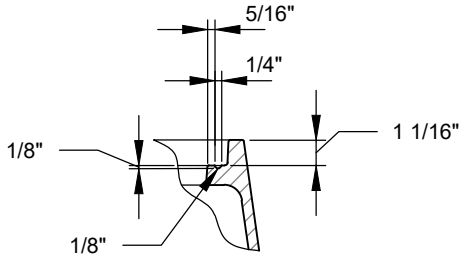
INTERSECTION OF SEWERS AT MANHOLE

FILE NAME: SD842.DWG | DETAIL NUMBER: **842**

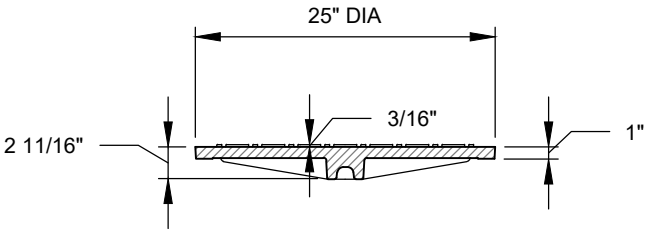
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PLAN
NTS

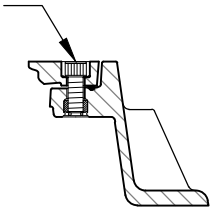


GASKET GROOVE DETAIL
NTS

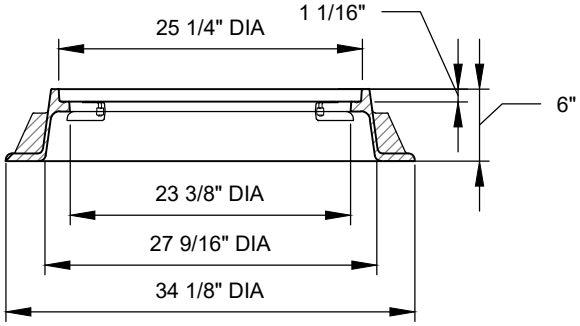


COVER SECTION
NTS

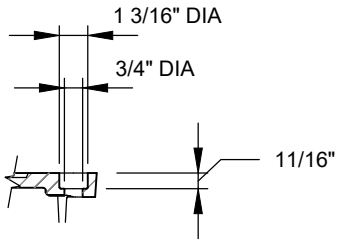
(3) BLT SOC (ALLEN HEAD)
5/8" - 11 X 1.5 SS WITH
SS AND RUBBER WASHERS
REPLACEABLE NUT



EON BOLTING DETAIL
NTS



FRAME SECTION
NTS



BOLTHOLE DETAIL
NTS

EJIW #003705009B01
NTS

Gary M. Schimek

APPROVED BY: GARY M. SCHIMEK
ENVIRONMENTAL AND UTILITY SERVICES DIVISION MANAGER

REVISION DATE: MARCH 01, 2019

CityofRedmond
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STANDARD DETAILS

SEWER MANHOLE FRAME AND COVER

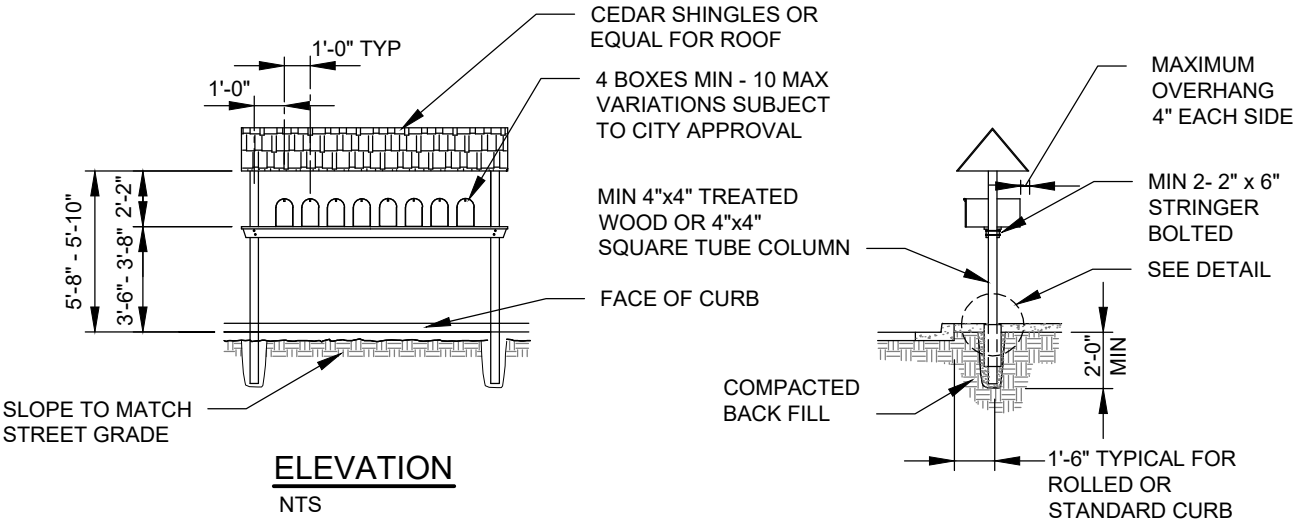
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SECTION 9

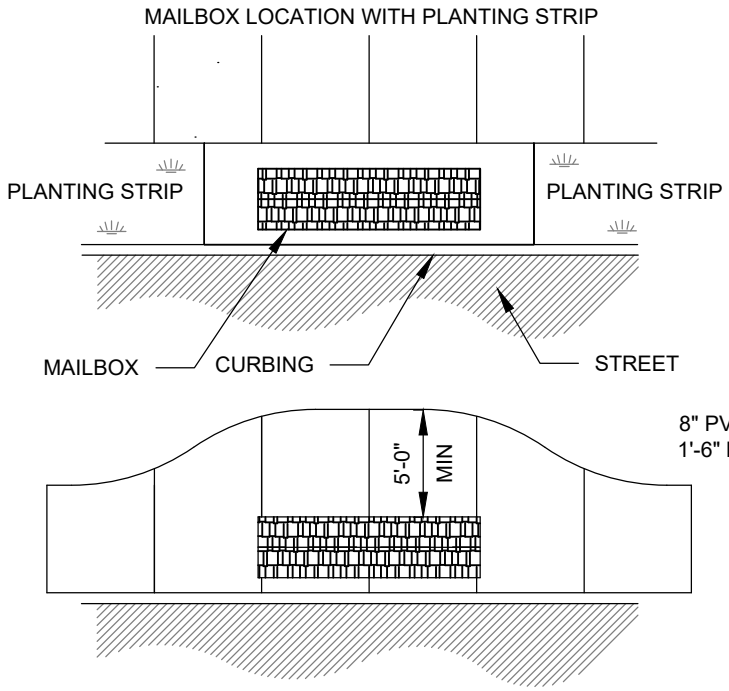
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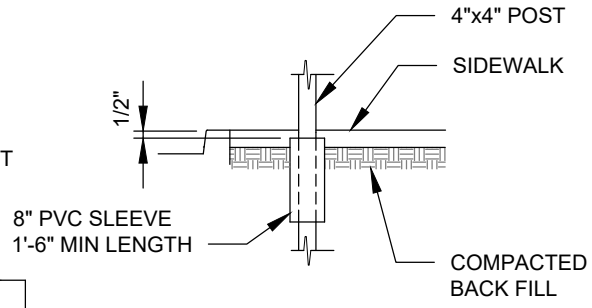


ELEVATION
NTS

ELEVATION
NTS



PLAN VIEWS
NTS



SLEEVE DETAIL
NTS

NOTES:

1. MAILBOX MUST BE POSTMASTER APPROVED WITH A UNIFORM BOX STYLE AND METHOD OF ADDRESS IDENTIFICATION.
2. LOCATION IS SUBJECT TO APPROVAL BY CITY FOR PROTECTION OF VIEWS, ACCESS, AND UTILITIES.
3. THE SKETCH DEPICTS A MINIMUM STRUCTURAL AND DIMENSIONAL STANDARD. INNOVATIVE DESIGNS MEETING THE MINIMUM DIMENSIONAL AND STRUCTURAL REQUIREMENTS ARE ACCEPTABLE.
4. DO NOT PLACE MAILBOX OVER CITY UTILITIES.
5. CLUSTER BOX UNIT MAILBOXES APPROVED BY UNITED STATES POSTAL SERVICE (USPS) ARE AN ACCEPTABLE REPLACEMENT FOR THIS MAILBOX STANDARD. (SEE STD DETAIL 901A)

Lisa W. Rigg

APPROVED BY: LISA W. RIGG
DEVELOPMENT ENGINEERING MANAGER

REVISION DATE: MARCH 01, 2018

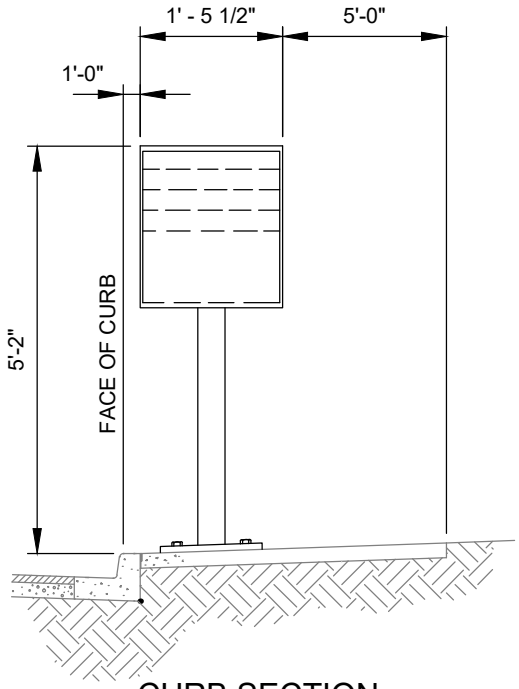
CityofRedmond WASHINGTON

STANDARD DETAILS

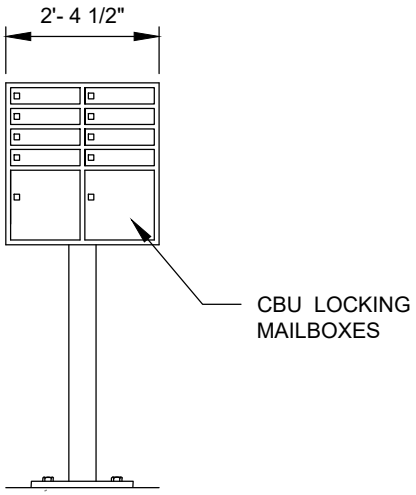
MAILBOX STANDARD

FILE NAME: SD901.DWG | DETAIL NUMBER: **901**

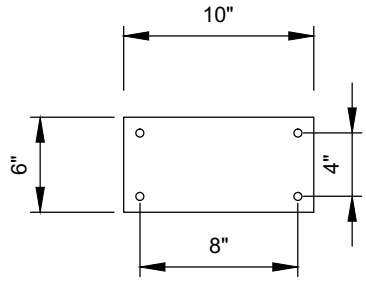
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CURB SECTION
NTS



STREET ELEVATION
NTS



PEDESTAL BOLT
BASE PATTERN
NTS

NOTES:

1. MAILBOX MUST BE POSTMASTER APPROVED WITH A UNIFORM BOX STYLE AND METHOD OF ADDRESS IDENTIFICATION.
2. LOCATION IS SUBJECT TO APPROVAL BY CITY FOR PROTECTION OF VIEWS, ACCESS, AND UTILITIES.
3. DO NOT PLACE MAILBOX OVER CITY UTILITIES.
4. TYPE AND LOCATION OF CLUSTER BOX UNITS (CBU) INCLUDING PEDESTAL, BASE PLATE, BREAKAWAY BOLTS AND ASSOCIATED CONCRETE SLAB SHALL BE APPROVED BY THE U.S. POSTAL SERVICE.
5. INSTALLATION OF CBU WILL BE DONE BY DEVELOPER. CONTACT GLEN MILLEY AT REDMOND POST OFFICE 425-885-0252 FOR A LIST OF SUPPLIERS. FOLLOWING INSTALLATION, POST OFFICE WILL ASSIGN NUMBERS AND INSTALL THEIR LOCKS.
6. OLD MAIL BOXES MUST BE REMOVED TO MEET CITY STANDARDS.

Lisa W. Rigg

APPROVED BY: LISA W. RIGG
DEVELOPMENT ENGINEERING MANAGER

REVISION DATE: MARCH 01, 2018

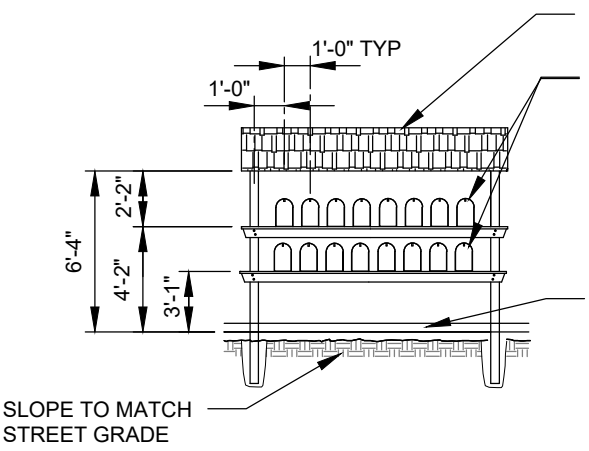
CityofRedmond
WASHINGTON

STANDARD DETAILS

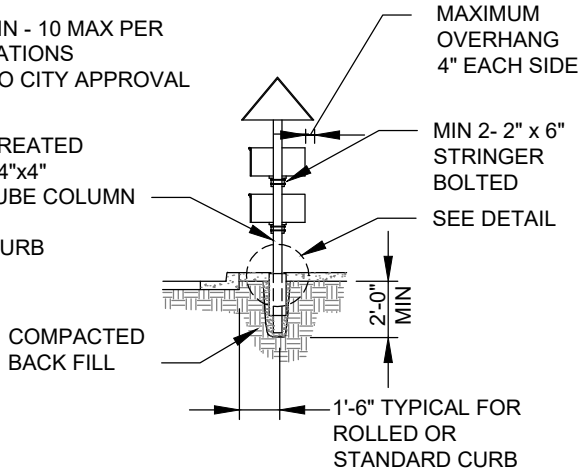
CLUSTER BOX MAILBOX STANDARD

FILE NAME: SD901A.DWG | DETAIL NUMBER: **901A**

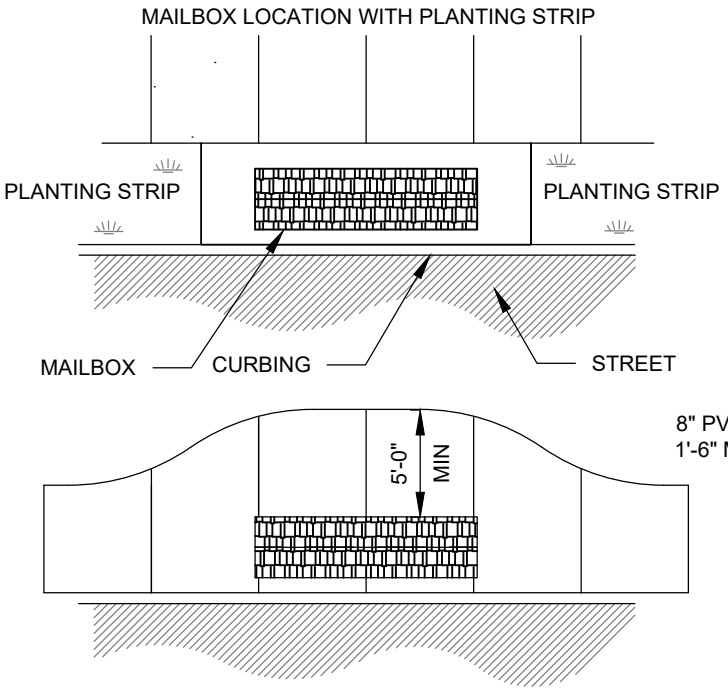
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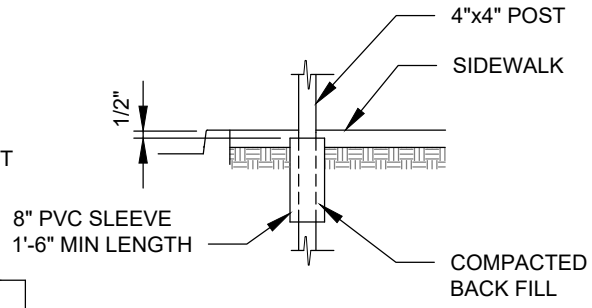
ELEVATION
NTS



ELEVATION
NTS



PLAN VIEWS
NTS



SLEEVE DETAIL
NTS

NOTES:

1. MAILBOX MUST BE POSTMASTER APPROVED WITH A UNIFORM BOX STYLE AND METHOD OF ADDRESS IDENTIFICATION.
2. LOCATION IS SUBJECT TO APPROVAL BY CITY FOR PROTECTION OF VIEWS, ACCESS, AND UTILITIES.
3. THE SKETCH DEPICTS A MINIMUM STRUCTURAL AND DIMENSIONAL STANDARD. INNOVATIVE DESIGNS MEETING THE MINIMUM DIMENSIONAL AND STRUCTURAL REQUIREMENTS ARE ACCEPTABLE.
4. DO NOT PLACE MAILBOX OVER CITY UTILITIES.
5. CLUSTER BOX UNIT MAILBOXES APPROVED BY UNITED STATES POSTAL SERVICE (USPS) ARE AN ACCEPTABLE REPLACEMENT FOR THIS MAILBOX STANDARD. (SEE STD DETAIL 901A)

Lisa W. Rigg

APPROVED BY: LISA W. RIGG
DEVELOPMENT ENGINEERING MANAGER

REVISION DATE: MARCH 01, 2018

CityofRedmond WASHINGTON

STANDARD DETAILS

DOUBLE MAILBOX STANDARD

FILE NAME: SD902.DWG | DETAIL NUMBER: **902**

DocuSign Envelope ID: F681597A-CCE8-405B-ACDB-A8564C559739

NOTES:

1. CASTINGS SHALL BE GRAY IRON AASHTO M360, CLASS 35B.
2. COVER SEAT SHALL BE MACHINED FOR PERFECT CONTACT AROUND CIRCUMFERENCE AND FULL WIDTH OF BEARING SURFACE.
3. APPROXIMATE WEIGHTS STANDARD:
   - CASE 60 LBS
   - COVER 19 LBS
   - TOTAL 79 LBS
4. BRASS CAP 2" DIA MINIMUM.
5. IF MONUMENT IS LOCATED IN A SOFT AREA, INSTALL A 2' X 2' 4" THICK, CONCRETE PAD WITH CL. 3000 CONCRETE.

SURVEY MONUMENT CASE AND COVER

NTS

Paul S. Cho

APPROVED BY: PAUL S. CHO
TRAFFIC OPERATIONS SAFETY AND ENGINEERING MANAGER

REVISION DATE: MARCH 01, 2020

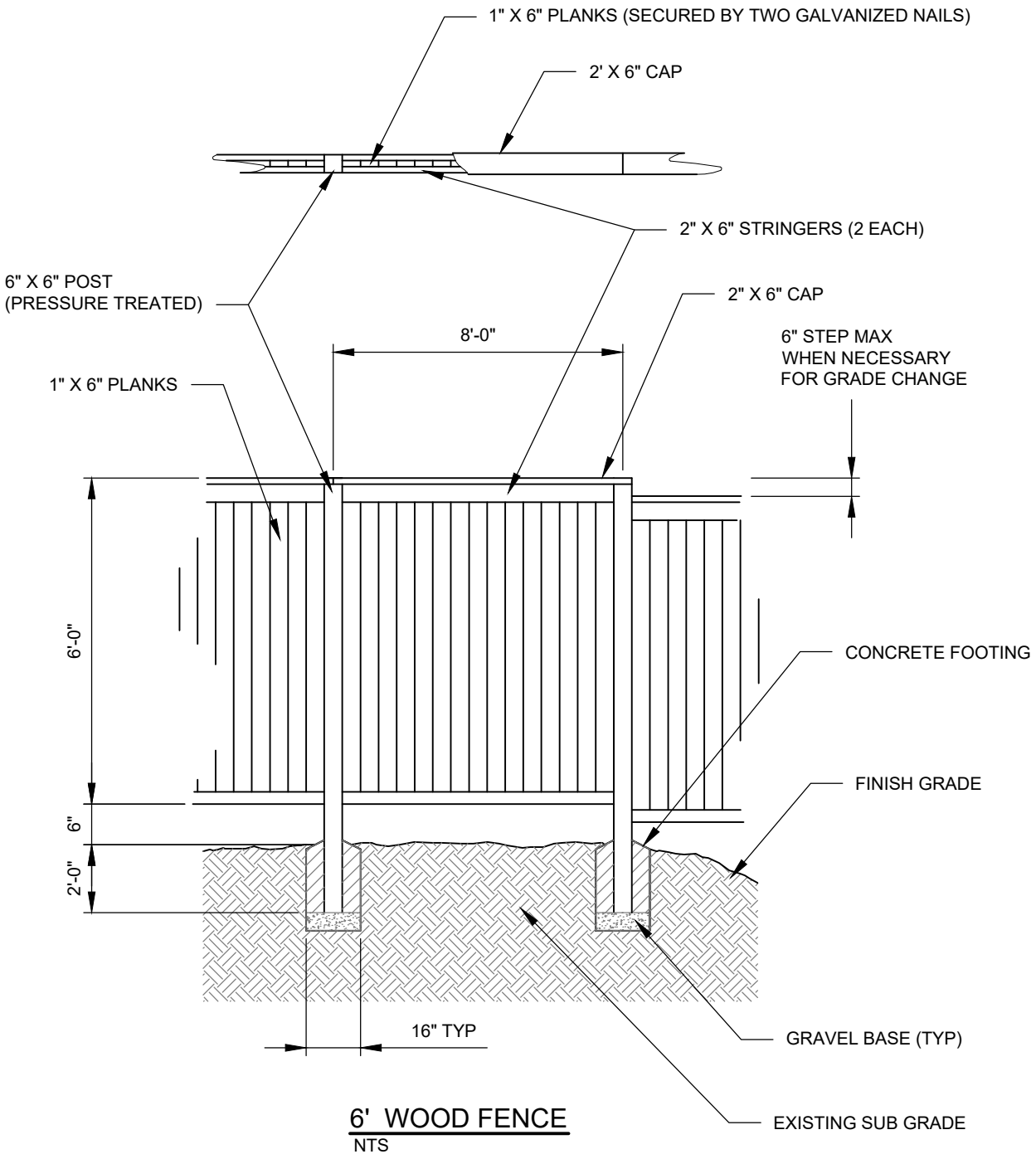
CityofRedmond WASHINGTON

STANDARD DETAILS

SURVEY MONUMENT CASE AND COVER

FILE NAME: SD903.DWG | DETAIL NUMBER: **903**

DocuSign Envelope ID: F681597A-CCE8-405B-ACDB-A8564C559739



6' WOOD FENCE

NTS

NOTES:

1. 6' X 6" POSTS NEED TO BE PRESSURE TREATED FIR.
2. ALL OTHER WOOD MEMBERS TO BE CEDAR.
3. ALL NAILS USED SHALL BE GALVANIZED.

Lisa W. Rigg

APPROVED BY: LISA W. RIGG
DEVELOPMENT ENGINEERING MANAGER

REVISION DATE: MARCH 01, 2018

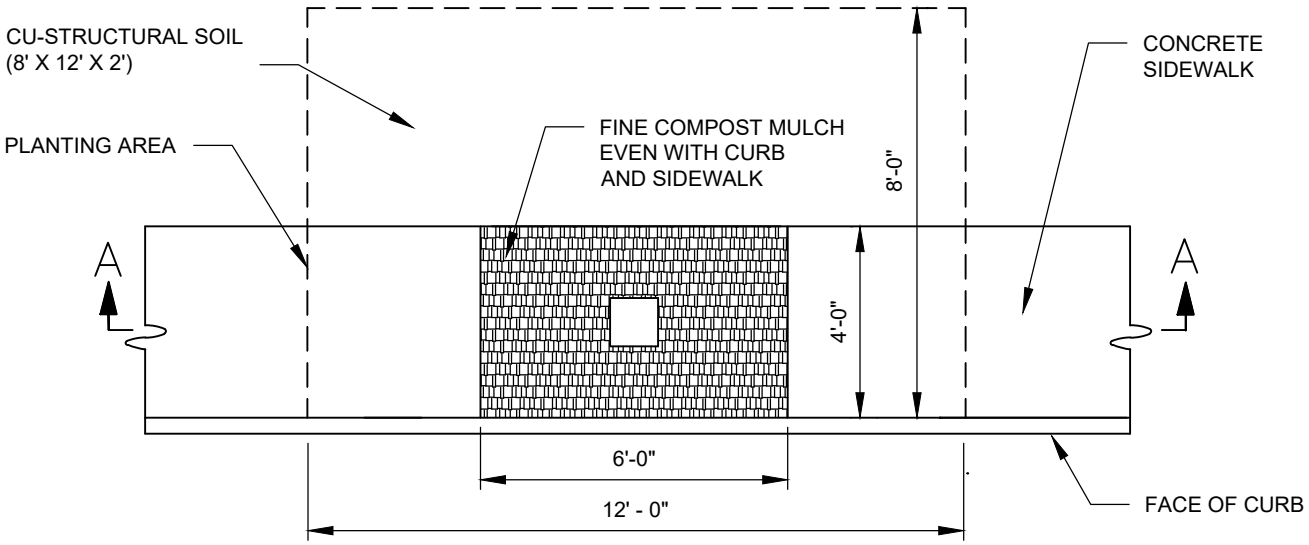
CityofRedmond
WASHINGTON

STANDARD DETAILS

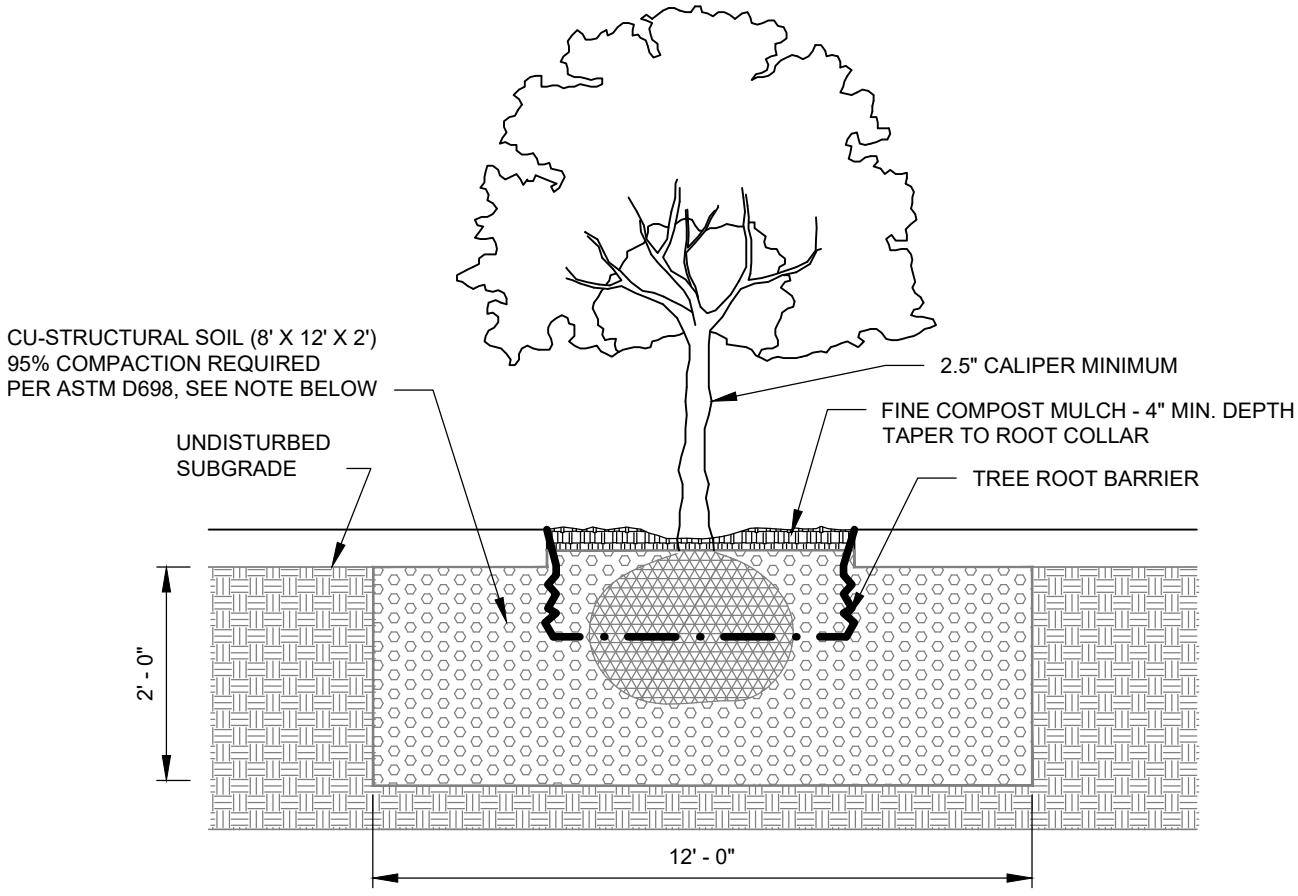
6' WOOD FENCE

FILE NAME: SD904.DWG | DETAIL NUMBER: **904**

DocuSign Envelope ID: F681597A-CCE8-405B-ACDB-A8564C559739



PLAN VIEW
NTS



NOTE:

CU-STRUCTURAL SOIL SUPPLIED
BY: PACIFIC TOPSOILS INC,
MILL CREEK, WA OR EQUAL

SECTION A-A
NTS

Dave Tuchek

APPROVED BY: DAVE TUCHEK
PARKS MAINTENANCE AND OPERATIONS MANAGER

REVISION DATE: MARCH 01, 2018

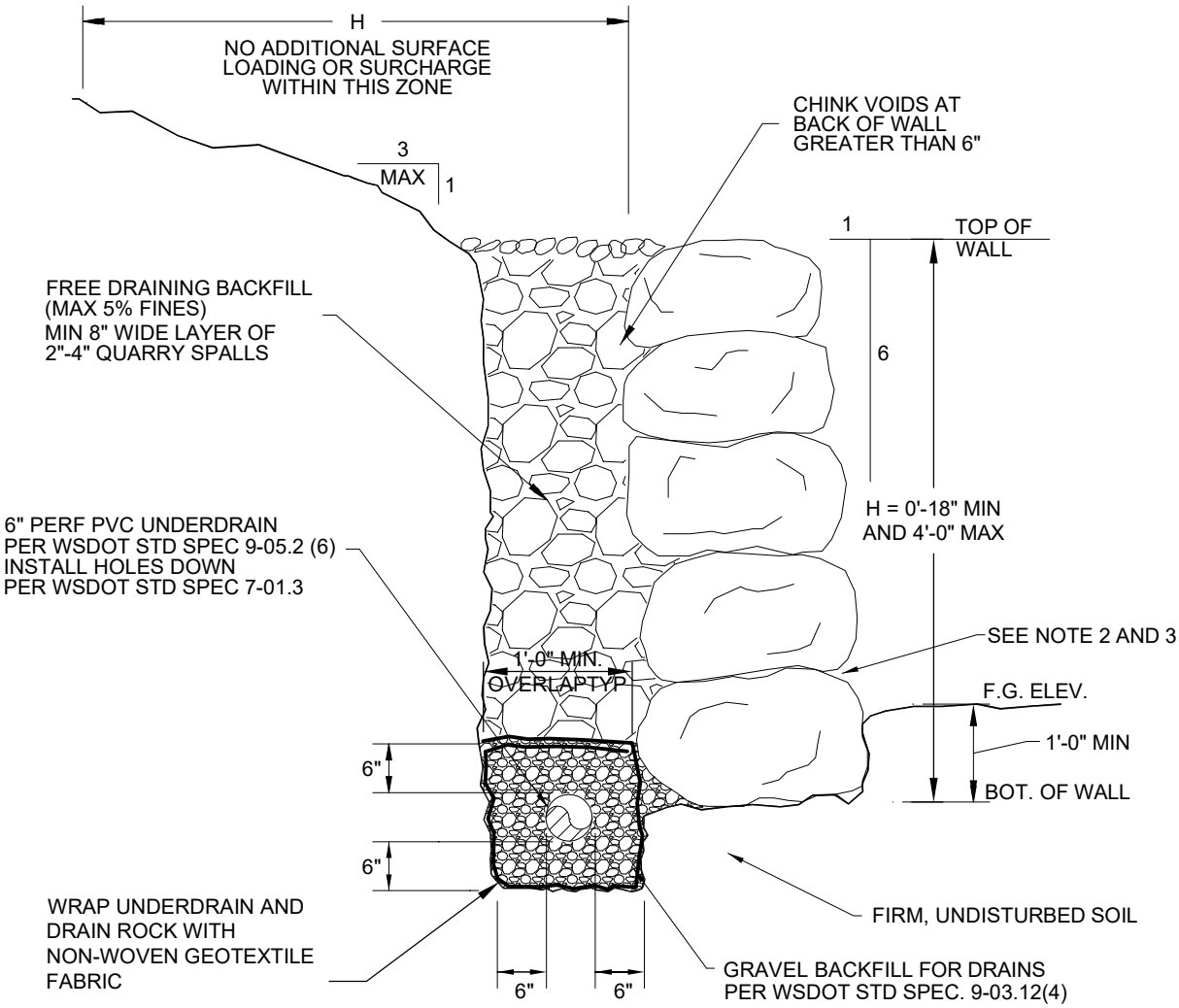
CityofRedmond
WASHINGTON

STANDARD DETAILS

STRUCTURAL SOIL FOR STREET TREES

FILE NAME: SD907.DWG | DETAIL NUMBER: **907**

DocuSign Envelope ID: F681597A-CCE8-405B-ACDB-A8564C559739



NOTES:

1. LONG DIMENSIONS OF THE ROCKS SHALL EXTEND INTO EARTH TO PROVIDE MAXIMUM STABILITY.
2. ROCK SHALL BE PLACED SO AS TO LOCK INTO TWO ROCKS IN THE LOWER TIER.
3. ROCK SHALL BE HARD, SOUND, AND DURABLE MATERIAL, FREE FROM SEAMS, CRACKS, AND OTHER DEFECTS AND SHALL MEET THE REQUIREMENTS OF WSDOT STD. SPEC 9-13.7. SIZE OF ROCK USED SHALL BE IN ACCORDANCE WITH "STANDARD ROCK WALL CONSTRUCTION GUIDELINES" OF THE ASSOCIATED ROCKERY CONTRACTORS (ARC).
4. UNDERDRAIN IS REQUIRED BEHIND ROCK WALL, IF ADJACENT TO CITY RIGHT-OF-WAY, AND/OR HEIGHT (H) GREATER THAN 18 INCHES.
5. UNDERDRAIN SHALL BE TIGHT-LINED TO THE STORM SYSTEM USING CARSON BOXES FOR CLEANOUTS. OTHER DISCHARGE METHODS MAY BE APPROVED BY THE ENGINEER.
6. WHERE NEEDED FOR SAFETY, AT LOCATIONS OF DROPS 30 INCHES OR GREATER, A SAFETY RAILING OF 42 INCH MINIMUM HEIGHT IS REQUIRED, SEE STANDARD DETAIL 321.
7. ROCKERIES MUST BE ACCESSIBLE BY MAINTENANCE VEHICLES.
8. CLEANOUTS WITH CARSON BOXES SHALL BE INSTALLED AT ALL BENDS AND EVERY 100 LF.
9. WALLS 4 FEET TALL AND GREATER REQUIRE A SEPARATE BUILDING PERMIT. UNDERDRAIN REQUIREMENTS APPLY TO ALL WALLS.

Lisa W. Rigg

APPROVED BY: LISA W. RIGG
DEVELOPMENT ENGINEERING MANAGER

REVISION DATE: MARCH 01, 2018

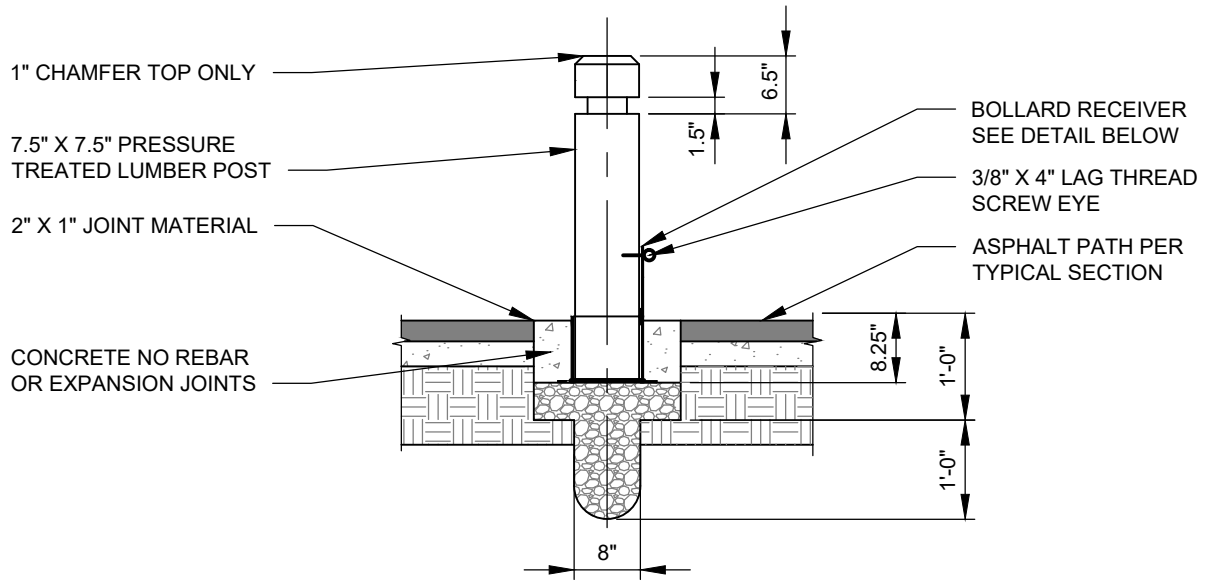
CityofRedmond
WASHINGTON

STANDARD DETAILS

ROCK WALL UNDER 4 FEET

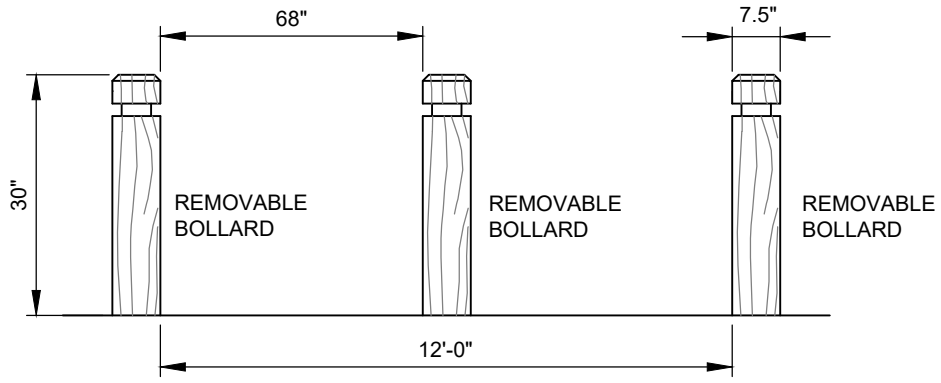
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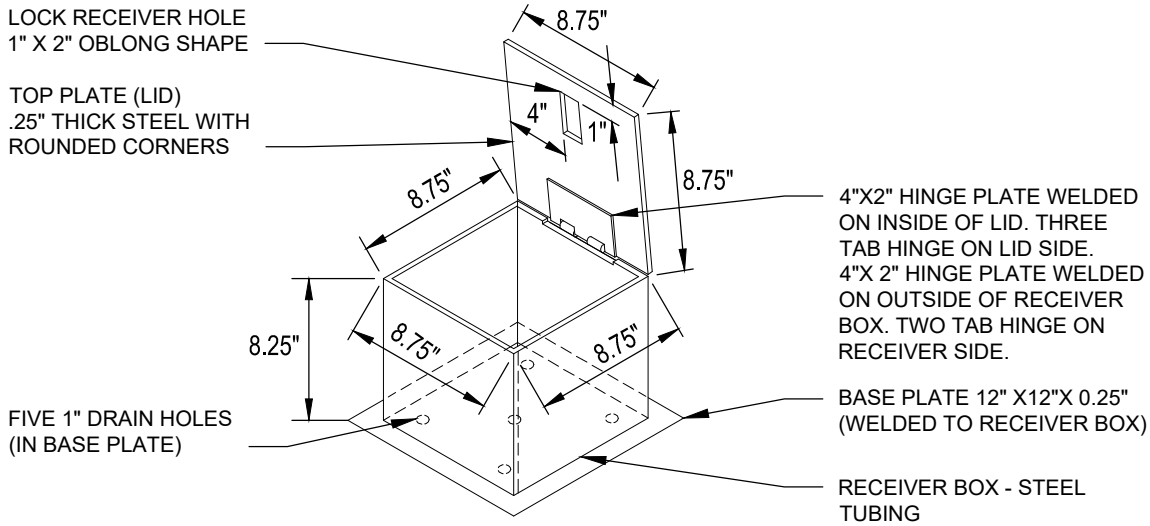
BOLLARD ELEVATION

NTS



BOLLARD SPACING

NTS



NOTE:
BOLLARD LID, HINGES, RECEIVER BOX AND BASE PLATE SHALL BE HOT DIPPED GALVANIZED.

REMOVABLE BOLLARD RECEIVER

NTS

Dave Tuchek

APPROVED BY: DAVE TUCHEK
PARKS MAINTENANCE AND OPERATIONS MANAGER

REVISION DATE: MARCH 01, 2019

CityofRedmond WASHINGTON

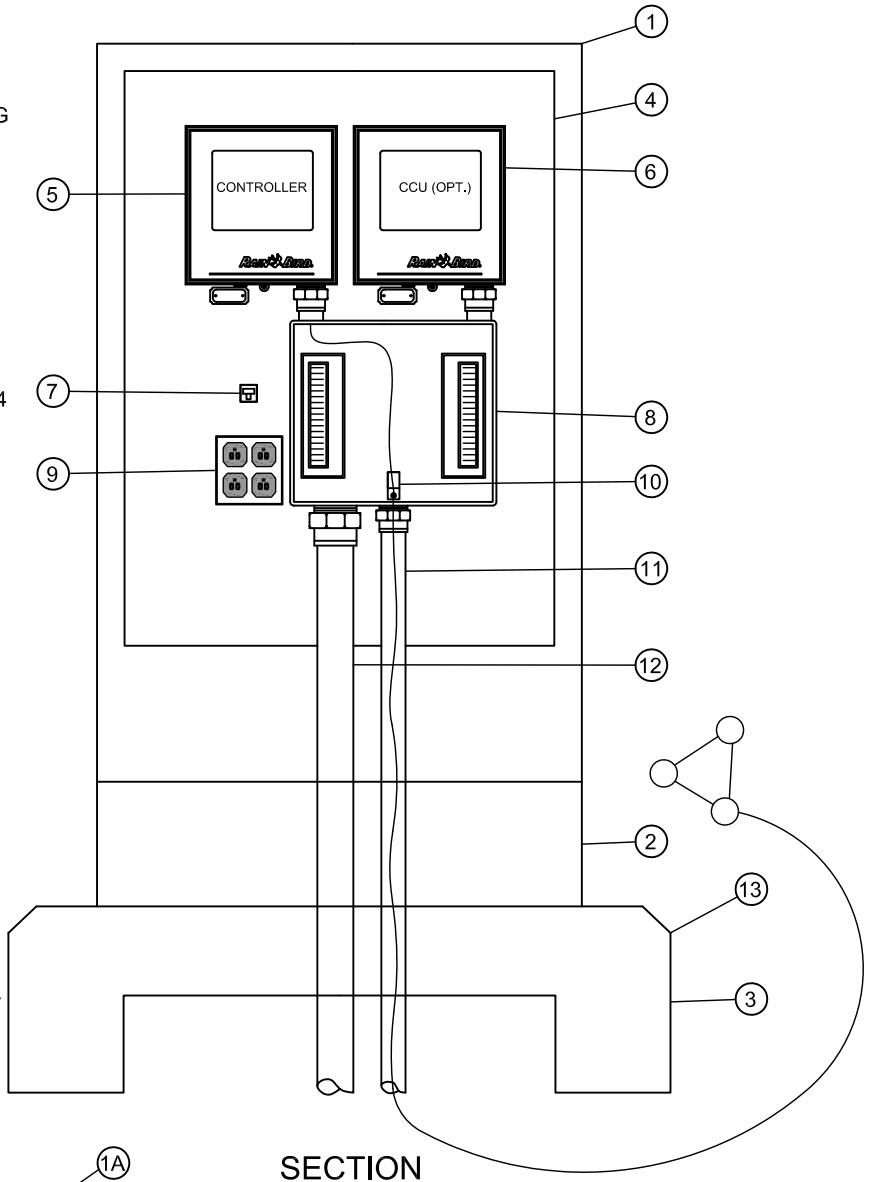
STANDARD DETAILS

REMOVABLE BOLLARD

FILE NAME: SD911.DWG | DETAIL NUMBER: **911**

DocuSign Envelope ID: F681597A-CCE8-405B-ACDB-A8564C559739

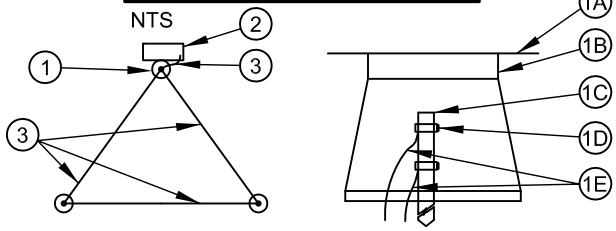
1. CONTROLLER CABINET - VIT INC. - STRONG BOX
   METERED - SB-24SS/120V
   NON-METERED - SB-24SS
2. RISER PEDESTAL - VIT INC. - STRONG BOX PED-24SS (12") REQ. ON NON-METERED CABINET
3. FOUNDATION - VIT INC. - STRONGBOX
   METERED CABINET - QUICKPAD - QP-M
   NON METERED CABINET - QUICKPAD QP-24
4. BACK PANEL - STAINLESS STEEL
   FOR WALL AND CABINET MOUNT (TYP.)
5. CONTROLLER: RAINBIRD ESP-XX, SAT OR SITE-W CONTROLLER WITH REMOTE RECEIVER CARD (#01060UP).
6. IF USING ESP-SAT - USE CCU 6 (JR)
7. RJ-11 PHONE JACK AND HARDLINE PHONE SERVICE (REQ.).
8. TERMINAL BOX W/ TERMINAL STRIPS.
9. GFI OUTLET
10. GROUND LUG.
11. 1" CONDUIT FOR GROUND WIRE FROM GROUNDING GRID (TYP.).
12. 2" CONDUIT FOR STATION ZONE CONTROL WIRES
13. FINISHED GRADE



SECTION
NTS

GROUND GRID DETAIL

NTS



GROUND ROD LAYOUT GROUND ROD ASSEMBLY

1. GROUND ROD ASSEMBLY
   - 1A. FINAL GRADE
   - 1B. 8" VALVE BOX
   - 1C. 8' COPPER CLAD GROUND ROD
   - 1D. GROUND ROD CLAMPS
   - 1E. MIN 10-1 BARE COPPER
2. PROTECTED DEVICE
3. BARE COPPER GROUND WIRE

NOTES:
1. MINIMUM 8' SPACING BETWEEN RODS
2. USE 10g (MINIMUM) BARE COPPER WIRE
3. WIRE FROM EQUIPMENT TO FIRST ROD SHOULD BE AS SHORT AND STRAIGHT AS POSSIBLE.
4. USE SEPARATE CLAMP FOR EACH WIRE

Dave Tuchek

APPROVED BY: DAVE TUCHEK
PARKS MAINTENANCE AND OPERATIONS MANAGER

REVISION DATE: JULY 01, 2014

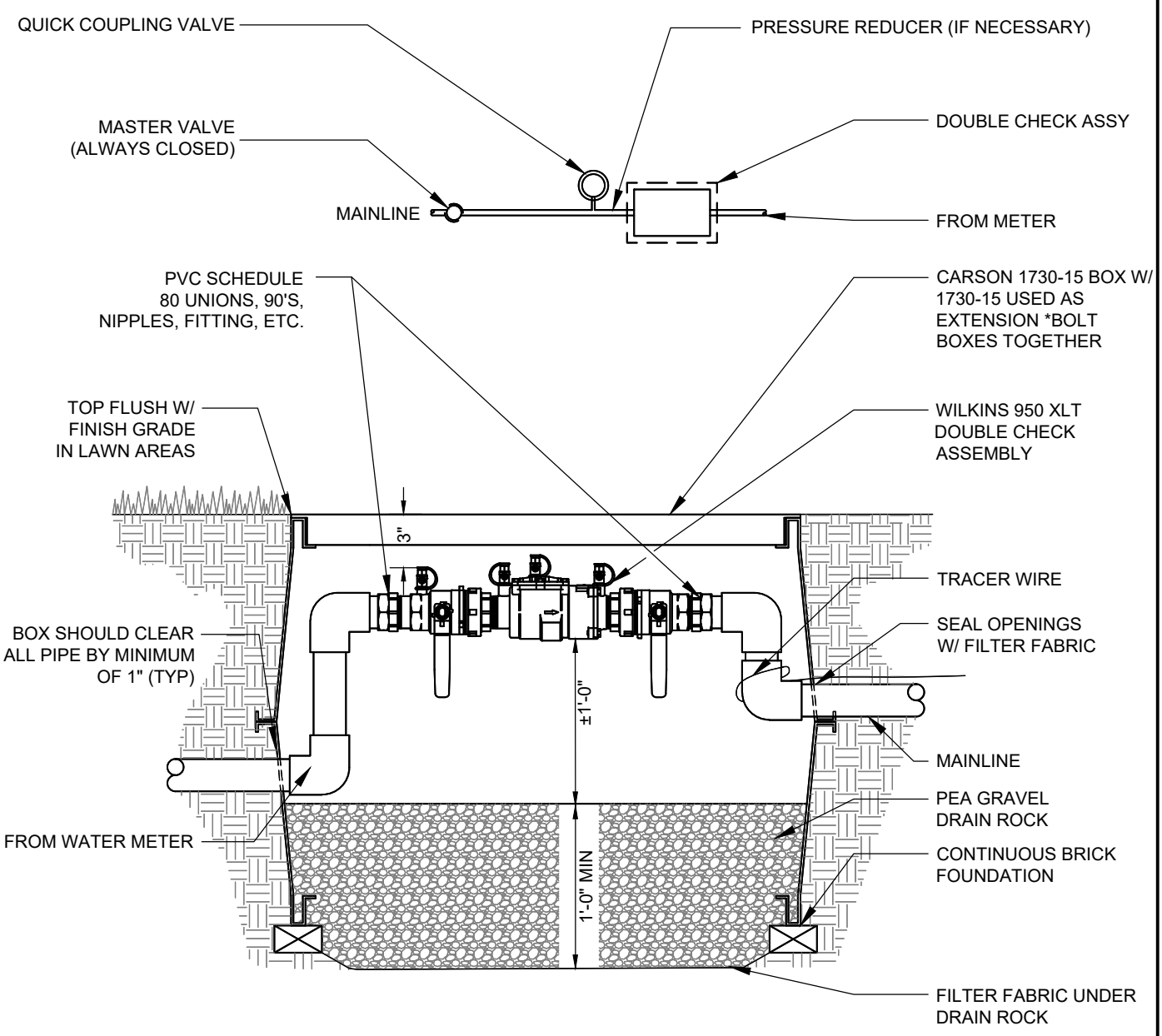
CityofRedmond
WASHINGTON

STANDARD DETAILS

IRRIGATION CONTROL PANEL AND CABINET

FILE NAME: SD920.DWG | DETAIL NUMBER: **920**

DocuSign Envelope ID: F681597A-CCE8-405B-ACDB-A8564C559739



SECTION
NTS

Dave Tuchek

APPROVED BY: DAVE TUCHEK
PARKS MAINTENANCE AND OPERATIONS MANAGER

REVISION DATE: MARCH 01, 2016

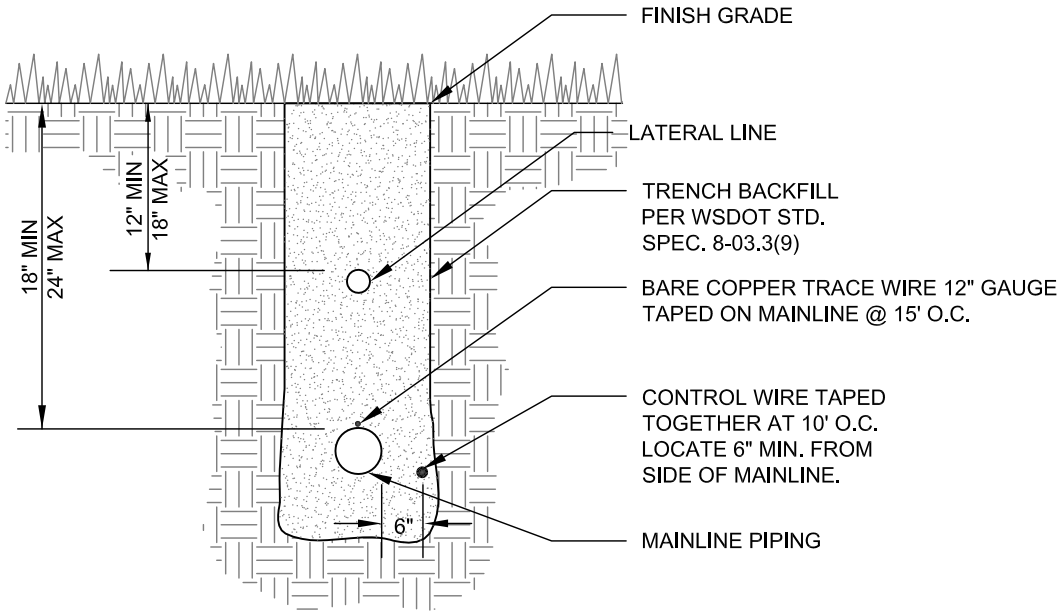
CityofRedmond
WASHINGTON

STANDARD DETAILS

PARKS DOUBLE CHECK VALVE

FILE NAME: SD921.DWG | DETAIL NUMBER: **921**

DocuSign Envelope ID: F681597A-CCE8-405B-ACDB-A8564C559739



SECTION

NTS

NOTES:

1. SEE STD. SPEC. 9-15.05 FOR REDMOND PARKS IRRIGATION STANDARDS.

Dave Tuchek

APPROVED BY: DAVE TUCHEK
PARKS MAINTENANCE AND OPERATIONS MANAGER

REVISION DATE: MARCH 01, 2017

CityofRedmond
WASHINGTON

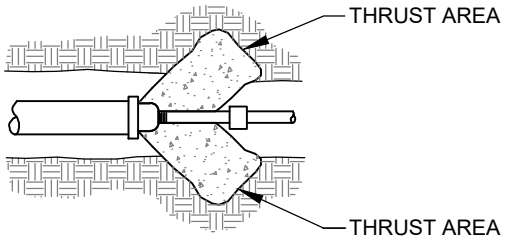
STANDARD DETAILS

IRRIGATION TRENCH

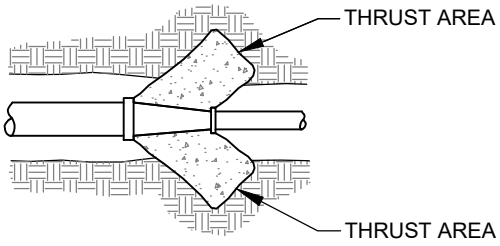
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DETAIL NUMBER: **922**

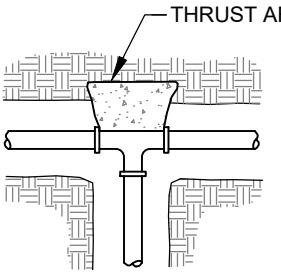
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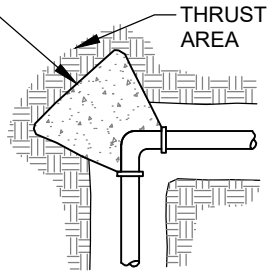
CAPS / PLUGS



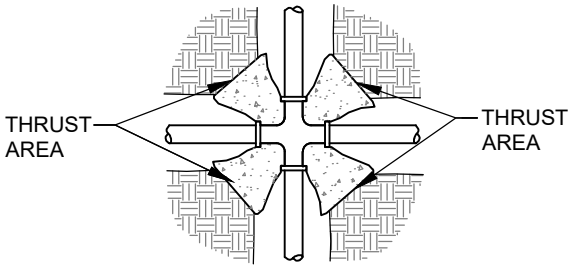
REDUCERS



TEES



ELLS



CROSSES

FITTING SIZES	BEARING AREA OF BLOCK IN SQUARE FEET			
	TEES & ENDS	90° BEND	45° BEND	22.5° BEND
4"	1-1/2	2	1-1/2	1-1/2

ALL BLOCKING SHALL BE POURED AGAINST FIRM UNDISTURBED SOIL.
SOIL BEARING PRESSURE SHALL EXCEED 4,500 LB PER SQUARE FOOT FOR ABOVE AREAS.

SECTION

NTS

Dave Tuchek

APPROVED BY: DAVE TUCHEK
PARKS MAINTENANCE AND OPERATIONS MANAGER

REVISION DATE: MARCH 01, 2018

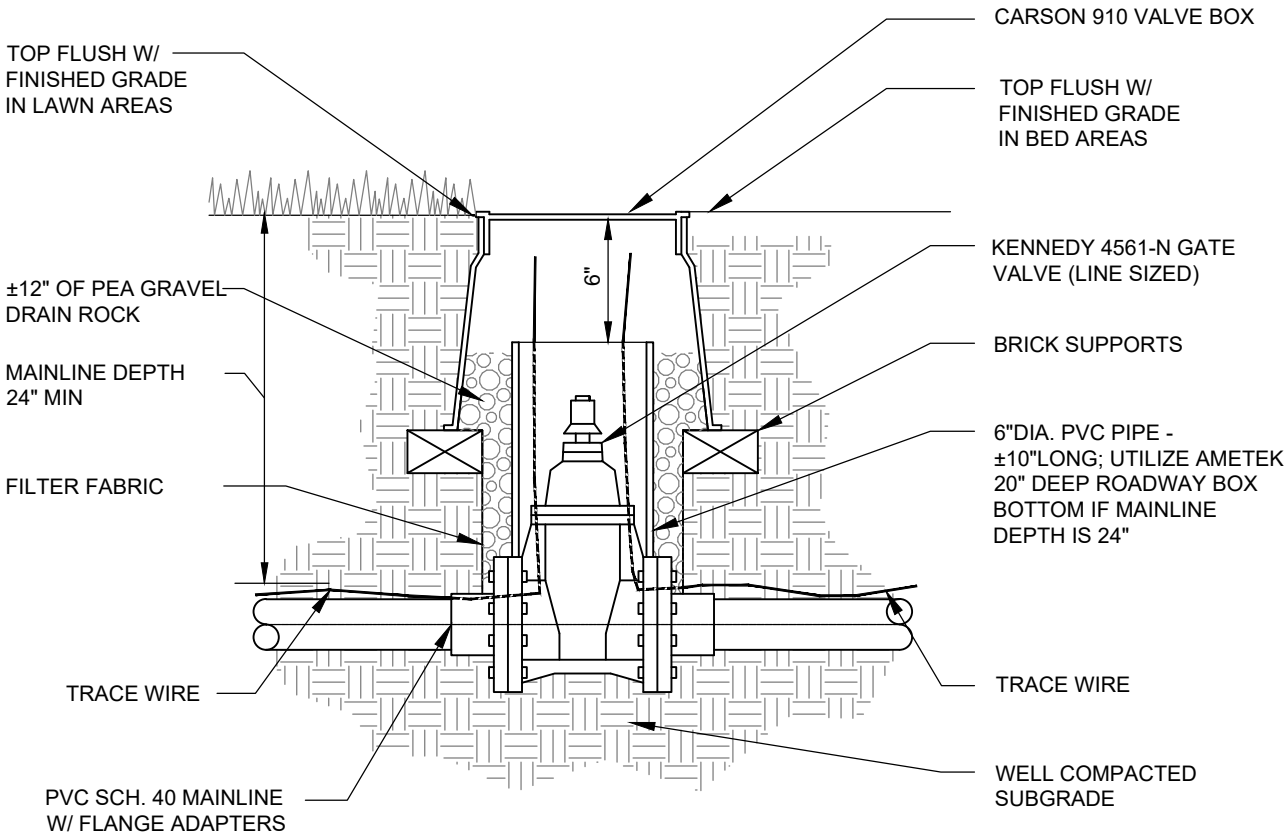
CityofRedmond
WASHINGTON

STANDARD DETAILS

IRRIGATION THRUST BLOCK

FILE NAME: SD718.DWG | DETAIL NUMBER: **923**

DocuSign Envelope ID: F681597A-CCE8-405B-ACDB-A8564C559739



SECTION

NTS

Dave Tuchek

APPROVED BY: DAVE TUCHEK
PARKS MAINTENANCE AND OPERATIONS MANAGER

REVISION DATE: MARCH 01, 2018

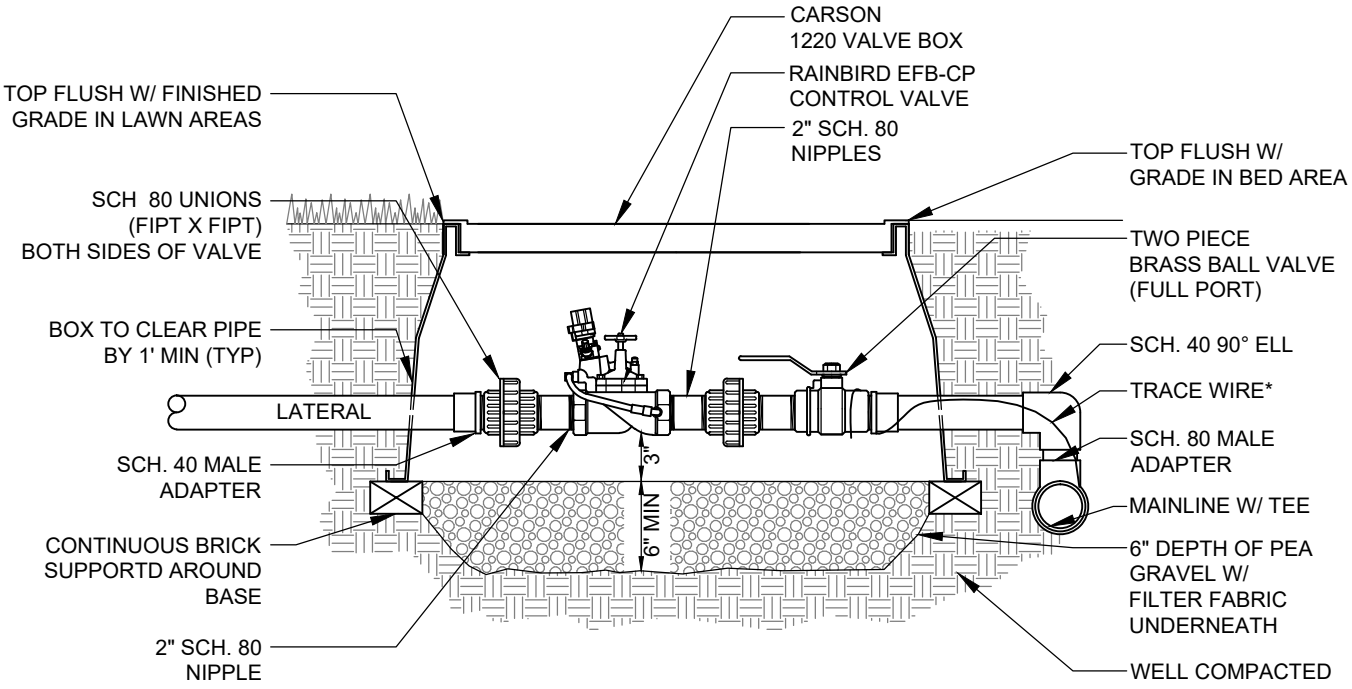
CityofRedmond
WASHINGTON

STANDARD DETAILS

IRRIGATION SYSTEM GATE VALVE

FILE NAME: SD925.DWG | DETAIL NUMBER: **925**

DocuSign Envelope ID: F681597A-CCE8-405B-ACDB-A8564C559739



* 12 GAUGE TRACE WIRE ON MAINLINE SIDE DEAD-ENDING AT EACH VALVE.

SECTION

NTS

NOTES:

1. ALL WIRE INSTALLATIONS WILL BE IN COMPLIANCE WITH APPLICABLE CODES.
2. BUNDLE AND TAPE WIRE EVERY 10 FEET. SET WIRE 6 INCHES FROM MAINLINE.
3. PROVIDE EXPANSION COILS AT EACH WIRE CONNECTION IN VALVE BOX.
4. COMPACT SOIL AROUND VALVE BOX TO SAME DENSITY AS UNDISTURBED ADJACENT SOIL.
5. PLACE FILTER FABRIC OVER OPENINGS (OUTSIDE) TO PREVENT SOIL FROM ENTERING BOX.
6. VALVE BOX SHALL NOT REST ON PIPES. PROVIDE 1 INCH CLEARANCE AROUND ALL PIPES.

Dave Tuchek

APPROVED BY: DAVE TUCHEK
PARKS MAINTENANCE AND OPERATIONS MANAGER

REVISION DATE: MARCH 01, 2018

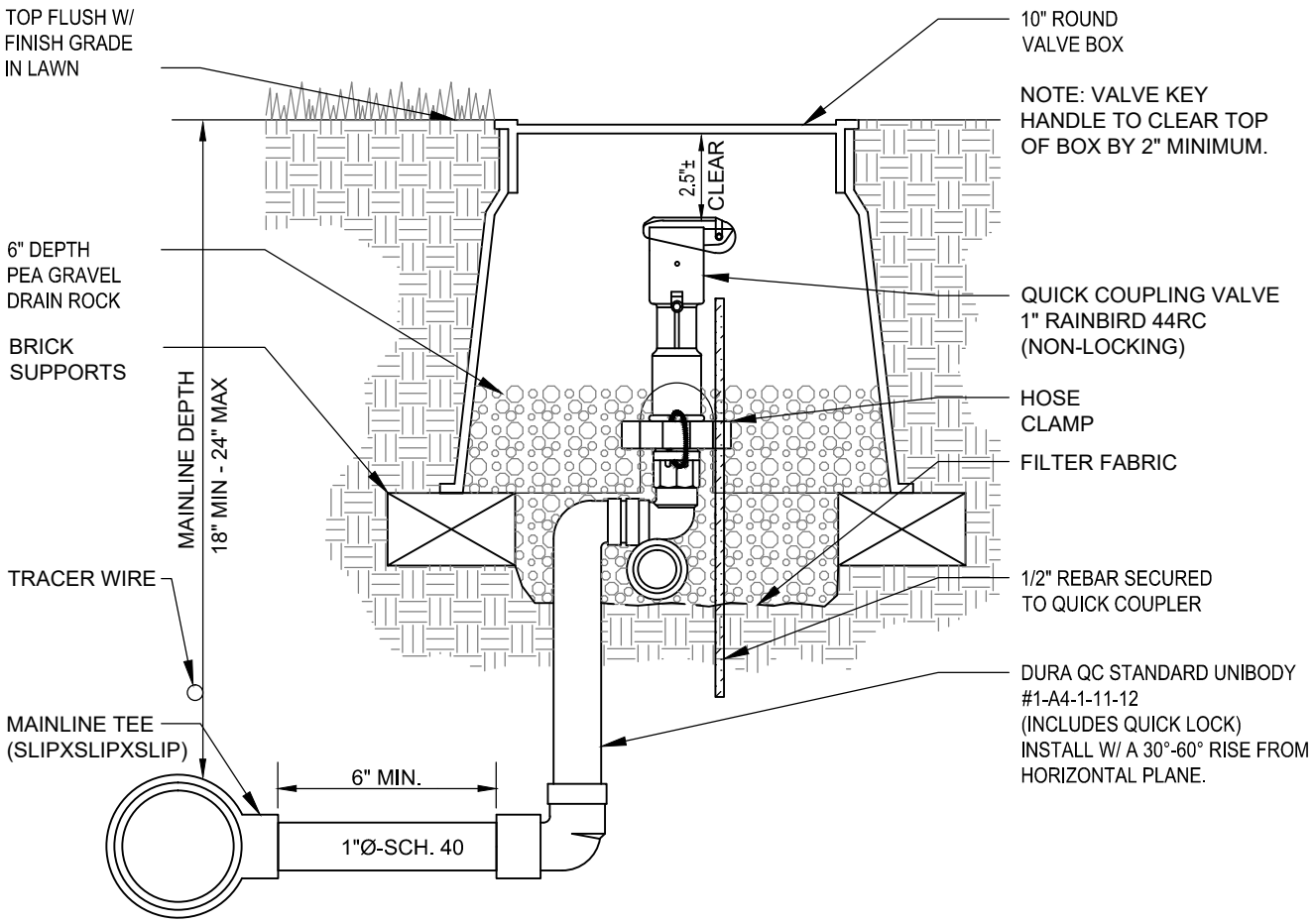
CityofRedmond
WASHINGTON

STANDARD DETAILS

IRRIGATION CONTROL VALVE

FILE NAME: SD718.DWG | DETAIL NUMBER: **926**

DocuSign Envelope ID: F681597A-CCE8-405B-ACDB-A8564C559739



SECTION

NTS

Dave Tuchek

APPROVED BY: DAVE TUCHEK
PARKS MAINTENANCE AND OPERATIONS MANAGER

REVISION DATE: MARCH 01, 2018

CityofRedmond
WASHINGTON

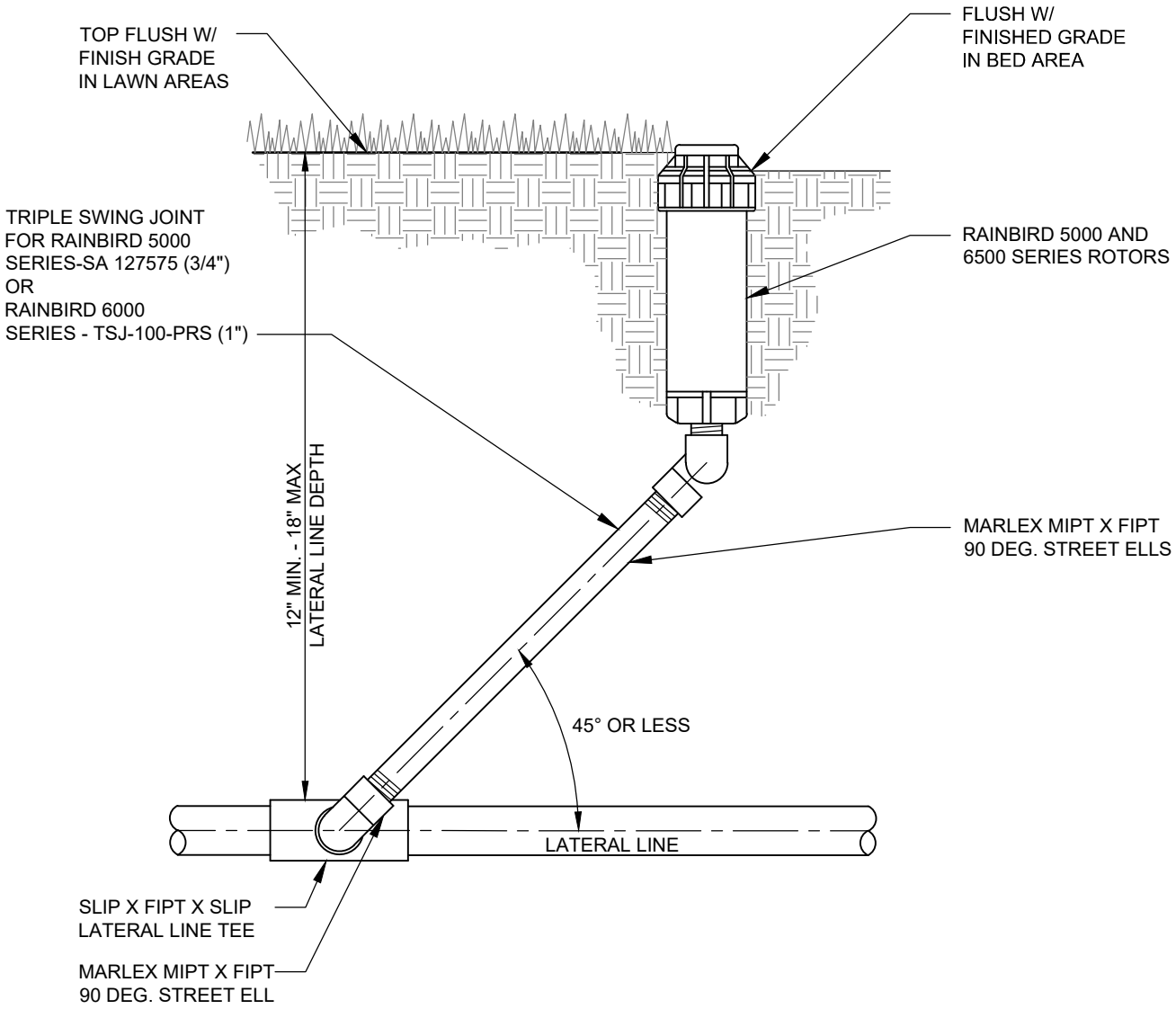
STANDARD DETAILS

IRRIGATION QUICK COUPLER

FILE NAME: SD718.DWG

DETAIL NUMBER: **927**

DocuSign Envelope ID: F681597A-CCE8-405B-ACDB-A8564C559739



SECTION
NTS

Dave Tuchek

APPROVED BY: DAVE TUCHEK
PARKS MAINTENANCE AND OPERATIONS MANAGER

REVISION DATE: MARCH 01, 2020

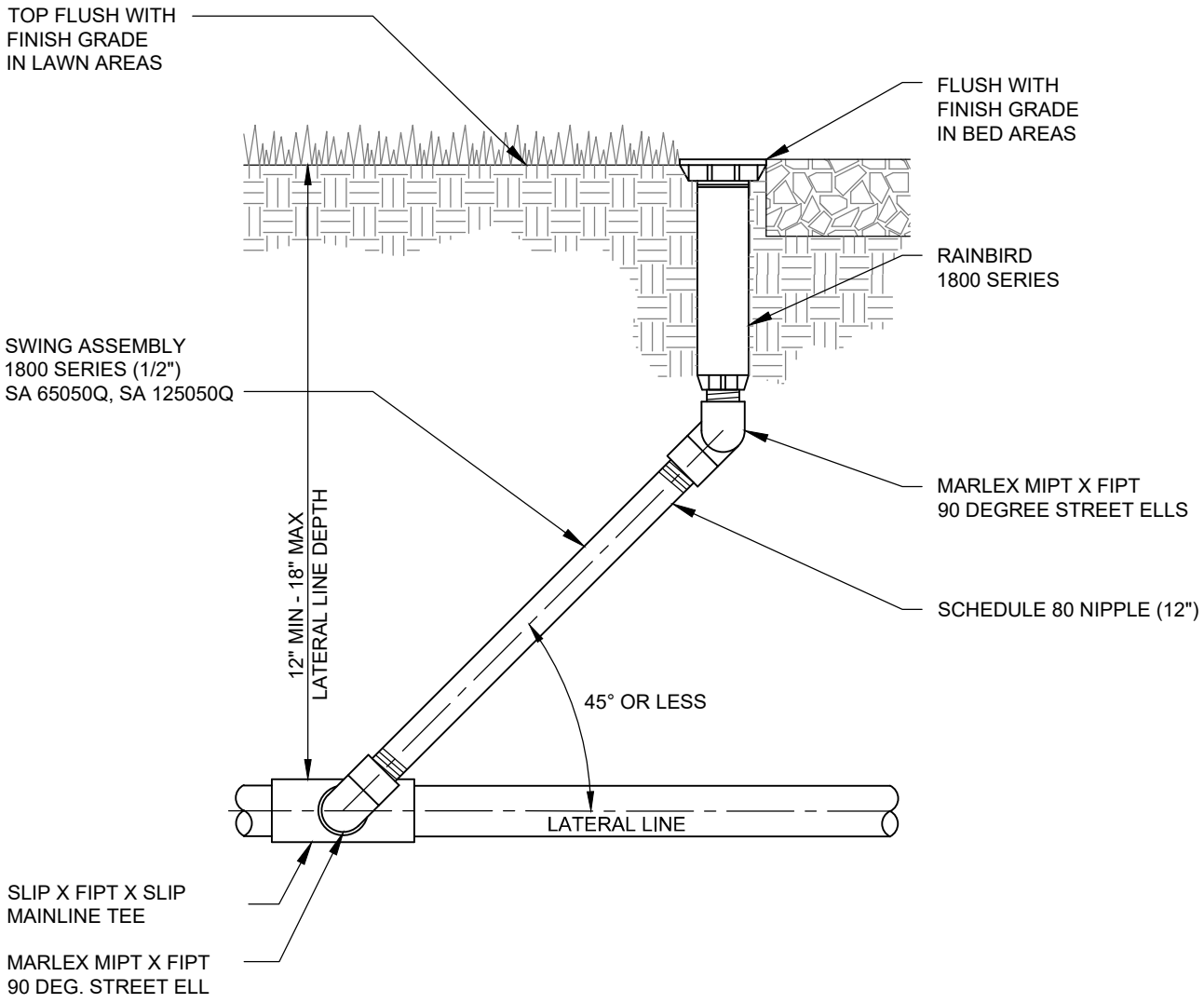
CityofRedmond
WASHINGTON

STANDARD DETAILS

RAINBIRD 5000 AND 6500 SERIES HEAD AND SWING JOINT

FILE NAME: SD928.DWG | DETAIL NUMBER: **928**

DocuSign Envelope ID: F681597A-CCE8-405B-ACDB-A8564C559739



SECTION

NTS

Dave Tuchek

APPROVED BY: DAVE TUCHEK
PARKS MAINTENANCE AND OPERATIONS MANAGER

REVISION DATE: MARCH 01, 2020

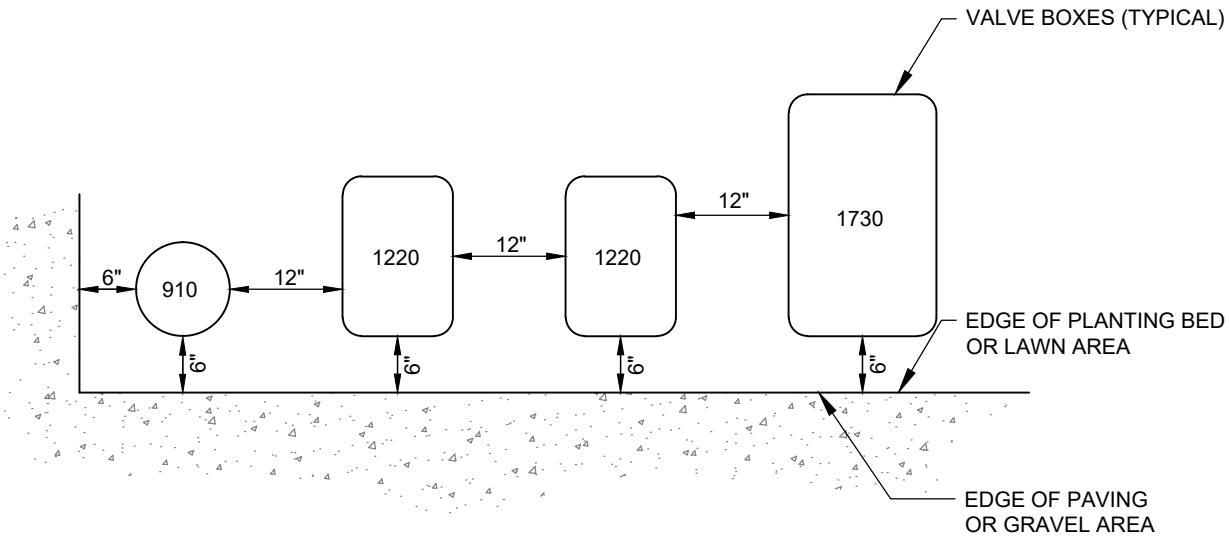
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WASHINGTON

STANDARD DETAILS

RAINBIRD 1800 SERIES HEAD AND SWING JOINT

FILE NAME: SD929.DWG | DETAIL NUMBER: **929**

DocuSign Envelope ID: F681597A-CCE8-405B-ACDB-A8564C559739



SECTION

NTS

NOTES:

TO FACILITATE REMOVAL AND SERVICING.

1. CENTER VALVE BOX OVER VALVE
2. SET BOXES PARALLEL TO EACH OTHER AND PERPENDICULAR TO EDGE.
3. AVOID OVER COMPACTING SOIL AROUND VALVE BOXES TO PREVENT COLLAPSE AND DEFORMATION OF VALVE BOXES.

Dave Tuchek

APPROVED BY: DAVE TUCHEK
PARKS MAINTENANCE AND OPERATIONS MANAGER

REVISION DATE: MARCH 01, 2018

CityofRedmond
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STANDARD DETAILS

IRRIGATION VALVE BOX INSTALLATION

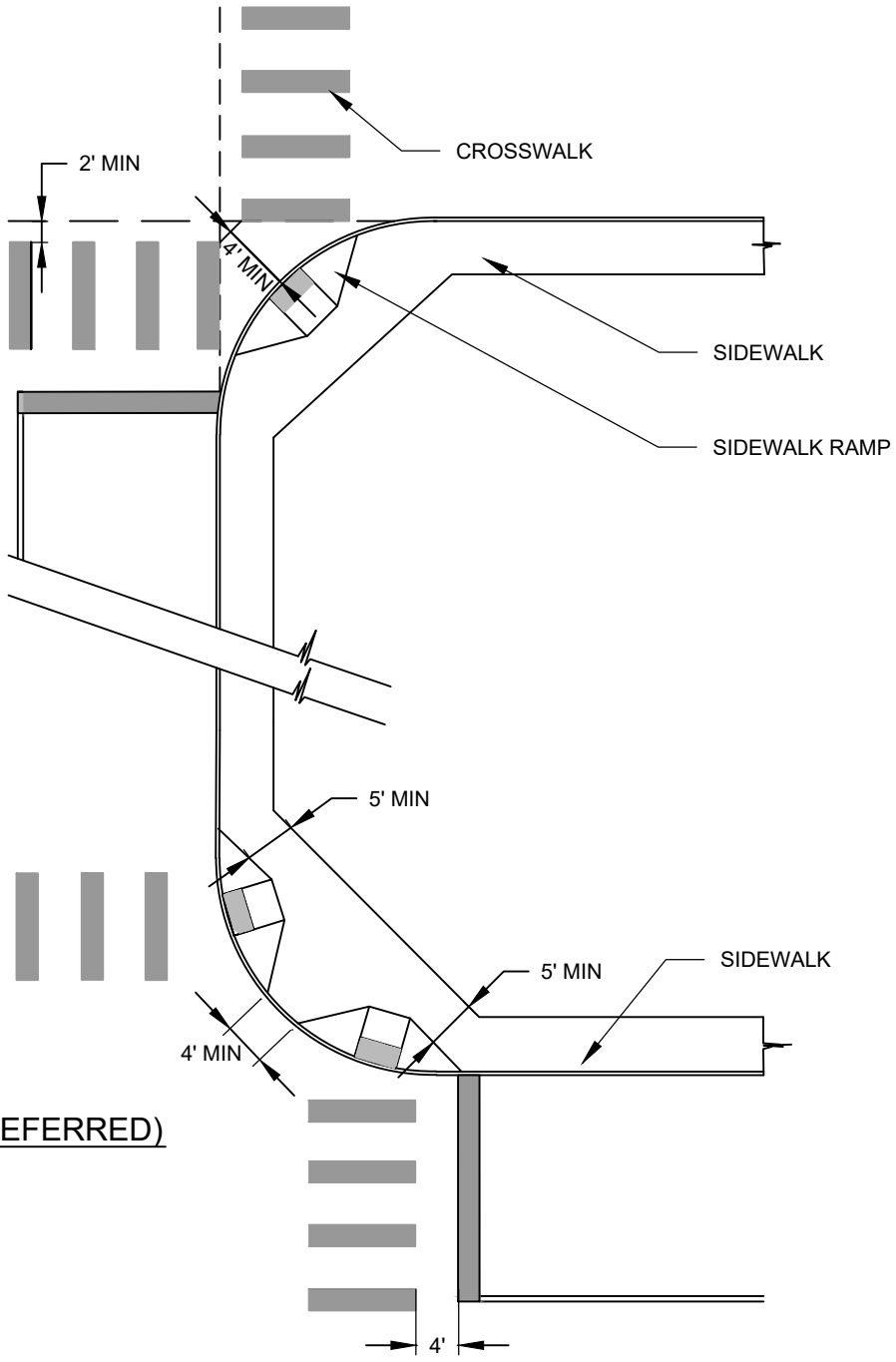
FILE NAME: SD718.DWG | DETAIL NUMBER: **930**

DocuSign Envelope ID: F681597A-CCE8-405B-ACDB-A8564C559739

SECTION 99

DESIGN GUIDANCE

DocuSign Envelope ID: F681597A-CCE8-405B-ACDB-A8564C559739



SINGLE CURB RAMP LAYOUT
NTS

DUAL CURB (PREFERRED) RAMP LAYOUT
NTS

NOTES:

1. SEE WSDOT STANDARD PLANS F-40.12, F-40.14, F-40.15, AND F-40.16 FOR ADDITIONAL DETAILS ON RAMP CONSTRUCTION.
2. SEE SD 311, 311A & 311B FOR ADDITIONAL DETAILS ON CROSSWALK AND STOP BAR CONSTRUCTION.
3. RAMP MUST BE WITHIN CROSSWALK.

Paul S. Cho

APPROVED BY: PAUL S. CHO
TRAFFIC OPERATIONS SAFETY AND ENGINEERING MANAGER

REVISION DATE: MARCH 01, 2020

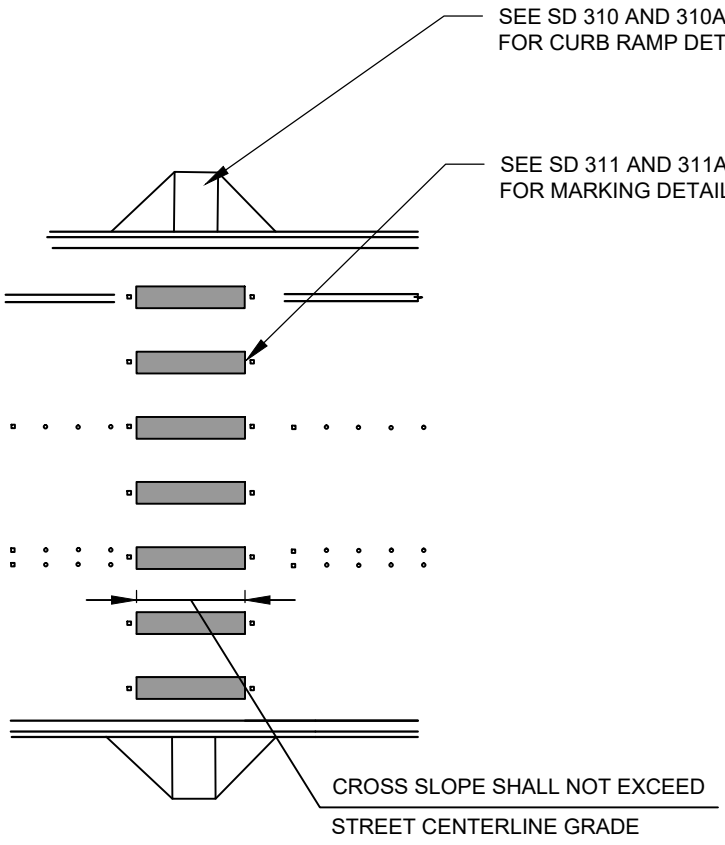
CityofRedmond WASHINGTON

STANDARD DETAILS

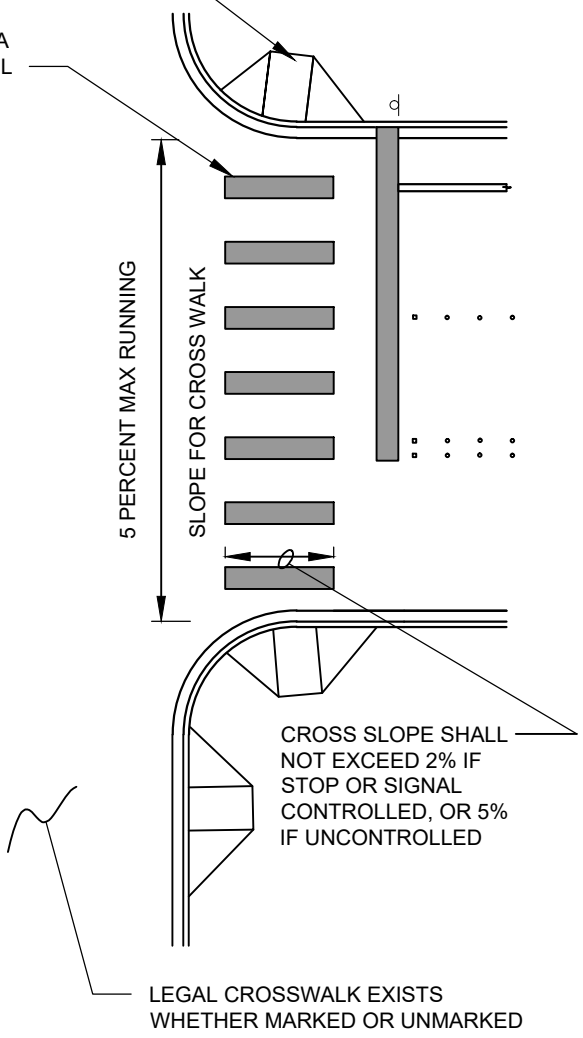
SIDEWALK RAMP LAYOUT

FILE NAME: DG01.DWG | DETAIL NUMBER: **DG01**

DocuSign Envelope ID: F681597A-CCE8-405B-ACDB-A8564C559739



MID BLOCK CROSSWALK
NTS



CROSSWALKS AT INTERSECTION
NTS

NOTES:

1. STANDARDS APPLY TO BOTH MARKED AND UNMARKED CROSSWALKS.
2. INSTALLATION SHALL REFLECT "REVISED DRAFT GUIDELINES FOR ACCESSIBLE PUBLIC RIGHTS-OF-WAY" DATED NOVEMBER 2012, EXCEPT AS APPROVED BY THE TRAFFIC ENGINEER.
3. RAMPS SHALL BE INSTALLED FOR ALL LEGAL CROSSWALKS, WHETHER MARKED OR UNMARKED, EXCEPT AS APPROVED BY THE TRAFFIC ENGINEER.
4. RAMP CROSS SLOPE SHALL NOT EXCEED THE CENTERLINE GRADE OF THE CROSSWALK.
5. SIDEWALK GRADE SHALL NOT EXCEED THE GENERAL GRADE OF THE PARALLEL STREET.

Paul S. Cho

APPROVED BY: PAUL S. CHO
TRAFFIC OPERATIONS SAFETY AND ENGINEERING MANAGER

REVISION DATE: MARCH 01, 2020

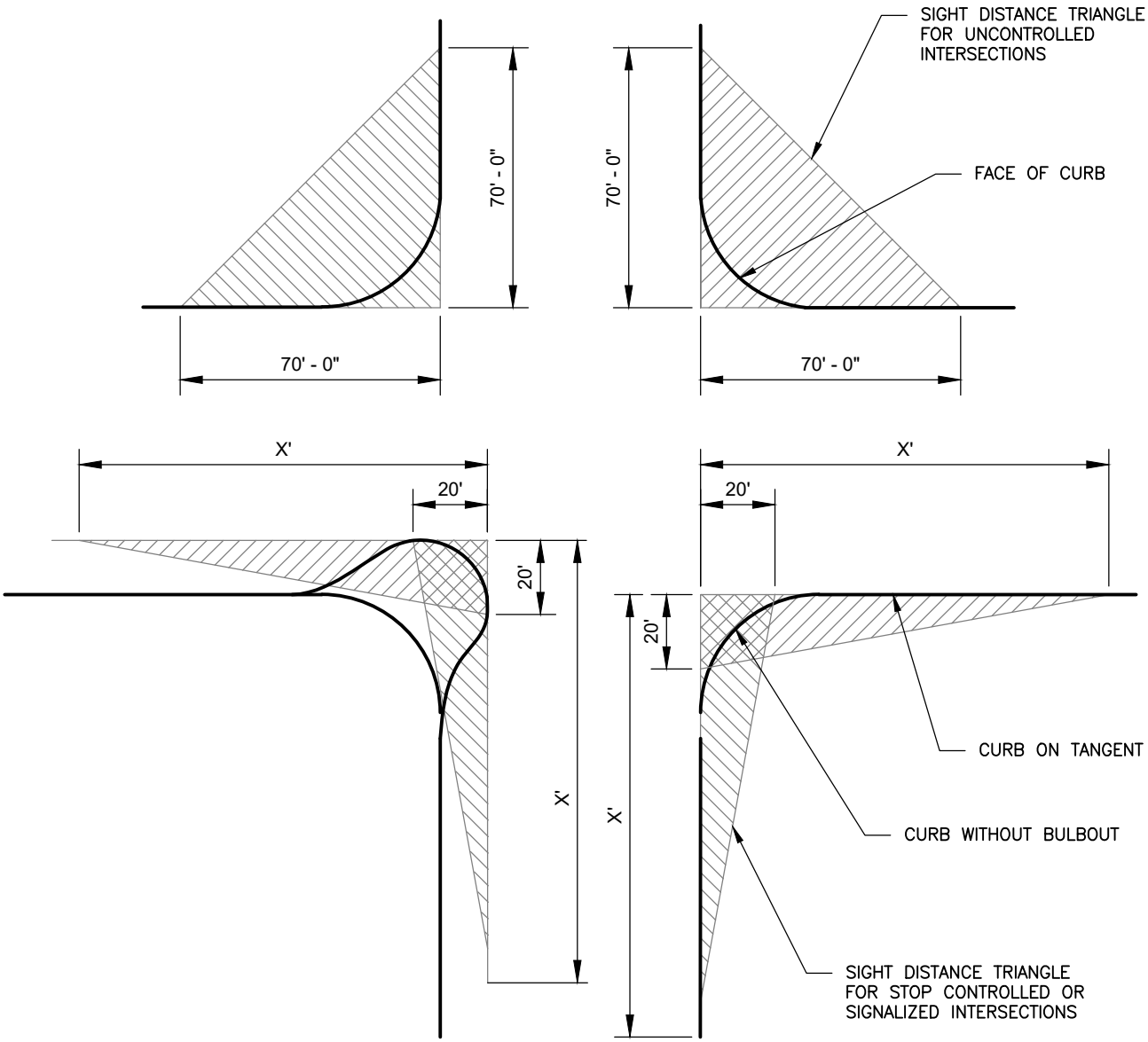
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STANDARD DETAILS

CROSSWALK ACCESSIBILITY DESIGN STANDARDS

FILE NAME: DG02.DWG | DETAIL NUMBER: **DG02**

DocuSign Envelope ID: F681597A-CCE8-405B-ACDB-A8564C559739



PLAN VIEW

NTS

NOTES:

1. X IS a) 100 FEET ALONG ARTERIAL STREETS OR b) 65 FEET ALONG LOCAL ACCESS STREETS.
2. SHOW TRIANGLES FOR STREET AND NON SINGLE FAMILY RESIDENTIAL DRIVEWAY INTERSECTIONS.
3. SIGHT DISTANCE TRIANGLE LEGS ALIGN WITH CURB ON TANGENT.
4. SIGHT DISTANCE TRIANGLE IS APPLICABLE BETWEEN A HEIGHT OF EIGHT AND TWO FEET ABOVE GROUND. NO SIGHT OBSTRUCTIONS SHALL EXIST PER RZC 21.52.040

Paul S. Cho

APPROVED BY: PAUL S. CHO
TRAFFIC OPERATIONS SAFETY AND ENGINEERING MANAGER

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STANDARD DETAILS

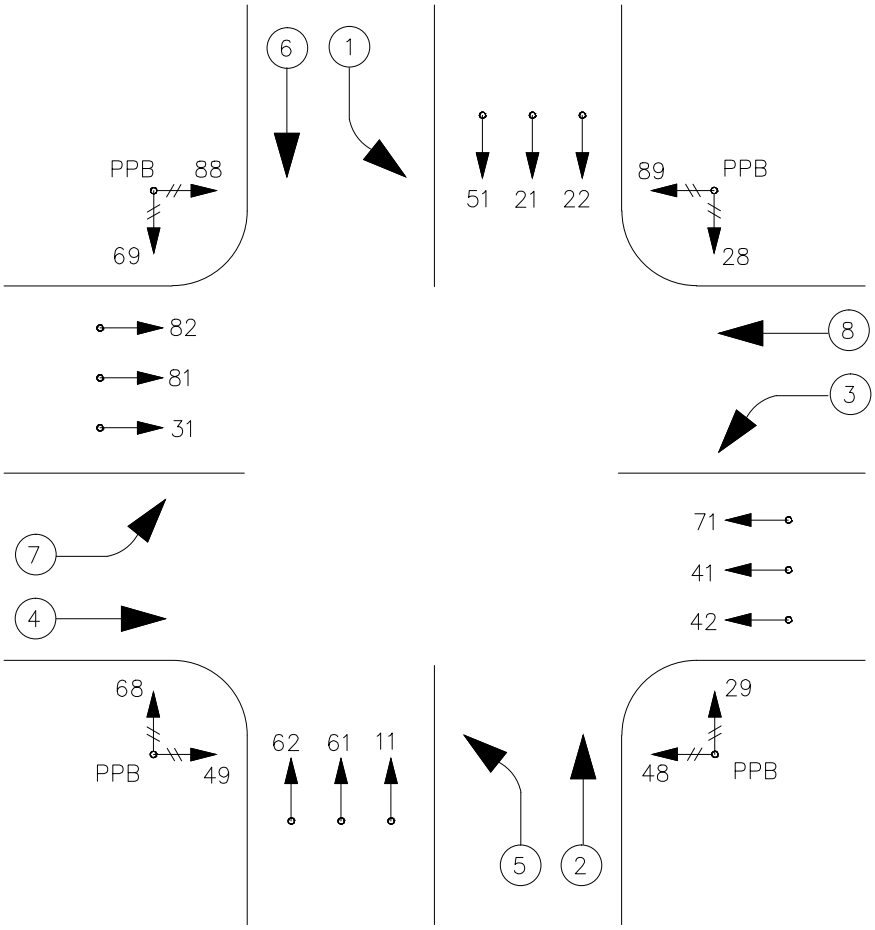
SIGHT DISTANCE TRIANGLE

FILE NAME: DG03.DWG | DETAIL NUMBER: **DG03**

DocuSign Envelope ID: F681597A-CCE8-405B-ACDB-A8564C559739

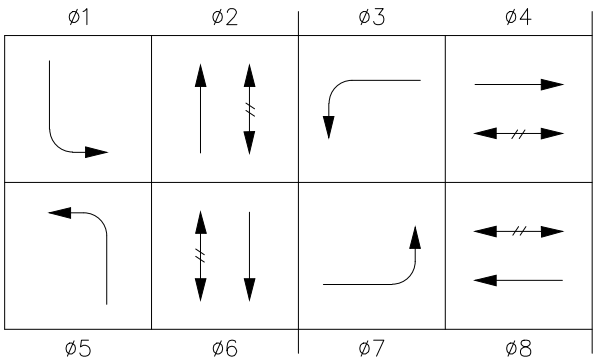
INTERSECTION HEAD NUMBERS

NTS



PHASING SEQUENCE DIAGRAM

NTS



NOTE:

PHASE 2 IS TYPICALLY NORTHBOUND. CONFIRM WITH TRAFFIC OPERATIONS DIVISION. EXCEPTIONS MAY occur, SUCH AS FOR CONSISTENCY ALONG A CURVING ARTERIAL.

Paul S. Cho

APPROVED BY: PAUL S. CHO
TRAFFIC OPERATIONS SAFETY AND ENGINEERING MANAGER

REVISION DATE: MARCH 01, 2020

CityofRedmond
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STANDARD DETAILS

STANDARD INTERSECTION HEAD NUMBERS AND PHASING

FILE NAME: DG04.DWG

DETAIL NUMBER: **DG04**

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DIMENSIONS

A STREET WIDTH	B CURB RETURN RADIUS	C OFFSET DISTANCE	D CIRCLE DIAMETER	E OPENING WIDTH
20'	<15'	RECONSTRUCT CURBS 5.5'	9'	16'+
	15'	5.0'	10'	17'+
	18'	4.5'	11'	18'–
	20'	4.0'	12'	19'+
	25'			
24'	<12'	RECONSTRUCT CURBS 5.5'	13'	16'
	12'	5.0'	14'	17'–
	15'	4.5'	15'	18'+
	20'	3.5'	17'	20'–
	25'			
25'	<12'	RECONSTRUCT CURBS 5.5'	14'	16'+
	12'	5.0'	15'	17'–
	15'	4.5'	16'	18'–
	18'	4.5'	16'	18'+
	20'	3.5'	18'	20'–
	25'			
30'	10'	5.5'	19'	16'+
	12'	5.0'	20'	17'–
	15'	5.0'	20'	17'+
	18'	4.5'	21'	18'+
	20'	4.0'	22'	19'+
	25'	3.0'	24'	20'
32'	10'	5.5'	21'	16'+
	12'	5.0'	22'	17'–
	15'	4.5'	23'	18'–
	18'	4.0'	24'	19'–
	20'	4.0'	24'	19'+
	25'	2.5'	27'	20'
36'	10'	5.0'	26'	17'–
	12'	5.0'	26'	17'+
	15'	4.5'	27'	18'+
	18'	4.0'	28'	19'+
	20'	3.5'	29'	20'–
	25'	1.5'	33'	20'
40'	10'	5.0'	30'	17'+
	12'	4.5'	31'	18'+
	15'	4.0'	32'	19'–
	18'	3.5'	33'	20'–
	20'	3.0'	34'	20'
	25'	1.0'	38'	

GEOMETRY

OPTIMUM CRITERIA

OFFSET DISTANCE (C)	OPENING WIDTH (E)
5.5' MAX.	16' MIN.
5.0'	17' ±
4.5'	18' ±
4.0'	19' ±
3.5' OR LESS	20' ±

NOTES:

1. USE DIMENSION SCHEDULE AS A DESIGN GUIDE. FINAL DIMENSIONS TO BE DETERMINED BY THE ENGINEER.
2. FOR PLANTER ISLAND SPECIFICATIONS SEE TRAFFIC CIRCLE DETAIL SD478.

Paul S. Cho

APPROVED BY: PAUL S. CHO
TRAFFIC OPERATIONS SAFETY AND ENGINEERING MANAGER

REVISION DATE: MARCH 01, 2020

CityofRedmond
WASHINGTON

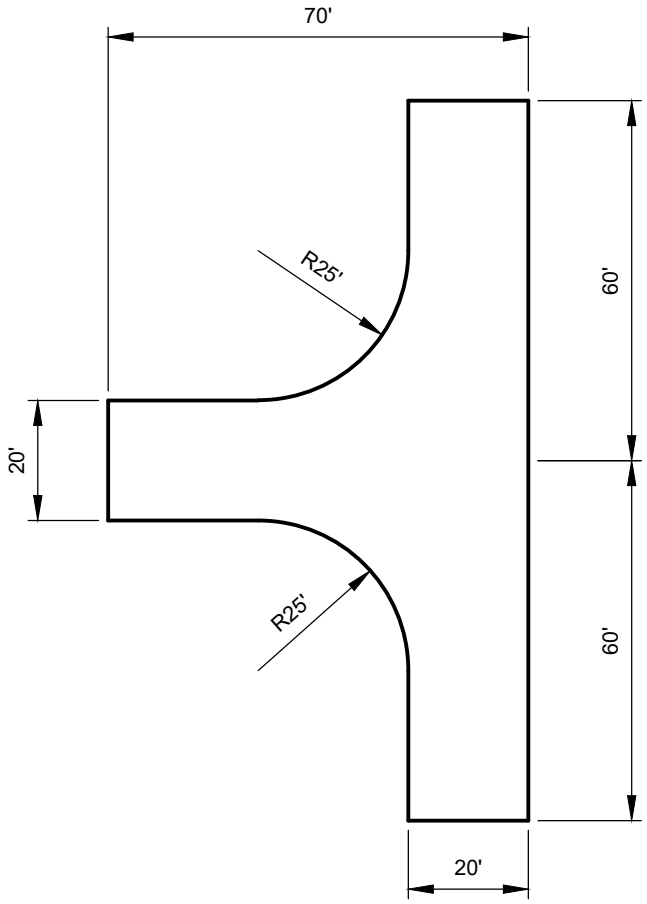
STANDARD DETAILS

TRAFFIC CIRCLE DIMENSIONS

FILE NAME: DG05.DWG

DETAIL NUMBER: **DG05**

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APPROVED BY: TODD SHORT
FIRE MARSHAL

REVISION DATE: MARCH 01, 2020

CityofRedmond
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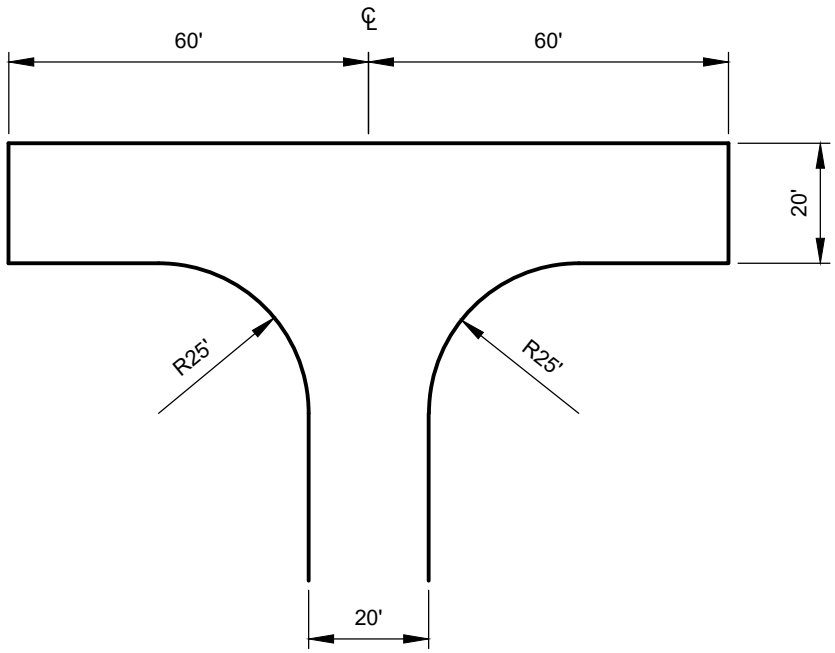
STANDARD DETAILS

120' HAMMERHEAD ALTERNATE

FILE NAME: DG06.DWG

DETAIL NUMBER: **DG06**

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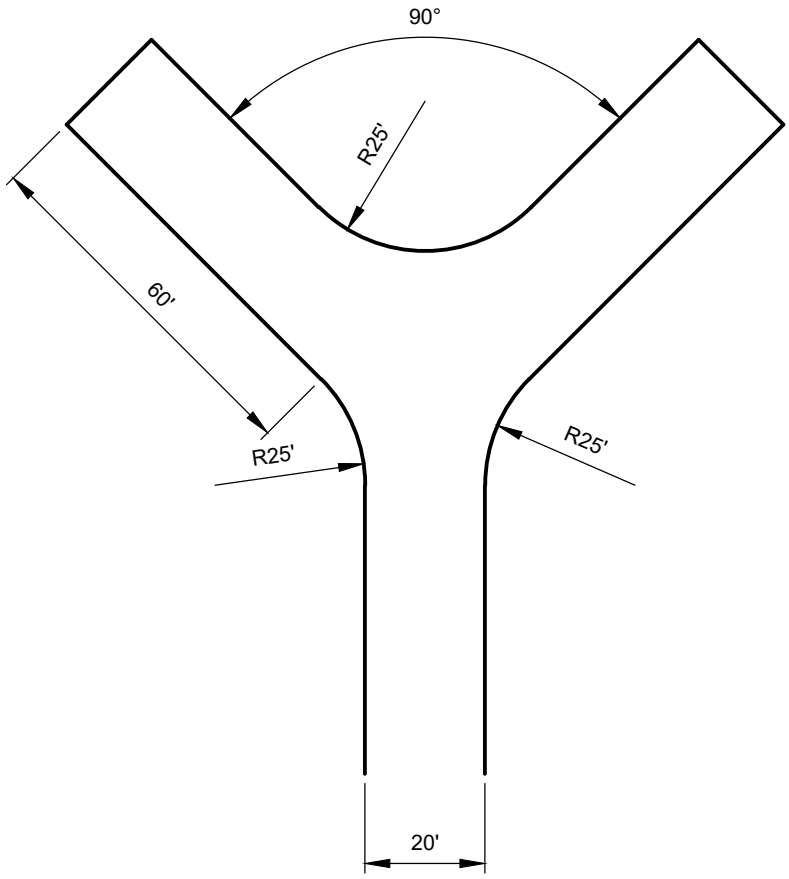
STANDARD DETAILS

120' HAMMERHEAD

FILE NAME: DG07.DWG

DETAIL NUMBER: **DG07**

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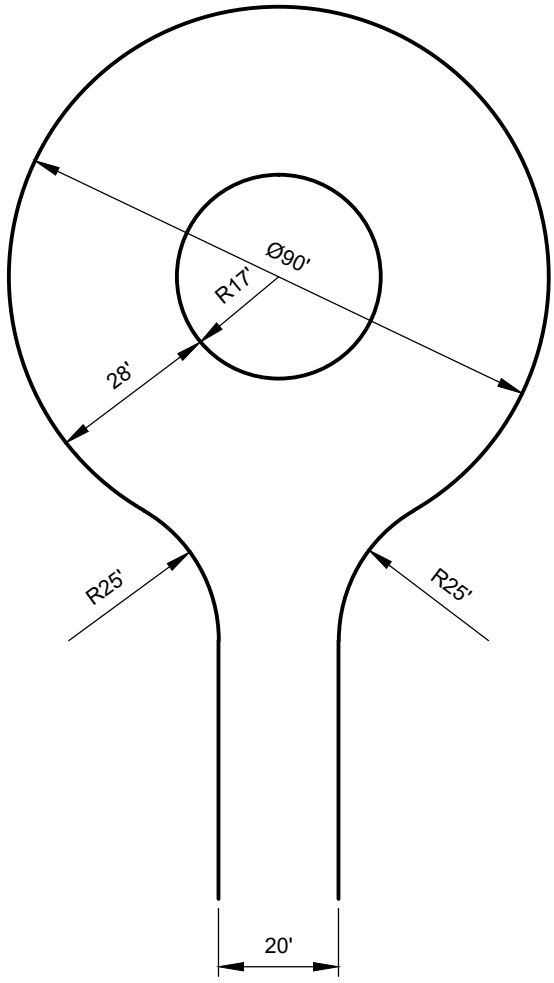
STANDARD DETAILS

60' Y

FILE NAME: DG08.DWG

DETAIL NUMBER: **DG08**

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APPROVED BY: TODD SHORT
FIRE MARSHAL

REVISION DATE: MARCH 01, 2020

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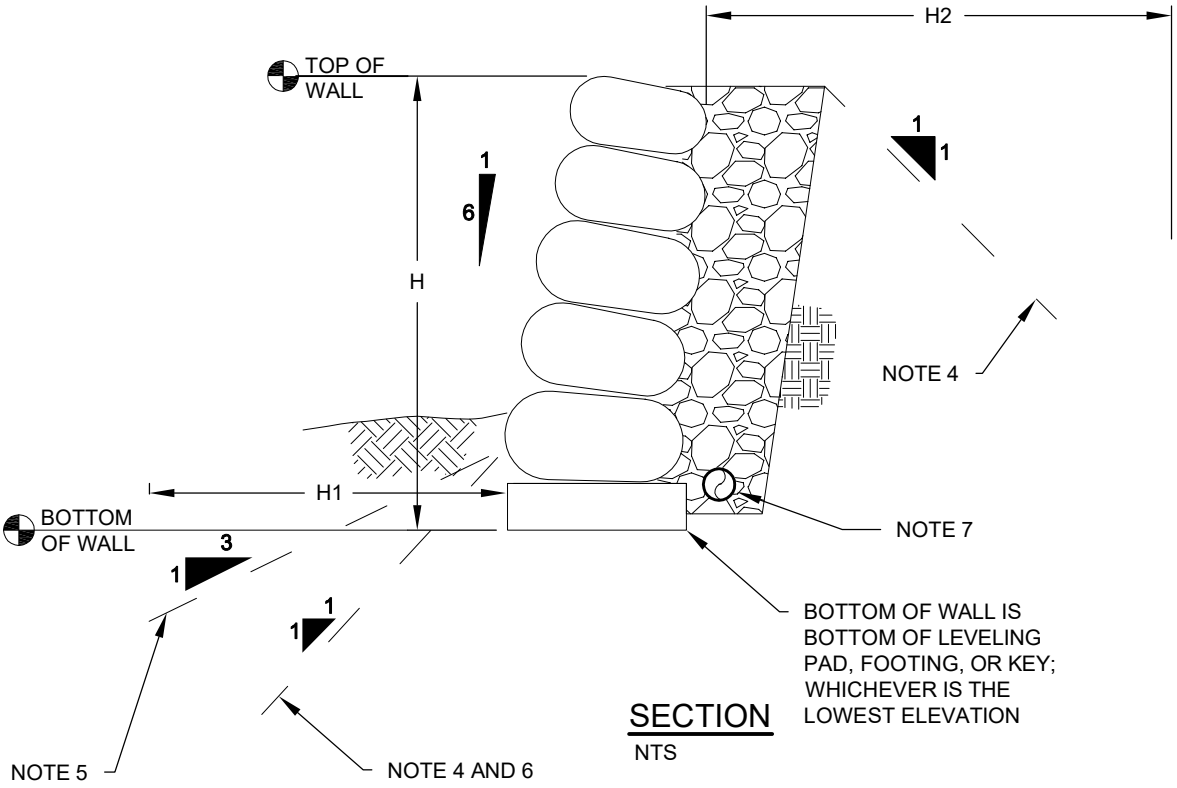
STANDARD DETAILS

90' CUL-DE-SAC

FILE NAME: DG09.DWG

DETAIL NUMBER: **DG09**

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SECTION
NTS

NOTES:

1. FREE-STANDING HEIGHT OF ROCK WALL, "H" = VARIES PER DESIGN ALL ROCKERY/RETAINING WALLS OF HEIGHT 4 FEET OR GREATER SHALL BE DESIGNED BY STRUCTURAL OR GEOTECHNICAL ENGINEER.
2. MINIMUM DISTANCE IN WHICH NO REMOVAL OF SUBGRADE, TRENCHING, OR EXCAVATION IS ALLOWED, "H1" = HEIGHT OF WALL "H".
3. MINIMUM DISTANCE IN WHICH NO REMOVAL OF SUBGRADE, TRENCHING, OR EXCAVATION, IS ALLOWED, "H2" = HEIGHT OF WALL "H".
4. PLANE BELOW WHICH NO EXCAVATION IS ALLOWED.
5. PLANE DEPICTING MAXIMUM FINISHED GRADE: 3H:1V.
6. PLANE DEPICTING ZONE OF INFLUENCE: 1H:1V. THIS REPRESENTS THE AREA OF IMPACTS FROM THE MASS OF THE RETAINING STRUCTURE ON BURIED ELEMENTS (UTILITIES, ETC).
7. UNDERDRAIN IS REQUIRED BEHIND ROCKERY/RETAINING WALL IF ADJACENT TO CITY RIGHT-OF-WAY AND/OR HEIGHT(H) GREATER THAN 18 INCHES.SEE SD 909 FOR WALL DRAIN DETAIL.

Lisa W. Rigg

APPROVED BY: LISA W. RIGG
DEVELOPMENT ENGINEERING MANAGER

REVISION DATE: MARCH 01, 2018

CityofRedmond
WASHINGTON

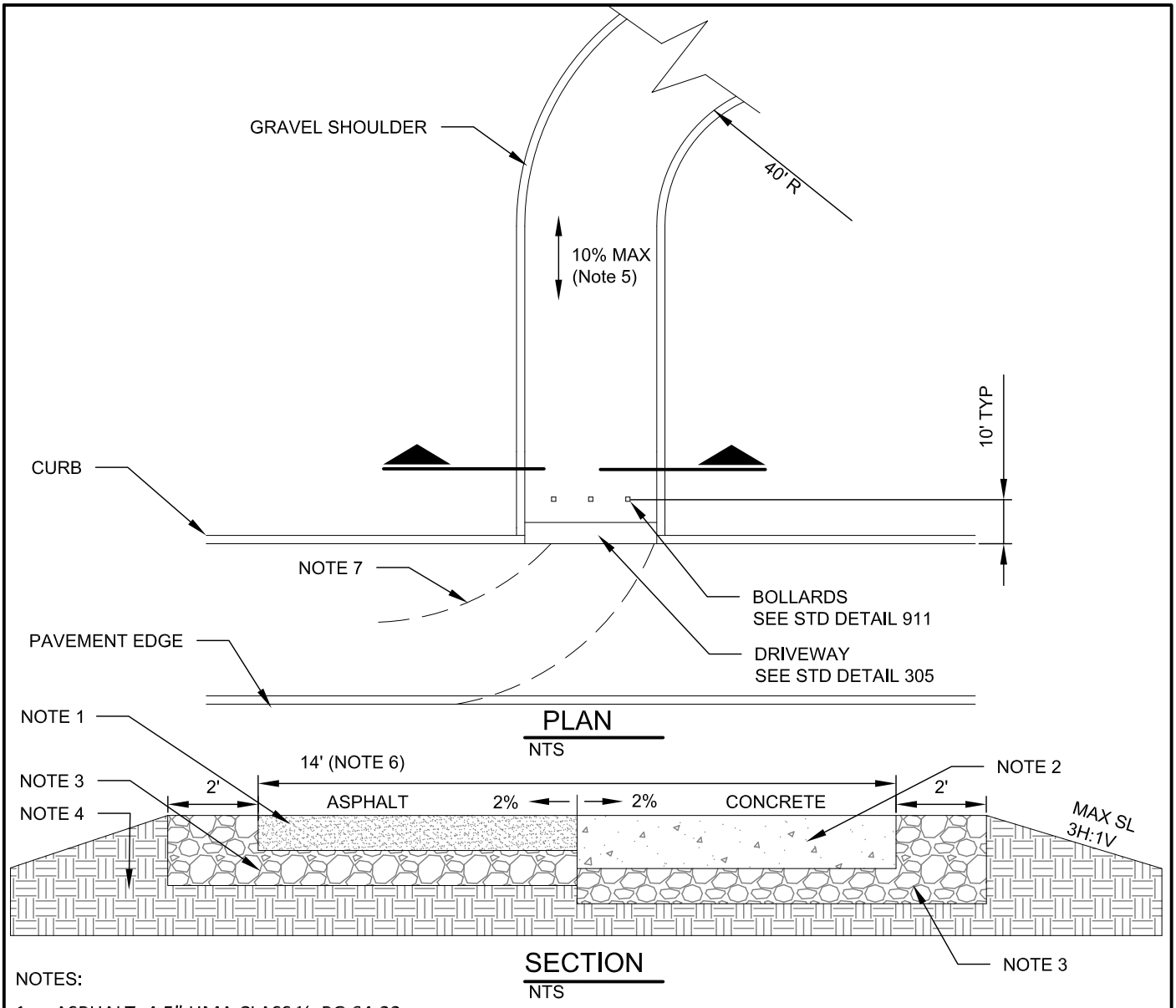
STANDARD DETAILS

ROCKERY/RETAINING WALL EXCAVATION GUIDELINES

FILE NAME: DG10.DWG

DETAIL NUMBER: **DG10**

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NOTES:

1. ASPHALT: 4.5" HMA CLASS ½, PG 64-22
2. CONCRETE: 6" PORTLAND CEMENT CONCRETE PER 5-05. FINISH SURFACE BY TEXTURING WITH COMB PERPENDICULAR TO CENTER LINE OF PAVEMENT PER 5-05.3(11). MAXIMUM CONTRACTION JOINT SPACING SHALL BE 14 FEET. THE LONG SIDE OF ANY PANEL SHALL BE NO MORE THAN 1.5 TIMES THE LENGTH OF THE SHORT SIDE OF THE SAME PANEL.
3. GRAVEL SHOULDER AND BASE: 4" OF 1-1/4" MINUS CRUSHED SURFACING BASE COURSE PER 9-03.3(3).
4. SUBGRADE: COMPACTED TO 95% DENSITY AS DETERMINED BY MODIFIED PROCTOR ASTM D 1557, AND RESILIENT MODULUS OF 10,000 PSI OR GREATER. A SOILS REPORT BY A PROFESSIONAL ENGINEER SHALL CERTIFY SUBGRADE IS ACCEPTABLE.
5. SLOPE MAY BE INCREASED TO 15%, 50 FEET AWAY FROM ANY MANHOLE STRUCTURE BY USE OF CONCRETE. VERTICAL GRADE TRANSITIONS AND TURNS SHALL ACCOMMODATE THE DESIGN EDUCTOR TRUCK (SEE DG-24). ANY SLOPE GREATER THAN 10% REQUIRES SPECIAL DESIGN DETAILS TO DEMONSTRATE SUITABLE ACCESS.
6. WIDTH MAY BE REDUCED TO 12 FEET FOR STORMWATER ACCESS ROADS, 50 FEET AWAY FROM MAINTENANCE ACCESS POINTS OR TURNS.
7. MINIMUM INSIDE TURN RADIUS OF 40 FEET IS REQUIRED. AUTOTURN SHALL BE PROVIDED SHOWING TURNING MOVEMENT CAN BE MADE TO AND FROM MAIN ROAD AVOIDING OBSTACLES AND ONCOMING TRAFFIC. DRIVEWAY MAY BE WIDENED OR CHANGED TO RADIUS ENTRY TO ACCOMMODATE TURNING MOVEMENT WITH ENGINEER APPROVAL. PUBLIC VAULTS REQUIRE AUTOTURN USING CURRENT CITY'S EDUCTOR TRUCK.
8. SEE STORMWATER TECHNICAL NOTEBOOK 8.6.9.1 FOR ADDITIONAL STORMWATER MAINTENANCE ACCESS REQUIREMENTS.
9. SEE WATER & WASTEWATER REQUIREMENTS SECTION V, 3.j. FOR ADDITIONAL UTILITY ACCESS REQUIREMENTS.

Gary M. Schimek

APPROVED BY: GARY M. SCHIMEK
ENVIRONMENTAL AND UTILITY SERVICES DIVISION MANAGER

REVISION DATE: MARCH 01, 2020

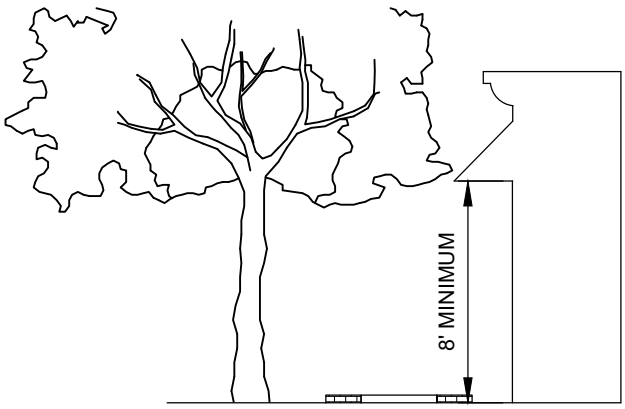
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STANDARD DETAILS

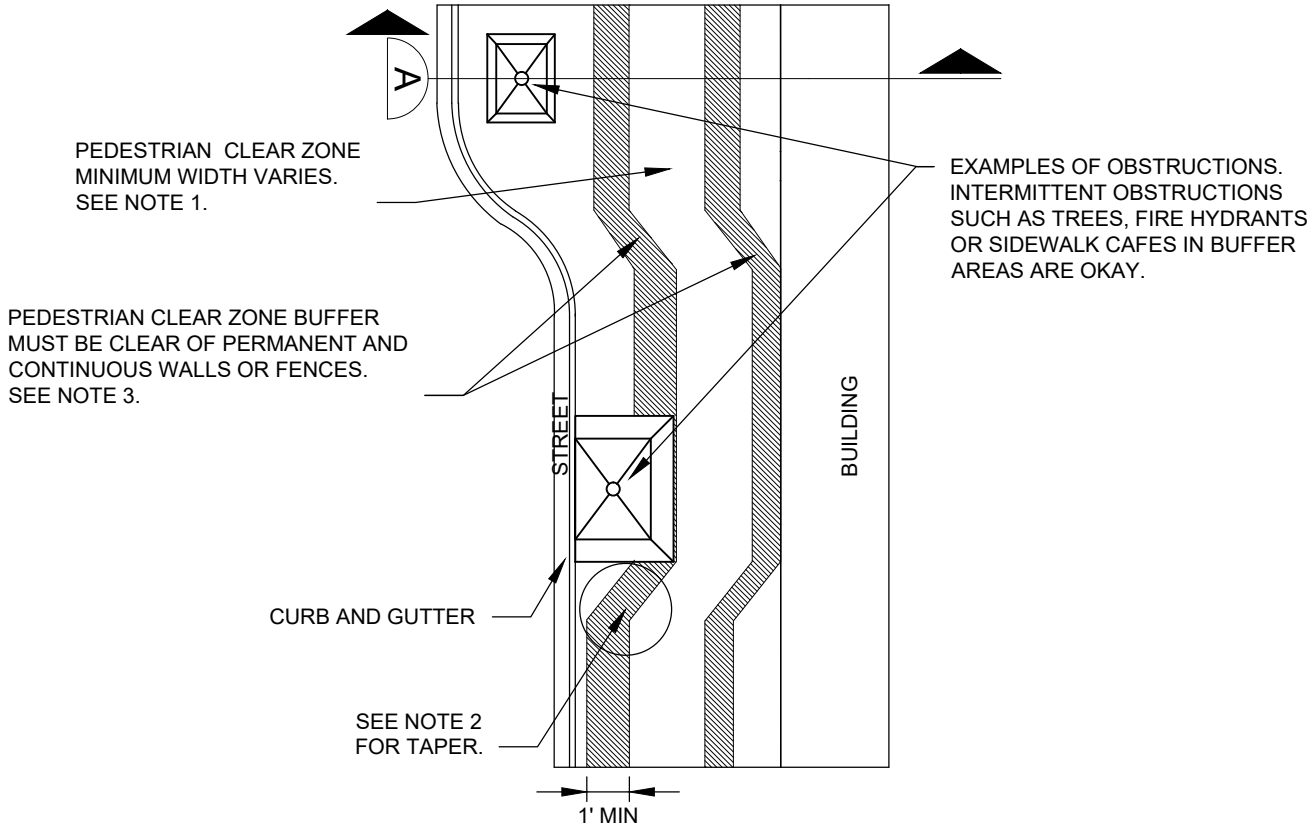
UTILITY MAINTENANCE ACCESS

FILE NAME: SDDG11.DWG | DETAIL NUMBER: **DG11**

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SECTION A
NTS



PLAN VIEW
NTS

NOTES:

1. PEDESTRIAN CLEAR ZONE SHALL BE 6' MINIMUM IN DOWNTOWN AND OVERLAKE URBAN CENTERS. 6' MINIMUM IN PEDESTRIAN PRIORITY ZONES. 5' MINIMUM IN THE REST OF THE CITY. SEE TRANSPORTATION MASTER PLAN APPENDIX F-DESIGN GUIDANCE FOR MAP OF PEDESTRIAN PRIORITY ZONES
2. PROVIDE MINIMUM 1.5:1 TAPER IN URBAN CENTERS AND PEDESTRIAN PRIORITY ZONES. PROVIDE MINIMUM 1:1 TAPER IN REST OF THE CITY.
3. CROSS HATCH IS SHOWN TO DELINEATE CLEAR ZONE FROM CLEAR ZONE BUFFER. SEE STANDARD DETAILS 303-304 FOR MATERIAL REQUIREMENTS.

Donell Cairns

APPROVED BY: DONALD CAIRNS
TRANSPORTATION PLANNING AND ENGINEERING MANAGER

REVISION DATE: MARCH 01, 2017

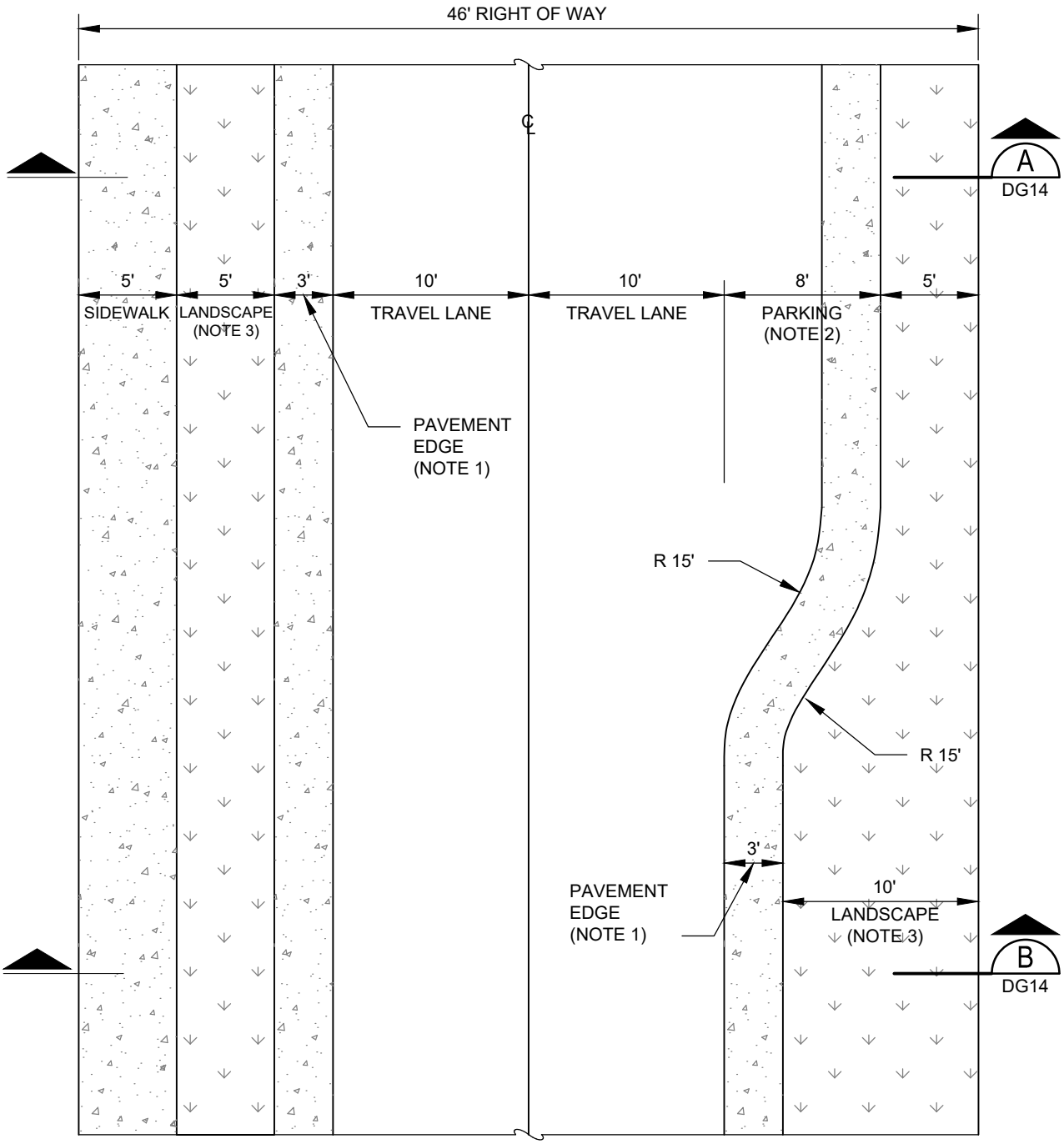
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STANDARD DETAILS

PEDESTRIAN CLEAR ZONE

FILE NAME: DG12_2017.DWG | DETAIL NUMBER: **DG12**

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PLAN VIEW

NTS

NOTES:

1. PAVEMENT EDGE SHALL CONSIST OF THICKENED EDGE CONCRETE ON EACH SIDE, SCORED OR SHINER AS APPROVED BY CITY ENGINEER.
2. PARKING SHALL BE LOCATED INTERMITTENTLY BETWEEN LANDSCAPED AREAS.
3. SEE RZC APPENDIX 2, SECTION 21c. THE CITY REQUIRES A CLEAR ZONE OF 10 FEET FROM THE EDGE OF TRAVELED WAY TO THE FACE OF ANY FIXED OBJECT WITHOUT BREAK AWAY CAPABILITIES. STREET TREES, LIGHT POLES AND HYDRANTS SHALL BE LOCATED IN LANDSCAPE AREAS AS APPROVED BY CITY ENGINEER.
4. SEE SD DG14 FOR 46' RUSTIC STREET SECTIONS.

Donell Cairns

APPROVED BY: DONALD CAIRNS
TRANSPORTATION PLANNING AND ENGINEERING MANAGER

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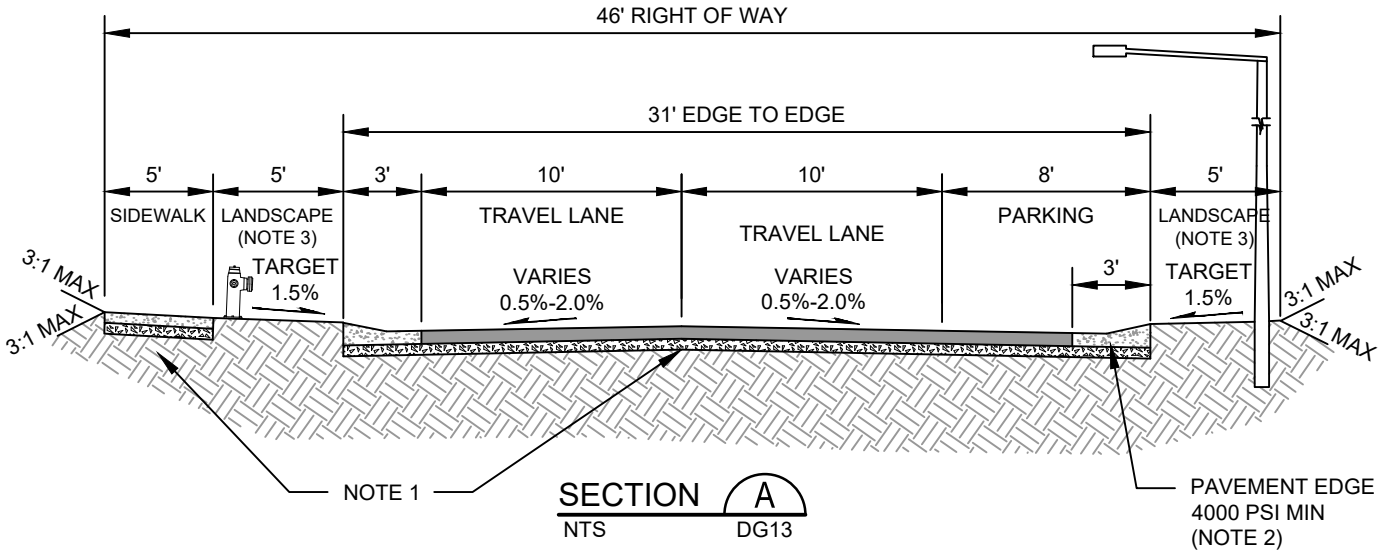
STANDARD DETAILS

46' RUSTIC STREET PLAN

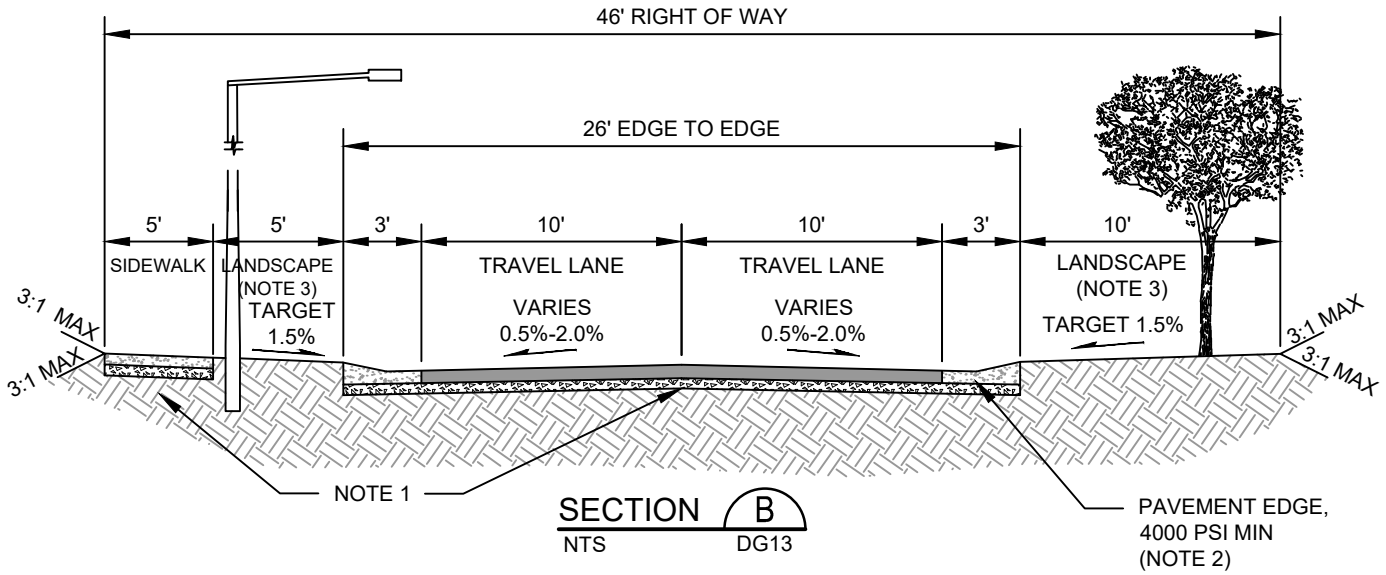
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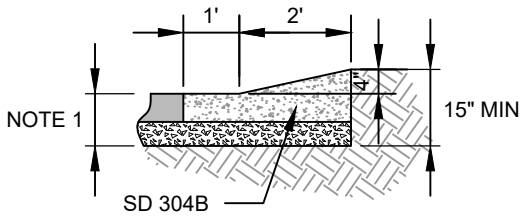
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SECTION A
NTS DG13



SECTION B
NTS DG13



THICKENED EDGE DETAIL
NTS

NOTES:

1. SEE STANDARD DETAIL 301 FOR SIDEWALK, PAVEMENT, BASE COURSE AND SUBGRADE REQUIREMENTS.
2. PAVEMENT EDGE SHALL CONSIST OF THICKENED EDGE CONCRETE (SEE DETAILS ABOVE) ON EACH SIDE, SCORED OR SHINER AS APPROVED BY CITY ENGINEER.
3. SEE RZC APPENDIX 2, SECTION 21c. THE CITY REQUIRES A CLEAR ZONE OF 10 FEET FROM THE EDGE OF TRAVELED WAY TO THE FACE OF ANY FIXED OBJECT WITHOUT BREAK AWAY CAPABILITIES. STREET TREES, LIGHT POLES AND HYDRANTS SHALL BE LOCATED IN LANDSCAPE AREAS AS APPROVED BY CITY ENGINEER.

Donell Cairns

APPROVED BY: DONALD CAIRNS
TRANSPORTATION PLANNING AND ENGINEERING MANAGER

REVISION DATE: MARCH 01, 2020

CityofRedmond
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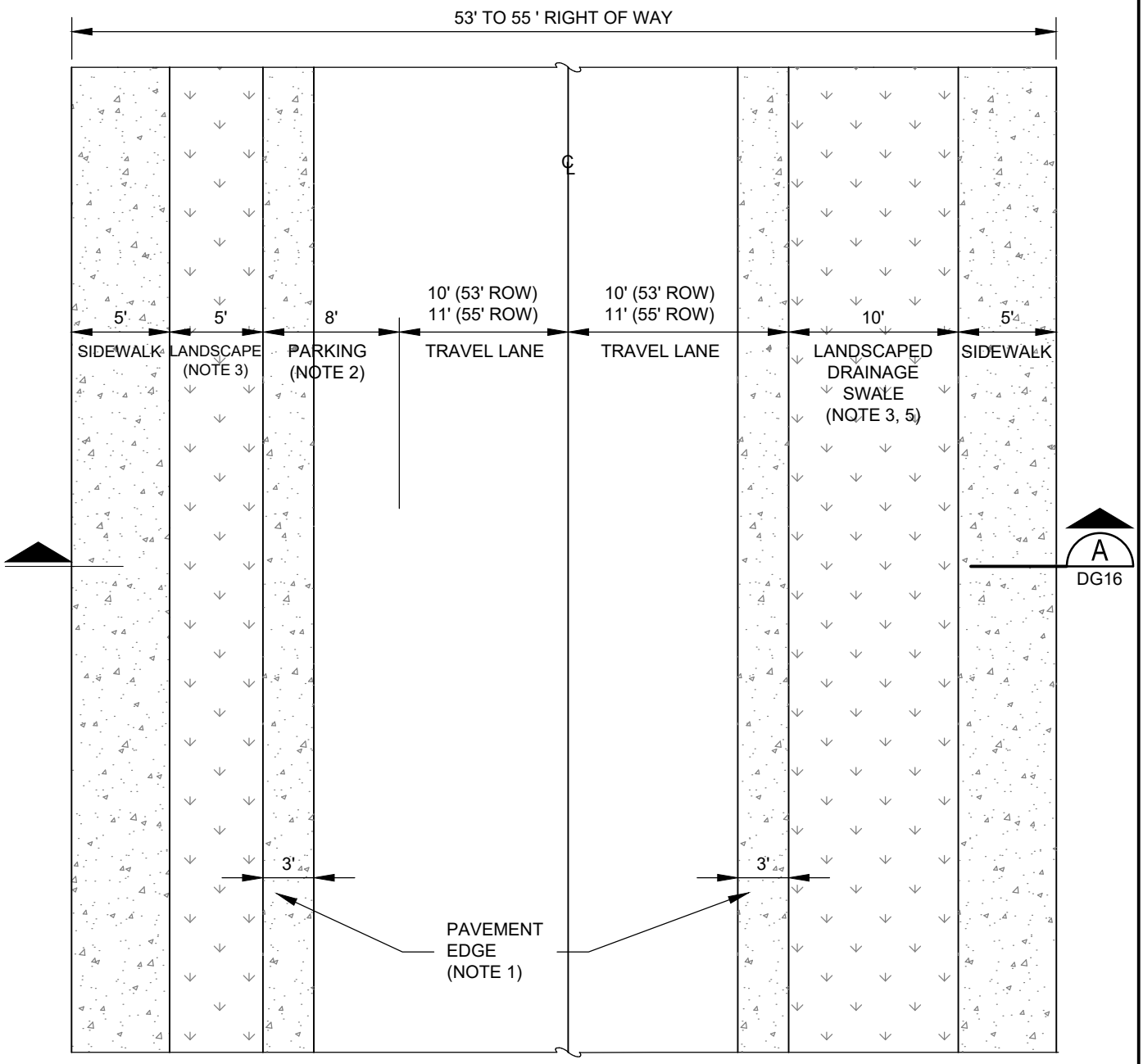
STANDARD DETAILS

46' RUSTIC STREET SECTIONS

FILE NAME: DG14.DWG

DETAIL NUMBER: **DG14**

DocuSign Envelope ID: F681597A-CCE8-405B-ACDB-A8564C559739



PLAN VIEW

NTS

NOTES:

1. PAVEMENT EDGE SHALL CONSIST OF THICKENED EDGE OR RIBBON CURB CONCRETE ON EACH SIDE, SCORED OR SHINER AS APPROVED BY CITY ENGINEER. RIBBON CURB DETAIL SHALL BE USED ADJACENT TO DRAINAGE SWALE.
2. SEE RZC APPENDIX 2, TABLE 3 FOR PARKING OPTIONS.
3. SEE RZC APPENDIX 2, SECTION 21c. THE CITY REQUIRES A CLEAR ZONE OF 10 FEET FROM THE EDGE OF TRAVELED WAY TO THE FACE OF ANY FIXED OBJECT WITHOUT BREAK AWAY CAPABILITIES. STREET TREES, LIGHT POLES AND HYDRANTS SHALL BE LOCATED IN LANDSCAPE AREAS AS APPROVED BY CITY ENGINEER.
4. SEE STANDARD DETAIL DG16 FOR 53' TO 55' RUSTIC STREET SECTIONS.
5. LANDSCAPED DRAINAGE SWALE SHALL BE DESIGNED TO ALLOW FOR DRIVEWAYS, UTILITY CROSSINGS, STREET TREES AND OTHER CONSTRAINTS. IF SOILS DON'T SUPPORT INFILTRATION, THEN AN UNDERDRAIN IS REQUIRED. OVERFLOW/OUTLET STRUCTURE SHALL BE INCLUDED AT LOW END OF EACH SWALE SECTION THAT IS INTERRUPTED BY A DRIVEWAY OR OTHER CROSSING, OR IF THE SWALE BECOMES TOO DEEP TO FIT WITHIN STREET SECTION.

Donell Cairns

APPROVED BY: DONALD CAIRNS
TRANSPORTATION PLANNING AND ENGINEERING MANAGER

REVISION DATE: MARCH 01, 2020

CityofRedmond
WASHINGTON

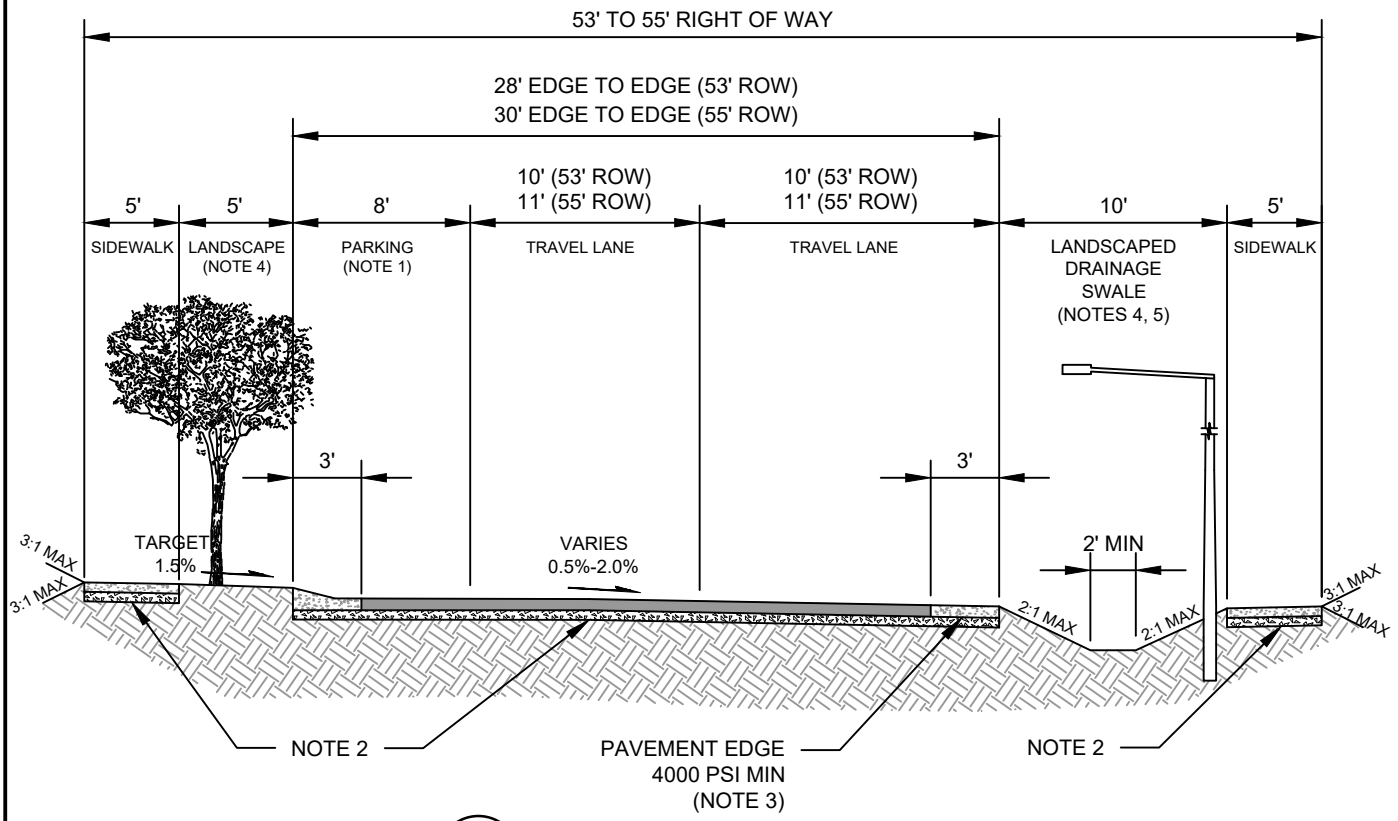
STANDARD DETAILS

53' TO 55' RUSTIC STREET PLAN

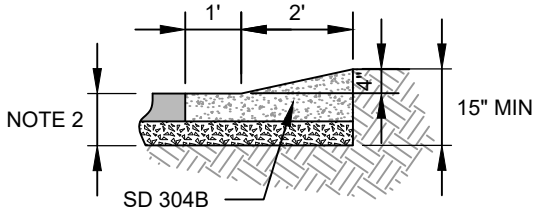
FILE NAME: DG15.DWG

DETAIL NUMBER: **DG15**

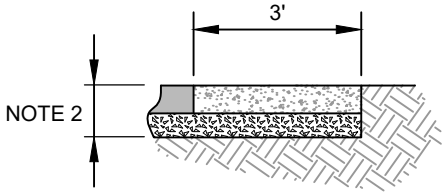
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SECTION A
NTS DG15



THICKENED EDGE DETAIL
NTS



RIBBON CURB DETAIL (SEE NOTE 3)
NTS

NOTES:

1. SEE RZC APPENDIX 2, TABLE 3 FOR PARKING OPTIONS.
2. SEE STANDARD DETAIL 301 FOR SIDEWALK, PAVEMENT, BASE COURSE AND SUBGRADE REQUIREMENTS.
3. PAVEMENT EDGE SHALL CONSIST OF THICKENED EDGE OR RIBBON CURB CONCRETE (SEE DETAILS ABOVE) ON EACH SIDE, SCORED OR SHINER AS APPROVED BY CITY ENGINEER. RIBBON CURB DETAIL SHALL BE USED ADJACENT TO DRAINAGE SWALES.
4. SEE RZC APPENDIX 2, SECTION 21c. THE CITY REQUIRES A CLEAR ZONE OF 10 FEET FROM THE EDGE OF TRAVELED WAY TO THE FACE OF ANY FIXED OBJECT WITHOUT BREAK AWAY CAPABILITIES. STREET TREES, LIGHT POLES AND HYDRANTS SHALL BE LOCATED IN LANDSCAPE AREAS AS APPROVED BY CITY ENGINEER.
5. LANDSCAPED DRAINAGE SWALE SHALL BE DESIGNED TO ALLOW FOR DRIVEWAYS, UTILITY CROSSINGS, STREET TREES AND OTHER CONSTRAINTS. IF SOILS DON'T SUPPORT INFILTRATION, THEN AN UNDERDRAIN IS REQUIRED. OVERFLOW/OUTLET STRUCTURE SHALL BE INCLUDED AT LOW END OF EACH SWALE SECTION THAT IS INTERRUPTED BY A DRIVEWAY OR OTHER CROSSING, OR IF THE SWALE BECOMES TOO DEEP TO FIT WITHIN STREET SECTION.

Donell Cairns

APPROVED BY: DONALD CAIRNS
TRANSPORTATION PLANNING AND ENGINEERING MANAGER

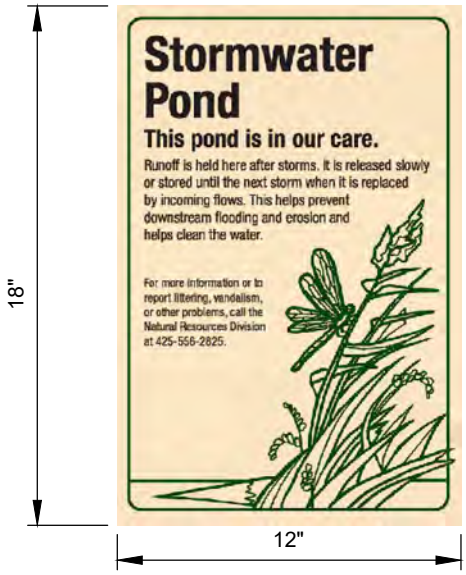
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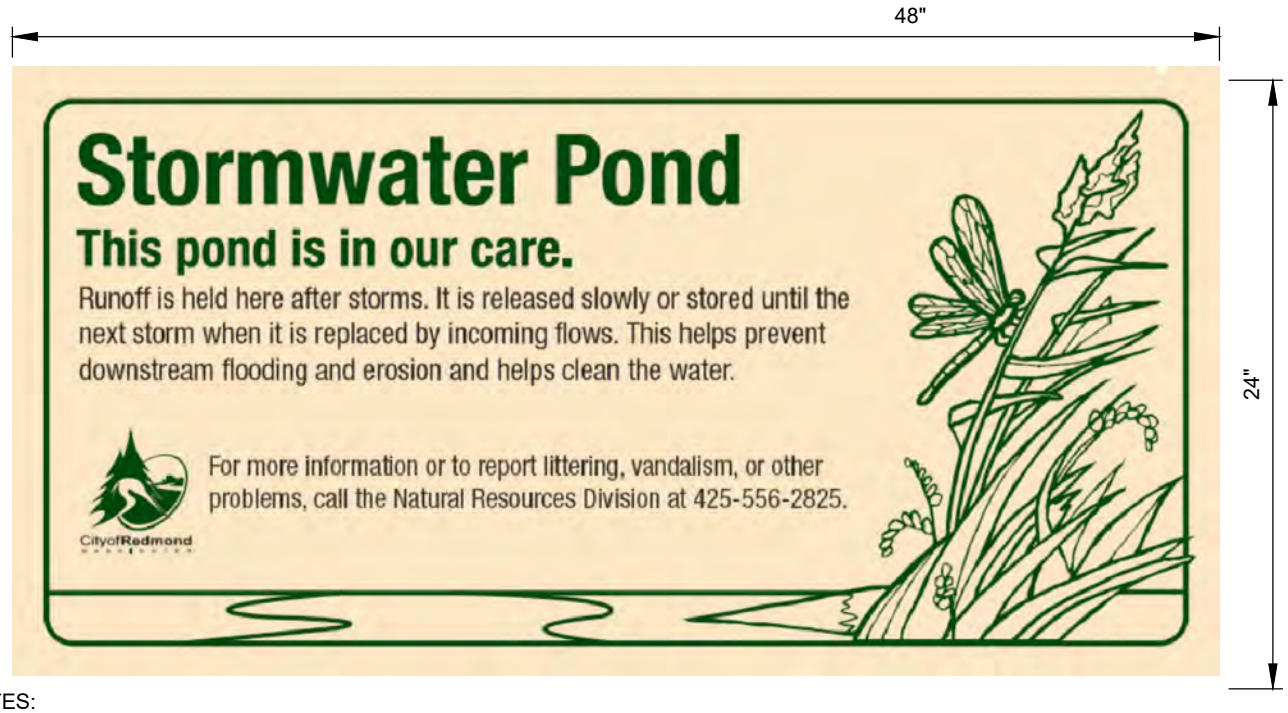
CityofRedmond WASHINGTON

STANDARD DETAILS

53' TO 55' RUSTIC STREET SECTIONS

FILE NAME: DG16.DWG | DETAIL NUMBER: **DG16**





NOTES:

1. THE SIGN COLORS ARE PMS 350 (DARK GREEN) FOR THE LETTERING AND PMS 726 (LIGHT TAN) FOR THE BACKGROUND.
2. THE FONT USED IS HELVETICA NEUE CONDENSED (BOLD AND REGULAR).
3. MATERIAL: 0.125-GAUGE ALUMINUM
4. FACE: 3 COATS OUTDOOR ENAMEL (SPRAYED)
5. LETTERING: SILK SCREEN ENAMEL
6. INSTALLATION: MOUNT ON FENCE, OR WITH PRESSURE TREATED POSTS WITH BEVELED TOPS, 1-1/2 INCH HIGHER THAN SIGN. IF POSTS ARE USED, SET IN 3 INCH DEEP BY 8INCH DIAMETER, CONCRETE FILLED POST HOLES. TOP OF SIGN SHOULD BE 3'-6" ABOVE GROUND. FOR LARGE SIGN, USE TWO POSTS. FOR SMALL SIGN, USE ONE.
7. PLACEMENT: FACE SIGN IN DIRECTION OF PRIMARY VISUAL OR PHYSICAL ACCESS. DO NOT BLOCK ACCESS ROAD. DO NOT PLACE WITHIN SIX FEET OF STRUCTURES. LOCATION IS SUBJECT TO APPROVAL BY THE STORMWATER ENGINEER.
8. AN ELECTRONIC FILE OF THE SIGN IS AVAILABLE FROM THE STORMWATER ENGINEER, AND THE STORMWATER ENGINEER WILL DETERMINE WHAT SIZE SIGN IS APPROPRIATE. FOR TREATMENT WETLANDS REPLACE TEXT "STORMWATER PON"D WITH "STORMWATER TREATMENT"

Gary M. Schimek

APPROVED BY: GARY M. SCHIMEK
ENVIRONMENTAL AND UTILITY SERVICES DIVISION MANAGER

REVISION DATE: MARCH 01, 2019

CityofRedmond WASHINGTON

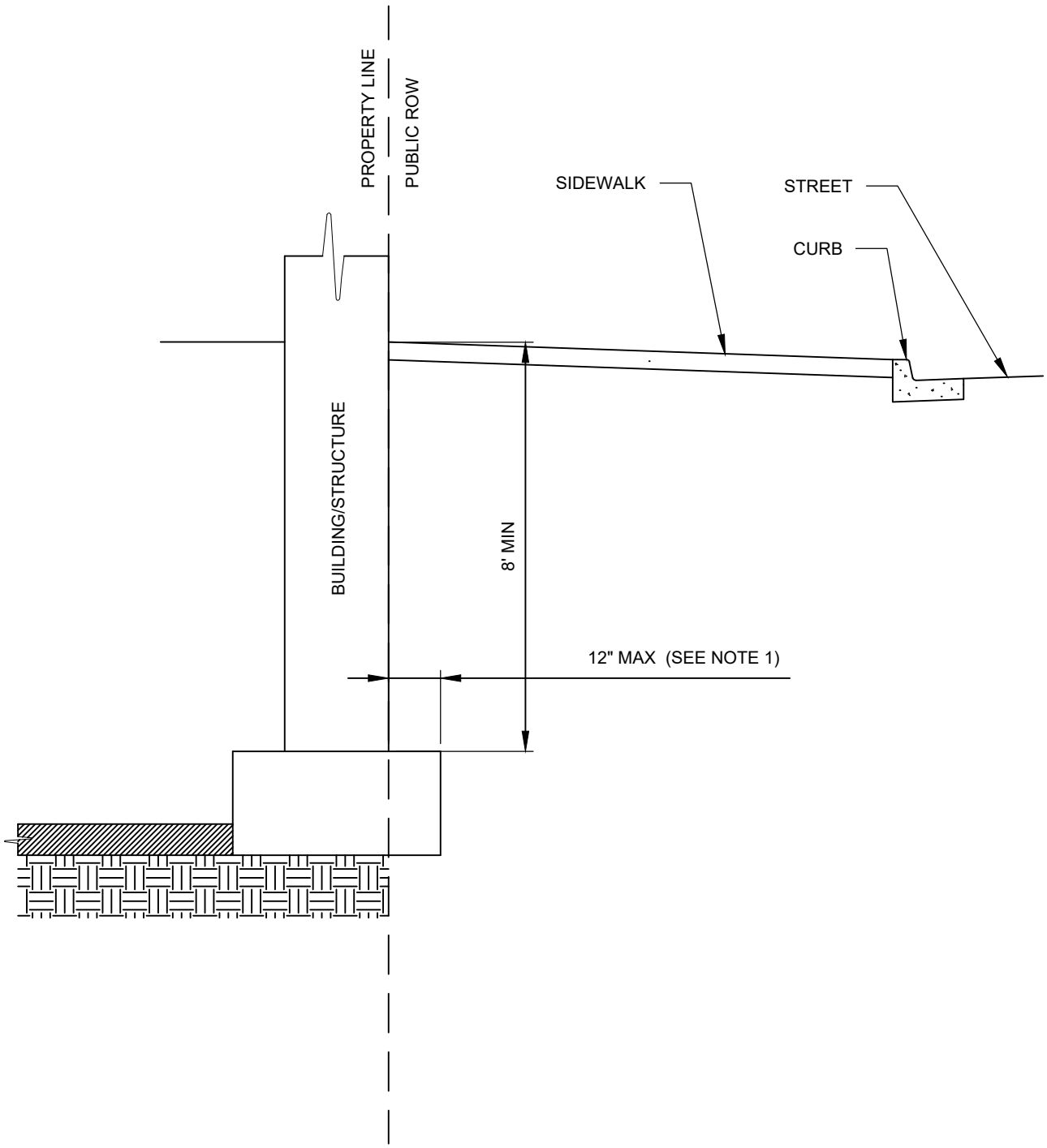
STANDARD DETAILS

POND SIGN

FILE NAME: DG17.DWG

DETAIL NUMBER: **DG17**

DocuSign Envelope ID: F681597A-CCE8-405B-ACDB-A8564C559739



PROFILE
NTS

NOTES:

1. THERE SHALL BE NO BELOW GRADE ENCROACHMENTS INTO THE RIGHT-OF-WAY UNLESS THE CITY OF REDMOND ZONING CODE ALLOWS STRUCTURES TO BE BUILT UP TO THE RIGHT OF WAY LINE ON A DESIGNATED PROPERTY, THE BUILDING FOUNDATION MAY ENCROACH A MAXIMUM OF 12 INCHES INTO THE RIGHT-OF-WAY AT A MINIMUM OF 8 FEET BELOW GRADE.

APPROVED BY:JON C. SPANGLER
CONSTRUCTION ENGINEERING MANAGER

REVISION DATE: MARCH 01, 2019

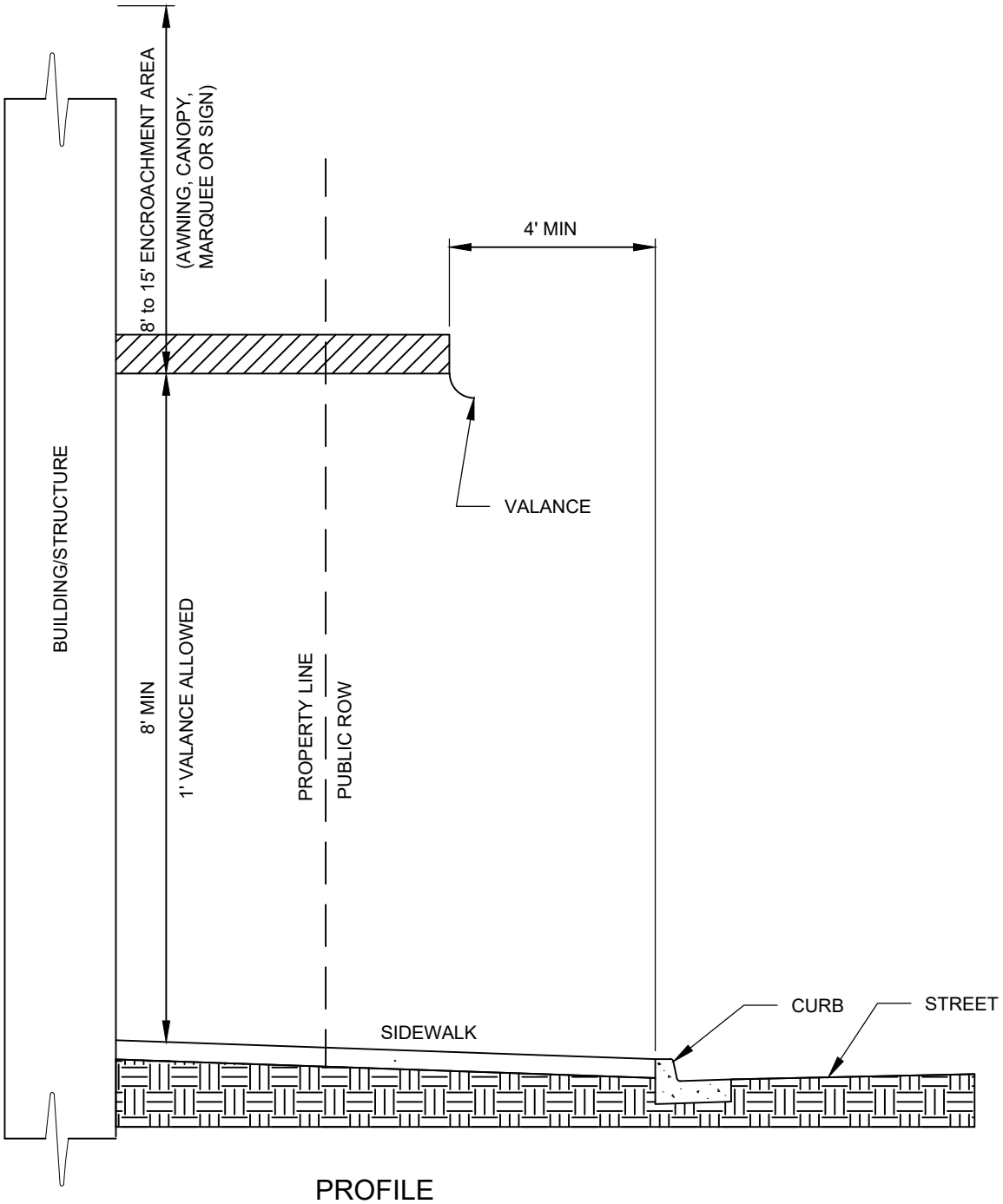
CityofRedmond WASHINGTON

STANDARD DETAILS

ENCROACHMENT DETAIL BELOW GRADE (ROW)

FILE NAME:SDDG18.DWG | DETAIL NUMBER:**DG18**

DocuSign Envelope ID: F681597A-CCE8-405B-ACDB-A8564C559739



PROFILE

NTS

NOTES:

1. MAXIMUM ALLOWABLE ENCROACHMENT FOR AWNINGS, CANOPIES, MARQUEES AND SIGNS IS TWO-THIRDS OF THE SIDEWALK WIDTH AND 4 FOOT MINIMUM FROM BACK OF CURB.
2. AT A MINIMUM THAT PORTION OF THE AWNING, CANOPY, MARQUEE OR SIGN THAT EXTENDS INTO THE RIGHT-OF-WAY MUST BE REMOVABLE.
3. THE PROPERTY OWNER IS RESPONSIBLE FOR REMOVAL AT THEIR EXPENSE AT THE CITIES REQUEST.
4. THE PROPERTY OWNER IS RESPONSIBLE FOR ALL MAINTENANCE RELATED TO AWNINGS, CANOPIES, MARQUEES AND SIGNS.
5. BUILDINGS, BALCONIES, STEPS, WINDOWS, ARCHITECTURAL FEATURES AND MECHANICAL EQUIPMENT ARE NOT ALLOWED IN THE RIGHT-OF-WAY

APPROVED BY:JON C. SPANGLER
CONSTRUCTION ENGINEERING MANAGER

REVISION DATE: MARCH 01, 2019

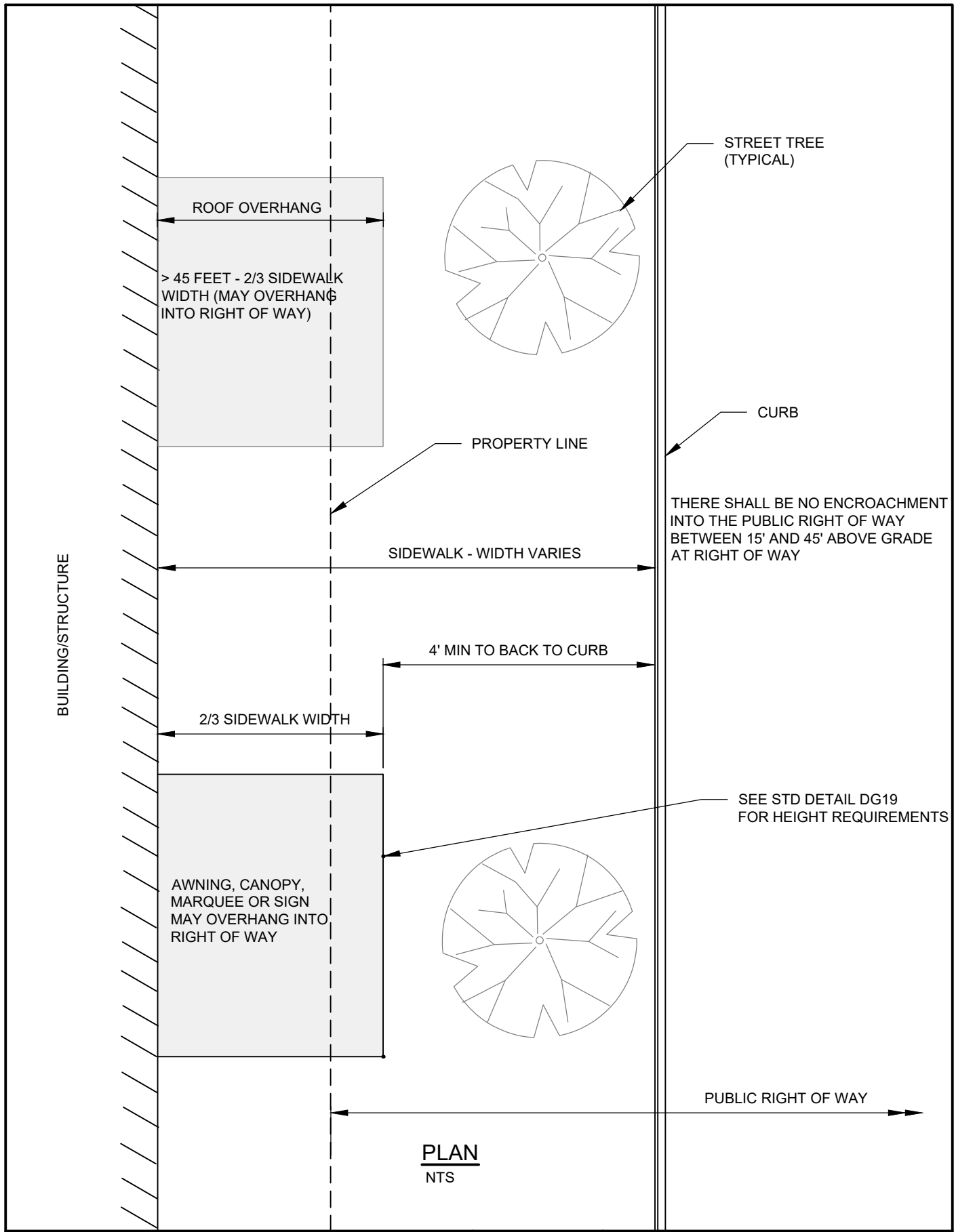
CityofRedmond
WASHINGTON

STANDARD DETAILS

ENCROACHMENT DETAIL AWNINGS, CANOPIES, MARQUEES & SIGNS 8-FEET TO 15-FEET (ROW)

FILE NAME:SDDG19.DWG | DETAIL NUMBER:**DG19**

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PLAN
NTS

APPROVED BY:JON C. SPANGLER
CONSTRUCTION ENGINEERING MANAGER

REVISION DATE: MARCH 01, 2019

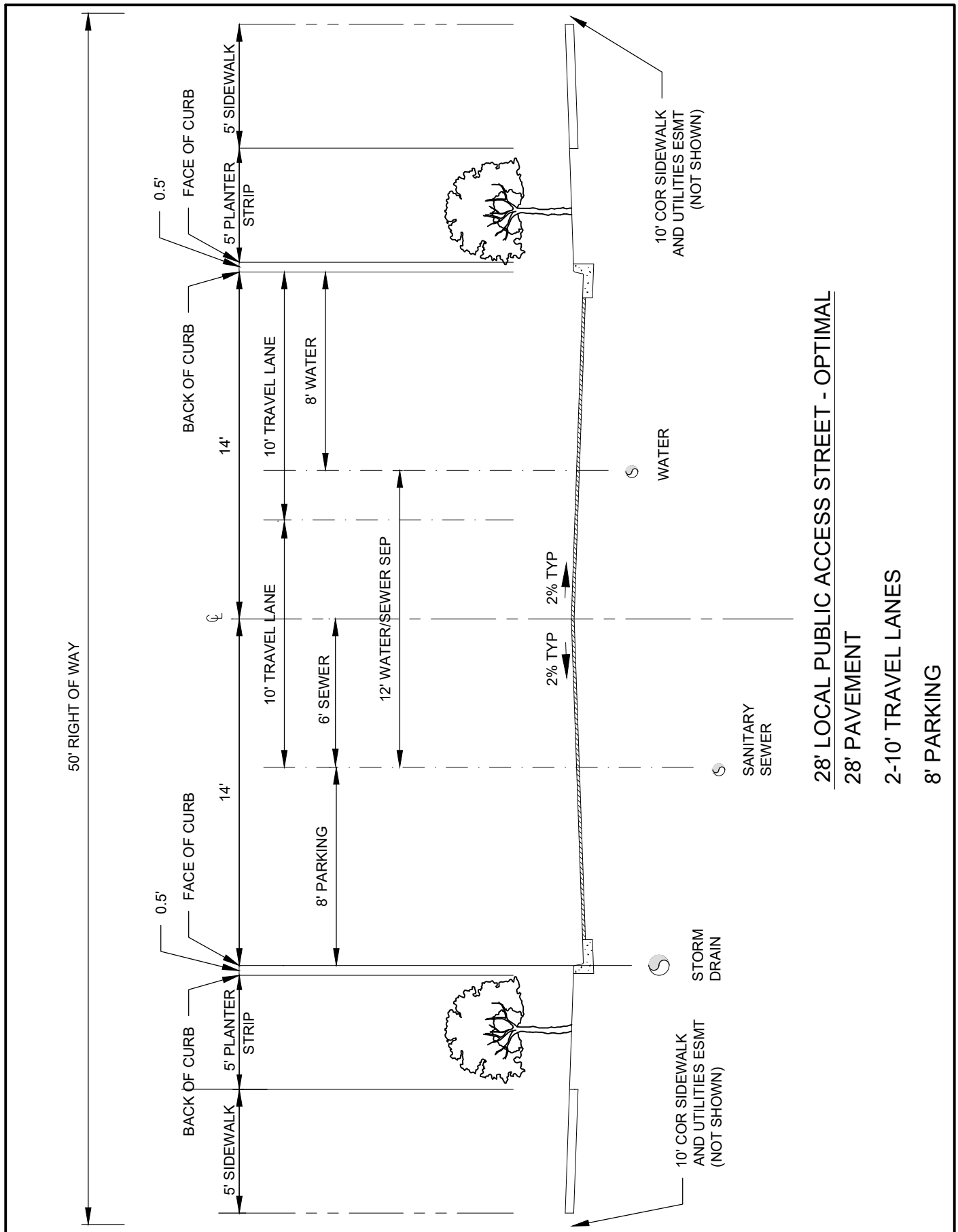
CityofRedmond
WASHINGTON

STANDARD DETAILS

ENCROACHMENT DETAIL

FILE NAME: SDDG20.DWG | DETAIL NUMBER: **DG20**

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Gary M. Schimek

APPROVED BY: GARY M. SCHIMEK
ENVIRONMENTAL AND UTILITY SERVICES DIVISION MANAGER

REVISION DATE: MARCH 01, 2019

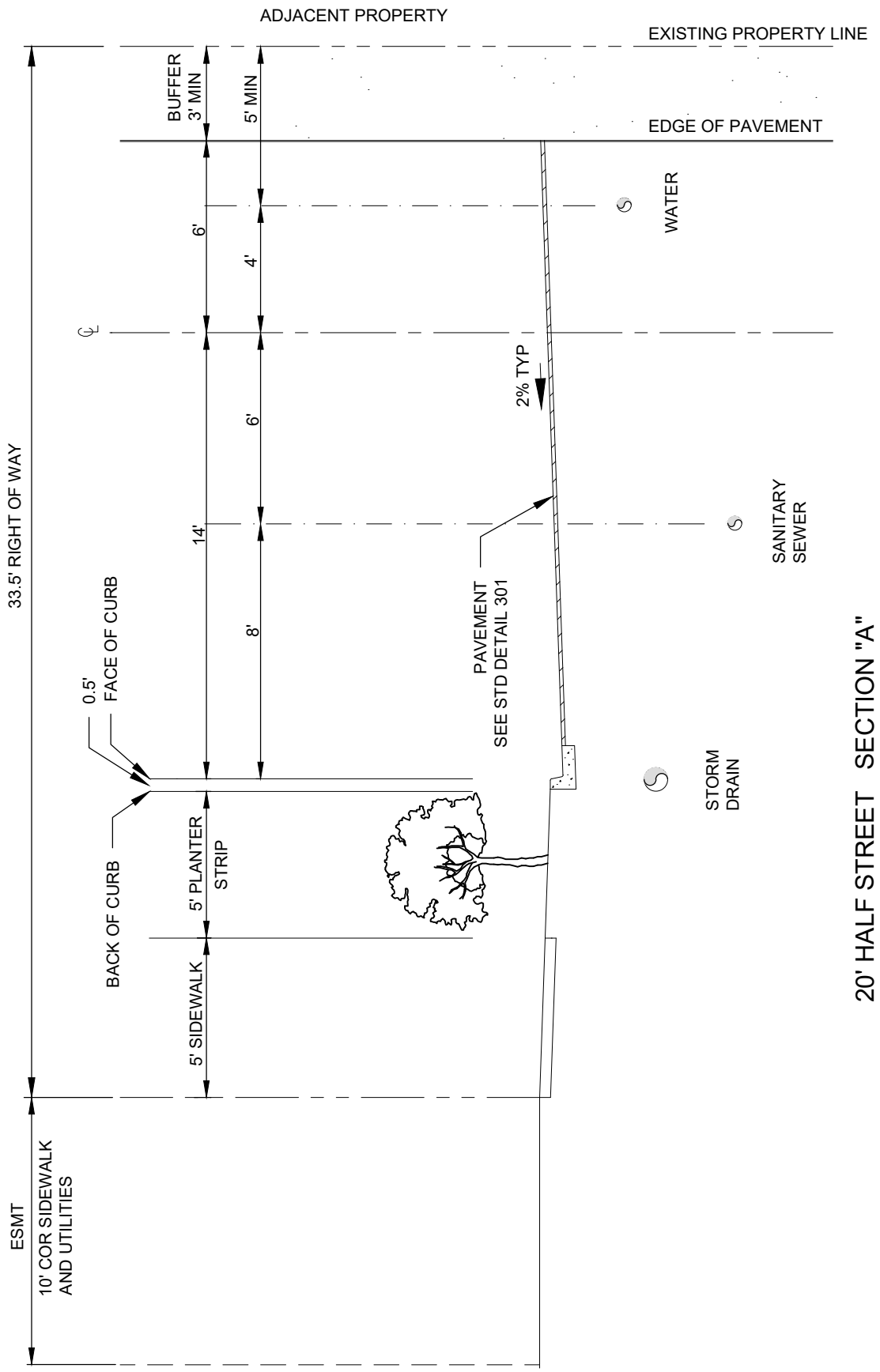
CityofRedmond WASHINGTON

STANDARD DETAILS

UTILITY LOCATIONS
28' LOCAL STREET

FILE NAME: SDDG21.DWG | DETAIL NUMBER: **DG21**

DocuSign Envelope ID: F681597A-CCE8-405B-ACDB-A8564C559739



20' HALF STREET SECTION "A"

NOTES:

1. LOCATE WATER MAIN MINIMUM 5 FEET FROM PROPERTY LINE. IF REQUIRED DEPTH OF WATER MAIN EXCEEDS 5 FEET, DISTANCE TO MAIN FROM PROPERTY LINE SHALL EQUAL DEPTH.
2. 3' MIN BUFFER (GRAVEL OR GRASS)

Gary M. Schimek

APPROVED BY: GARY M. SCHIMEK
ENVIRONMENTAL AND UTILITY SERVICES DIVISION MANAGER

REVISION DATE: MARCH 01, 2020

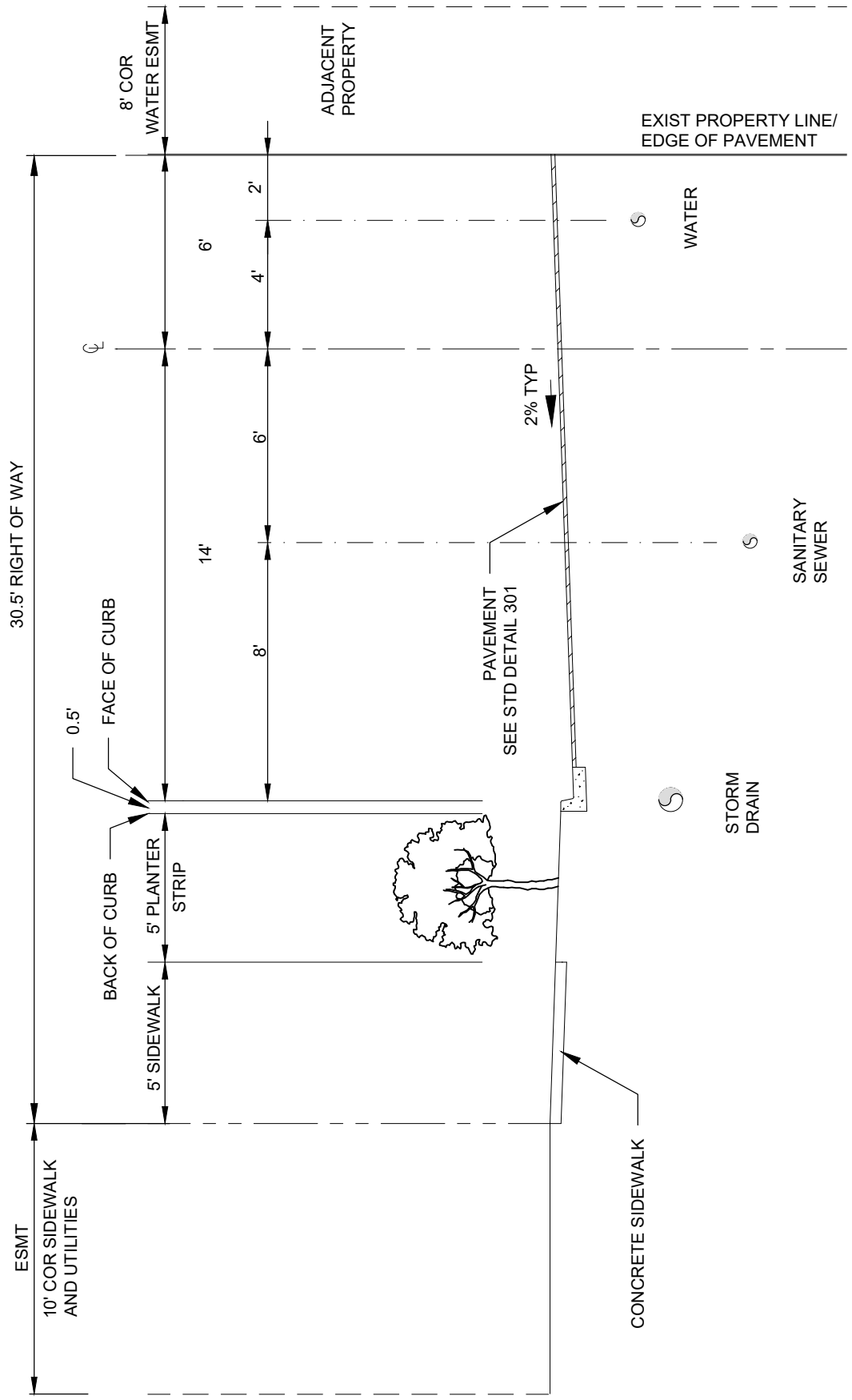
CityofRedmond WASHINGTON

STANDARD DETAILS

UTILITY LOCATIONS
20' HALF STREET "A"

FILE NAME: SDDG22.DWG | DETAIL NUMBER: **DG22**

DocuSign Envelope ID: F681597A-CCE8-405B-ACDB-A8564C559739



20' HALF STREET SECTION "B"

NOTES:

1. LOCATE WATER NEAR PROPERTY LINE
2. 8' CITY OF REDMOND (COR) WATER EASEMENT FROM ADJACENT PROPERTY

Gary M. Schimek

APPROVED BY: GARY M. SCHIMEK
ENVIRONMENTAL AND UTILITY SERVICES DIVISION MANAGER

REVISION DATE: MARCH 01, 2020

CityofRedmond
WASHINGTON

STANDARD DETAILS

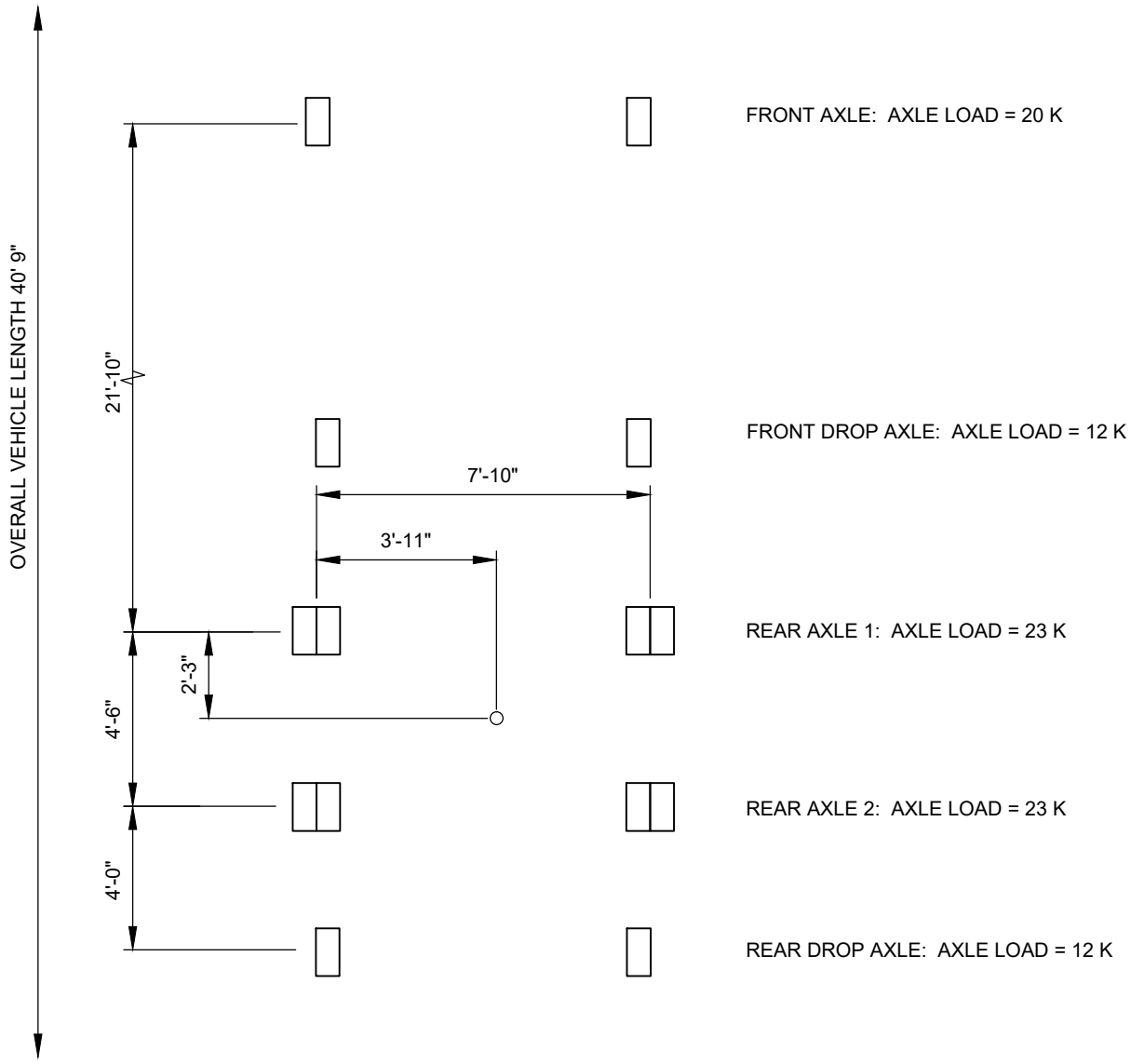
UTILITY LOCATIONS
20' HALF STREET "B"

FILE NAME: SDDG23.DWG | DETAIL NUMBER: **DG23**

DocuSign Envelope ID: F681597A-CCE8-405B-ACDB-A8564C559739

STRUCTURAL DESIGN OF VAULTS SHALL MEET ALL OF THE APPLICABLE DESIGN CRITERIA:

1. VAULTS SUBJECT TO VEHICLE LOADING: HS20 LOADING REQUIRED UNDER THE LATEST EDITION OF THE AMERICAN ASSOCIATION OF STATE HIGHWAY AND TRANSPORTATION OFFICIALS (AASHTO) PUBLICATION, "STANDARD SPECIFICATIONS FOR HIGHWAY BRIDGES".
2. VAULTS SUBJECT TO FIRE TRUCK LOADING: FIRE TRUCK OUTRIGGER LOAD: ASSUME 45,000 LB OVER 2 FT X 2 FT AREA
3. VAULTS SUBJECT TO EDUCTOR TRUCK LOADING: EDUCTOR TRUCK LOADING IN ACCORDANCE WITH DETAIL. THE LIVE LOAD CONDITIONS GIVEN SHALL BE APPLIED INDEPENDENTLY FROM EACH OTHER BUT IN COMBINATION WITH OTHER LOADS AS REQUIRED BY AASHTO AND THE IBC. EACH LOAD SHALL BE INCREASED BY ANY FACTORS REQUIRED BY AASHTO OR THE IBC UNLESS SPECIFICALLY EXCEPTED.



Gary M. Schimek

APPROVED BY: GARY M. SCHIMEK
ENVIRONMENTAL AND UTILITY SERVICES DIVISION MANAGER

REVISION DATE: MARCH 01, 2019

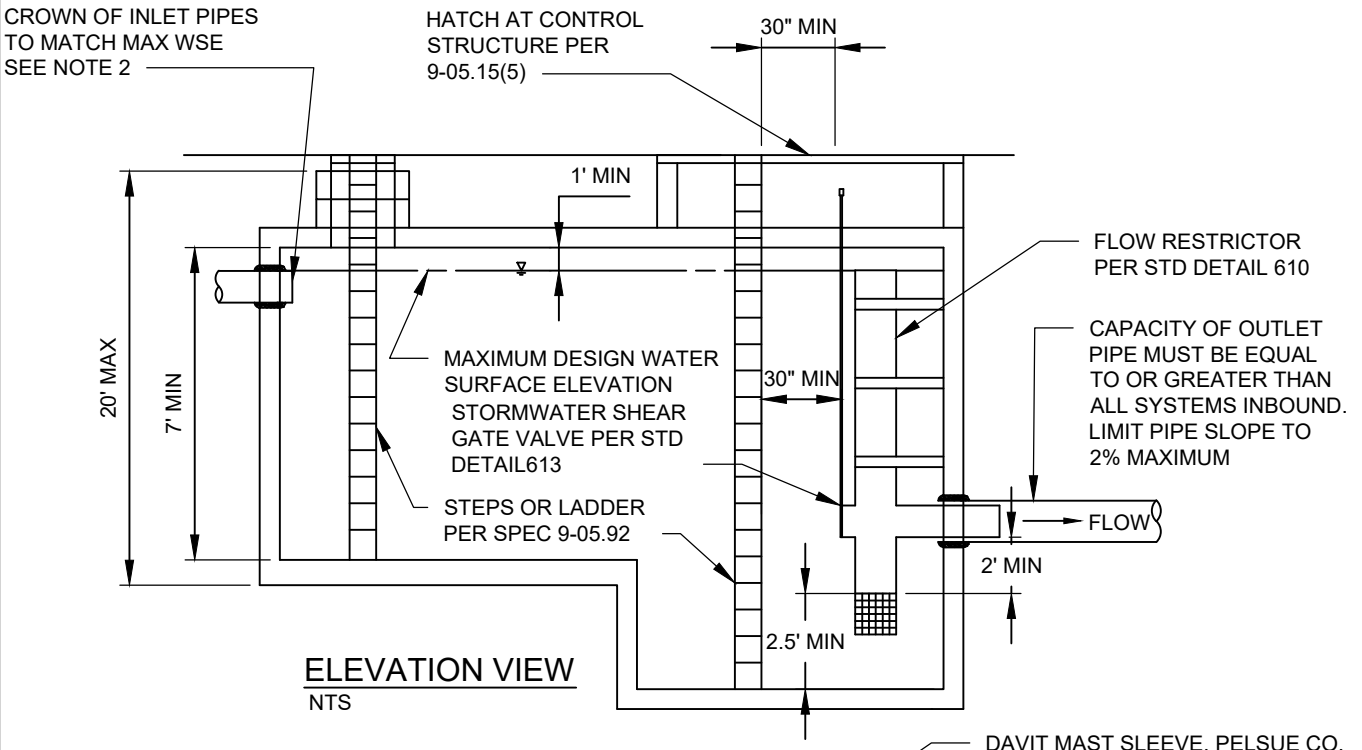
CityofRedmond WASHINGTON

STANDARD DETAILS

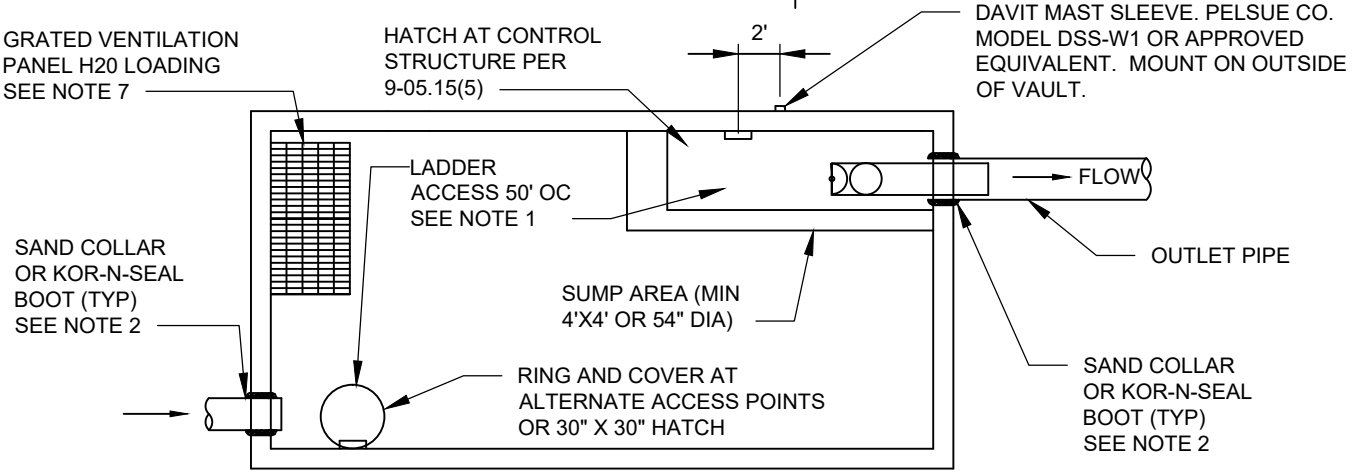
UTILITY VAULT LOADING

FILE NAME: SDDG24.DWG | DETAIL NUMBER: **DG24**

DocuSign Envelope ID: F681597A-CCE8-405B-ACDB-A8564C559739



ELEVATION VIEW
NTS



PLAN VIEW
NTS

NOTES:

1. PROVIDE LADDER RUNGS (SPEC 9-05.92) IMMEDIATELY ADJACENT TO ALL INLET/OUTLET PIPES.
2. APPLY NON-SHRINK GROUT TO INSIDE AND OUTSIDE OF ALL JOINTS, RINGS, RISERS AND FRAMES.
3. ALL PIPES SHALL BE PERPENDICULAR TO FACE OF VAULT.
4. PENETRATE CARRIER PIPE THROUGH VAULT WALL.
5. SLIP SMOOTH-BORE HORIZONTAL LEG OF FLOW CONTROL TEE INSIDE CARRIER PIPE.
6. HATCH OVER CONTROL STRUCTURE SHALL BE MINIMUM 36" X 72" AND LARGE ENOUGH TO BE OVER CONTROL STRUCTURE LADDER ACCESS AND SUMP.
7. GRATED VENTILATION PANEL MAY BE COMBINED WITH LADDER ACCESS POINT WITH STORMWATER ENGINEER APPROVAL.

Gary M. Schimek

APPROVED BY: GARY M. SCHIMEK
ENVIRONMENTAL AND UTILITY SERVICES DIVISION MANAGER

REVISION DATE: MARCH 01, 2020

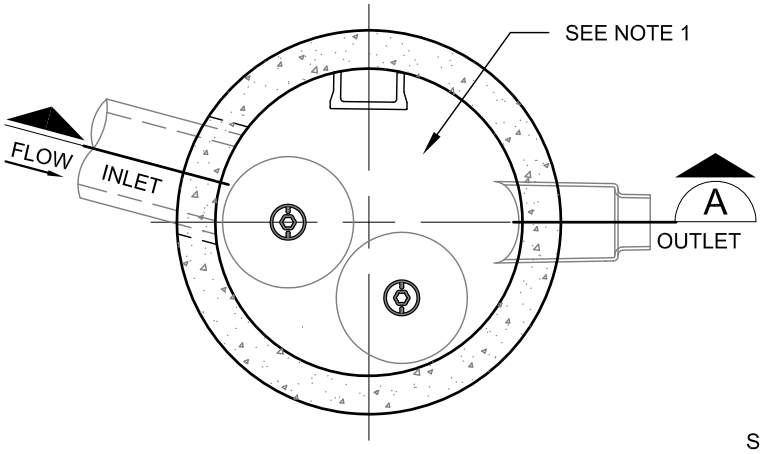
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WASHINGTON

STANDARD DETAILS

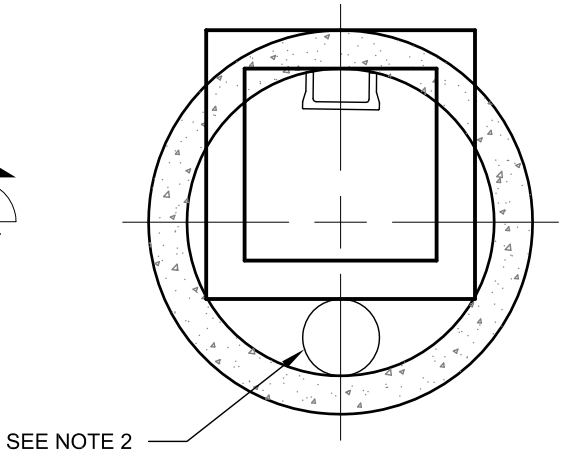
DETENTION VAULT ACCESS MANHOLE LID OVER LOW POINT

FILE NAME: DG25.DWG | DETAIL NUMBER: **DG25**

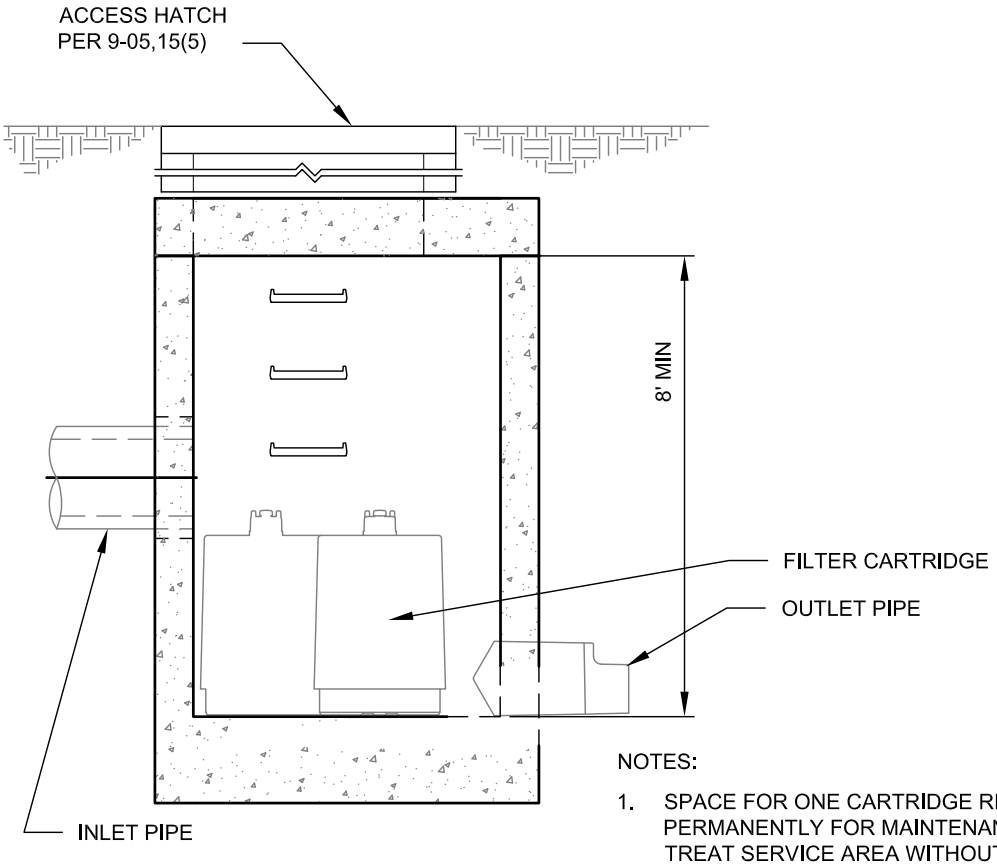
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INTERIOR PLAN
NTS



ACCESS PLAN
NTS



SECTION A
NTS

NOTES:

1. SPACE FOR ONE CARTRIDGE REMOVED AND LEFT OPEN PERMANENTLY FOR MAINTENANCE ACCESS. SYSTEM SIZED TO TREAT SERVICE AREA WITHOUT "REMOVED" CARTRIDGE.
2. 12 INCH CLEANOUT OVER OUTLET PIPE IF IT IS NOT BELOW HATCH OPENING.
3. THE 8 FOOT MINIMUM CLEARANCE CAN BE REDUCED IF ACCESS HATCHES ARE PROVIDED ABOVE ALL FILTERS.
4. SEE STORMWATER TECHNICAL NOTEBOOK 2.9.1.2 FOR GUIDANCE ON PROPRIETARY TREATMENT TECHNOLOGIES. FILTER SYSTEMS ARE NOT ALLOWED ON ALL PROJECTS.

Gary M. Schimek

APPROVED BY: GARY M. SCHIMEK
ENVIRONMENTAL AND UTILITY SERVICES DIVISION MANAGER

REVISION DATE: MARCH 01, 2020

CityofRedmond
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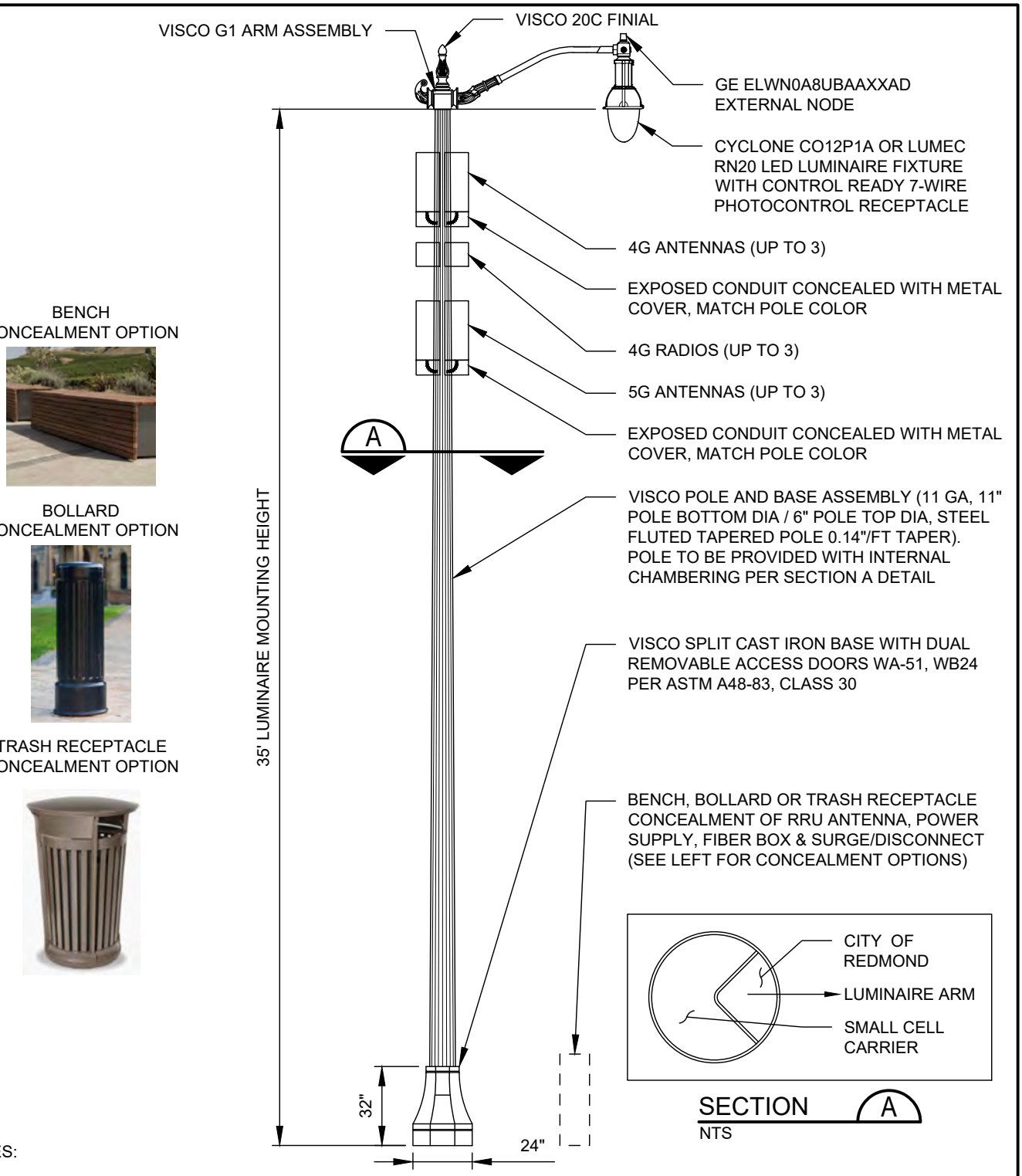
STANDARD DETAILS

FILTER VAULT ACCESS

FILE NAME: DG26.DWG

DETAIL NUMBER: **DG26**

DocuSign Envelope ID: F681597A-CCE8-405B-ACDB-A8564C559739



NOTES:

1. DEPLOYMENT CAN BE 4G, 5G OR BOTH.
2. EXTERNAL DISCONNECT SWITCH AND SIGNAGE SHALL BE PROVIDED AS PART OF THE SITE LICENSE ADDENDA.
3. FINAL POLE DRAWINGS AND POLE FOUNDATION DESIGN SHALL BE PROVIDED AND STAMPED AND SIGNED BY A STRUCTURAL ENGINEER REGISTERED WITH THE STATE OF WASHINGTON.
4. PAINT SPECIFICATIONS: ALL STEEL PARTS SHALL BE FACTORY GALVANIZED AND FACTORY POWDER COATED WITH PRIMER AND FINISH PAINT AND ALUMINUM LUMINAIRE FIXTURE SHALL BE FACTORY POWDER COATED WITH PRIMER AND FINISH PAINT PER WSDOT STANDARDS. FINISH PAINT SHALL BE RAL8556A PEKING BLUE.
5. STREET FURNITURE MANUFACTURER SHALL BE FORMS+SURFACES, RELIANCE FOUNDRY, LANDSCAPE FORMS AND/OR APPROVED EQUAL.

Paul S. Cho

APPROVED BY: PAUL S. CHO
TRAFFIC OPERATIONS SAFETY AND ENGINEERING MANAGER

REVISION DATE: OCTOBER 13, 2020

CityofRedmond
WASHINGTON

STANDARD DETAILS

OLD TOWN SMALL CELL LUMINAIRE POLE

FILE NAME: DG27.DWG

DETAIL NUMBER: **DG27**

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BENCH
CONCEALMENT OPTION

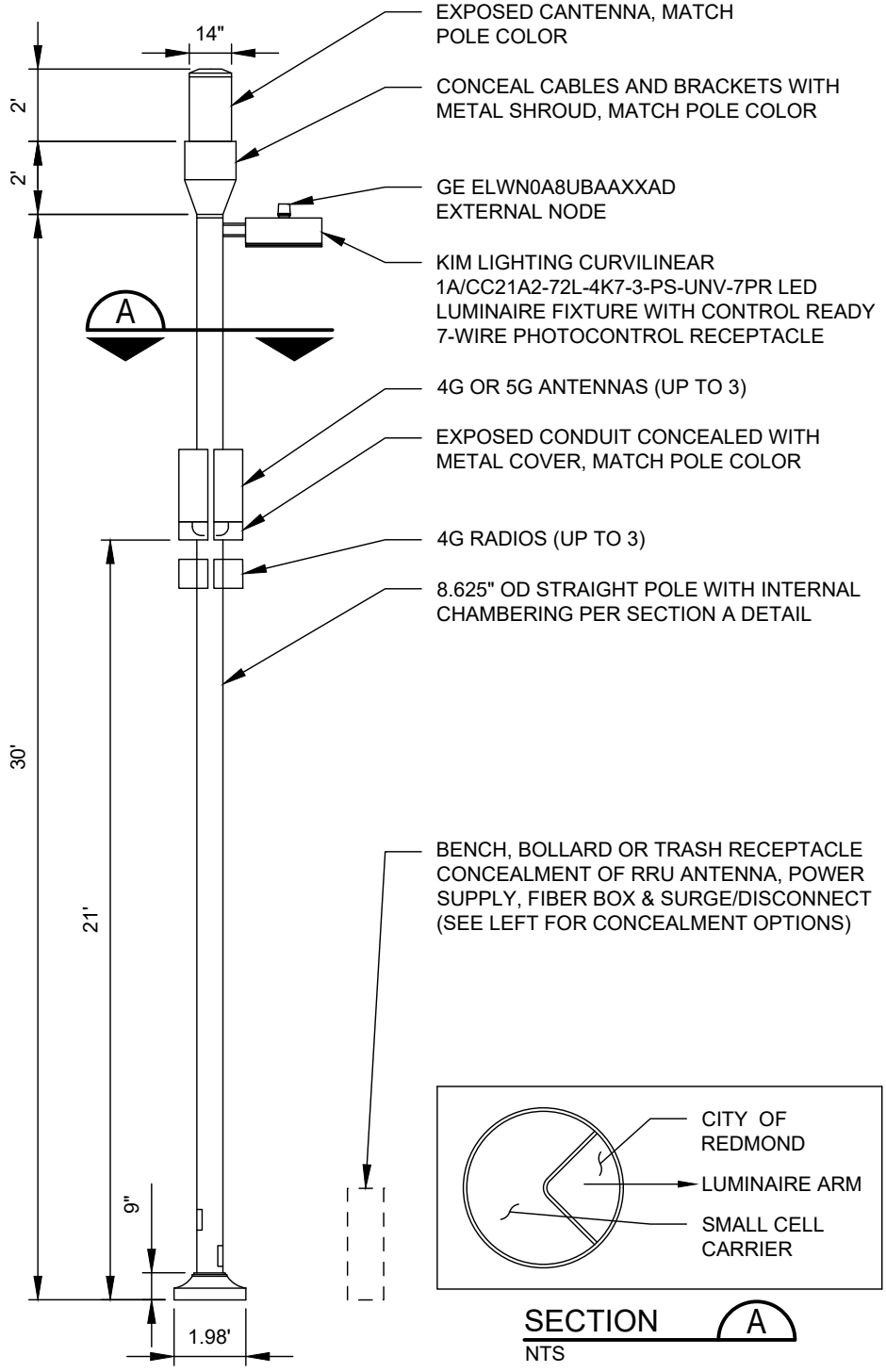


BOLLARD
CONCEALMENT OPTION



TRASH RECEPTACLE
CONCEALMENT OPTION





SECTION A
NTS

NOTES:

1. DEPLOYMENT CAN BE 4G, 5G OR BOTH.
2. EXTERNAL DISCONNECT SWITCH AND SIGNAGE SHALL BE PROVIDED AS PART OF THE SITE LICENSE ADDENDA.
3. FINAL POLE DRAWINGS AND POLE FOUNDATION DESIGN SHALL BE PROVIDED AND STAMPED AND SIGNED BY A STRUCTURAL ENGINEER REGISTERED WITH THE STATE OF WASHINGTON.
4. PAINT SPECIFICATIONS: ALL STEEL PARTS SHALL BE FACTORY GALVANIZED AND FACTORY POWDER COATED WITH PRIMER AND FINISH PAINT AND ALUMINUM LUMINAIRE FIXTURE AND BASE COVER SHALL BE FACTORY POWDER COATED WITH PRIMER AND FINISH PAINT PER WSDOT STANDARDS. FINISH PAINT SHALL BE "PLATINUM SILVER".
5. STREET FURNITURE MANUFACTURER SHALL BE FORMS+SURFACES, RELIANCE FOUNDRY, LANDSCAPE FORMS AND/OR APPROVED EQUAL.

Paul S. Cho

APPROVED BY: PAUL S. CHO
TRAFFIC OPERATIONS SAFETY AND ENGINEERING MANAGER

REVISION DATE: OCTOBER 13, 2020

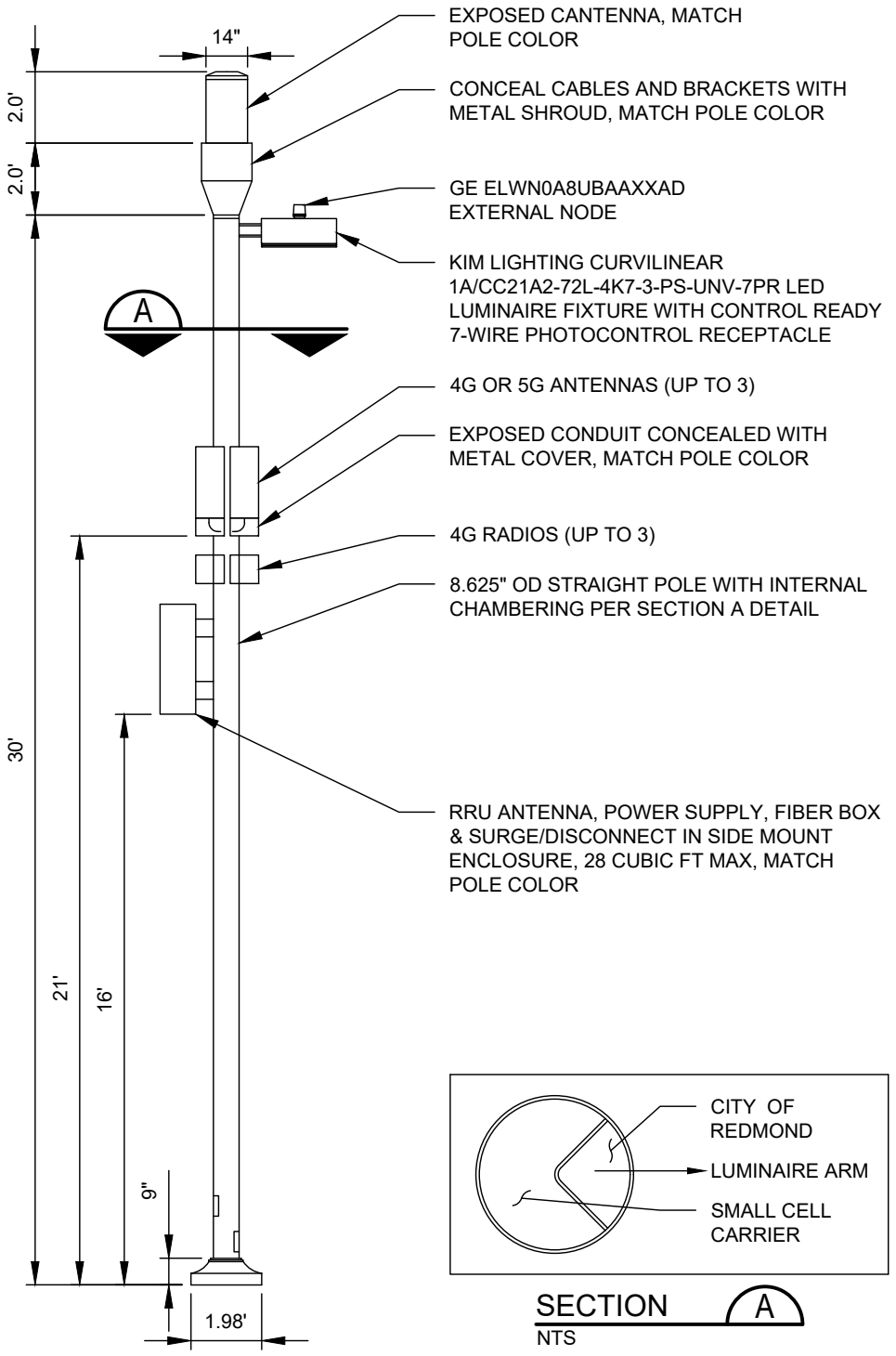
CityofRedmond
WASHINGTON

STANDARD DETAILS

OVERLAKE VILLAGE SMALL CELL LUMINAIRE POLE - FULL CONCEAL

FILE NAME: DG28.DWG

DETAIL NUMBER: **DG28**



NOTES:

1. DEPLOYMENT CAN BE 4G, 5G OR BOTH.
2. EXTERNAL DISCONNECT SWITCH AND SIGNAGE SHALL BE PROVIDED AS PART OF THE SITE LICENSE ADDENDA.
3. FINAL POLE DRAWINGS AND POLE FOUNDATION DESIGN SHALL BE PROVIDED AND STAMPED AND SIGNED BY A STRUCTURAL ENGINEER REGISTERED WITH THE STATE OF WASHINGTON.
4. PAINT SPECIFICATIONS: ALL STEEL PARTS SHALL BE FACTORY GALVANIZED AND FACTORY POWDER COATED WITH PRIMER AND FINISH PAINT AND ALUMINUM LUMINAIRE FIXTURE AND BASE COVER SHALL BE FACTORY POWDER COATED WITH PRIMER AND FINISH PAINT PER WSDOT STANDARDS. FINISH PAINT SHALL BE "PLATINUM SILVER".

Paul S. Cho

APPROVED BY: PAUL S. CHO
TRAFFIC OPERATIONS SAFETY AND ENGINEERING MANAGER

REVISION DATE: OCTOBER 13, 2020

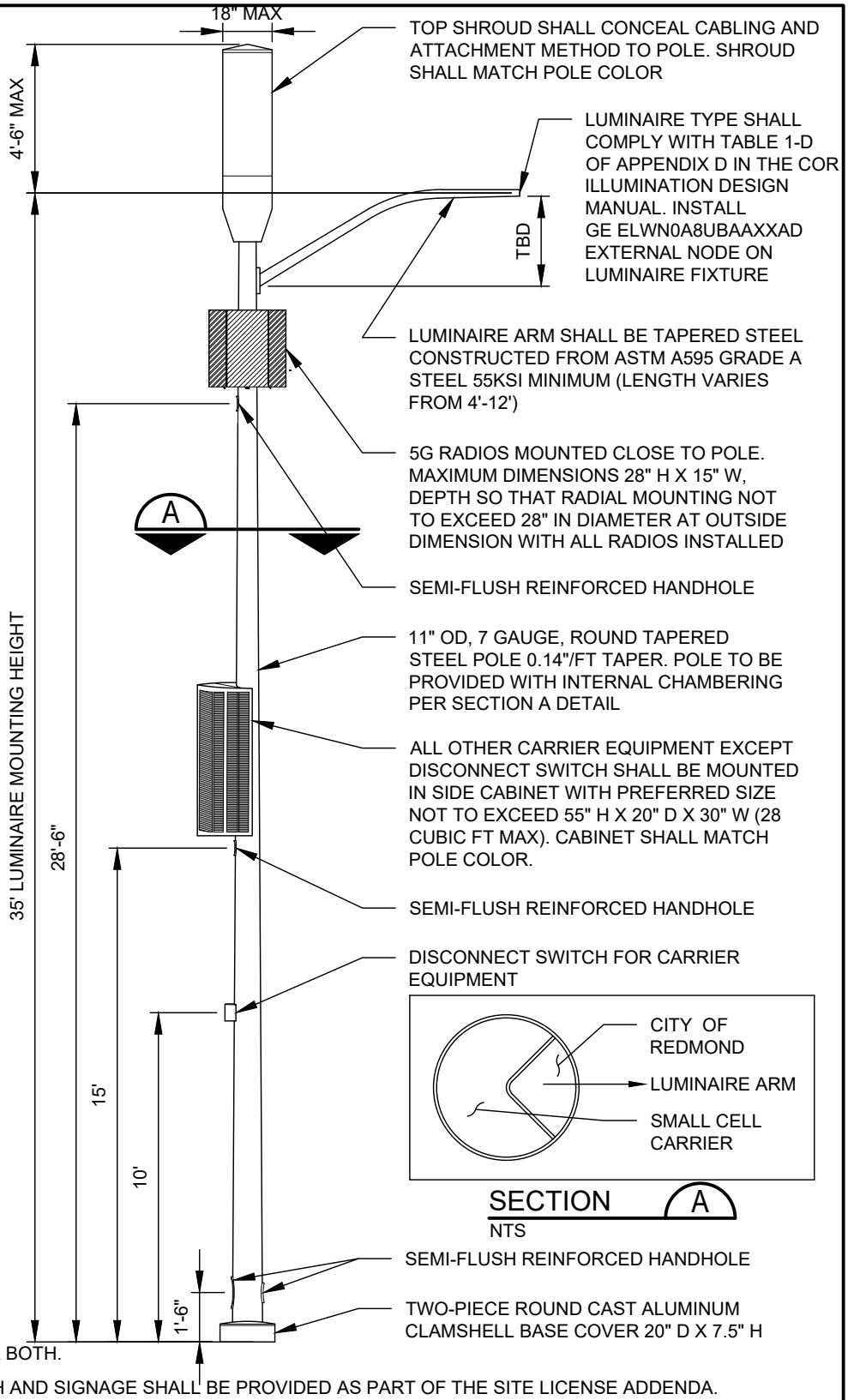
CityofRedmond WASHINGTON

STANDARD DETAILS

OVERLAKE VILLAGE SMALL CELL LUMINAIRE POLE - NON CONCEAL

FILE NAME: DG29.DWG | DETAIL NUMBER: **DG29**

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THIS DESIGN GUIDANCE APPLIES TO LOCATIONS WHERE THE COR ILLUMINATION DESIGN MANUAL SPECIFIES STANDARD DETAILS 420 AND 430 PER TABLE 1-D, APPENDIX D.

NOTES:

1. DEPLOYMENT CAN BE 4G, 5G OR BOTH.
2. EXTERNAL DISCONNECT SWITCH AND SIGNAGE SHALL BE PROVIDED AS PART OF THE SITE LICENSE ADDENDA.
3. FINAL POLE DRAWINGS AND POLE FOUNDATION DESIGN SHALL BE PROVIDED AND STAMPED AND SIGNED BY A STRUCTURAL ENGINEER REGISTERED WITH THE STATE OF WASHINGTON.
4. PAINT SPECIFICATIONS: ALL STEEL PARTS SHALL BE FACTORY GALVANIZED AND FACTORY POWDER COATED WITH PRIMER AND FINISH PAINT AND ALUMINUM LUMINAIRE FIXTURE AND CLAMSHELL BASE COVER SHALL BE FACTORY POWDER COATED WITH PRIMER AND FINISH PAINT PER WSDOT STANDARDS. FINISH PAINT SHALL BE RAL9004 SIGNAL BLACK EXCEPT POLES IN RESIDENTIAL AREAS SHALL BE FACTORY GALVANIZED ONLY.

Paul S. Cho

APPROVED BY: PAUL S. CHO
TRAFFIC OPERATIONS SAFETY AND ENGINEERING MANAGER

REVISION DATE: OCTOBER 13, 2020

CityofRedmond WASHINGTON

STANDARD DETAILS

SMALL CELL STEEL LUMINAIRE POLE

FILE NAME: DG30.DWG

DETAIL NUMBER: **DG30**

CityofRedmond
WASHINGTON

Water & Wastewater System Extensions

DESIGN REQUIREMENTS



April 2019

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SECTION I GENERAL

1. PURPOSE

The purpose of these Design Requirements is to provide engineers, designers, inspectors and others a reference to City of Redmond's requirements for the design and installation of improvements to the water and sewer systems. **No extension or modifications to the City's water and sewer system shall be made without approved construction drawings, prepared in accordance with these standards and approved permit(s).**

The design standards included herein are intended to result in utility systems which will:

a) Provide the needed source, storage and distribution facilities to maintain established levels of service during periods of maximum use.

b) Provide the needed sewer facilities to carry all anticipated sewage flows within a basin.

c) Conform to the City's Water System Plan and General Sewer Plan.

d) Be of material strong enough to resist all expected loads, both internal and external, in order to preserve the purity and potability of the water supply and protect ground and surface waters from the escape of wastewater.

e) Be safe and economical to maintain.

Alternate materials and methods may be considered for approval on the basis of these objectives and conformance to all requirements indicated elsewhere in these standards.

2. REVISIONS TO THESE REQUIREMENTS

It is anticipated that revisions to these requirements may be made from time to time. The date appearing on the title page is the date of latest revision. Users should utilize the most current City-approved edition to these requirements. This edition was approved in March 2019. Contact the Development Services Division at (425) 556-2876 or visit the City's website at www.redmond.gov to ensure this is the most current edition.

3. REFERENCED STANDARDS

a) Reference herein is made to the latest edition of standards, tests, methods, and specifications of research as follows:

b) AWWA Standards, prepared by the American Water Works Association (AWWA).

c) American National Standards, prepared by the American National Standards Institute (ANSI).

d) Standard Specifications, prepared by the American Society for Testing and Materials (ASTM).

e) Fire Flow Determination, Redmond Fire Department Standards.

f) Standard Specifications for Road, Bridge, and Municipal Construction, prepared by Washington State Department of Transportation and the Washington State Chapter, American Public Works Association (APWA), latest edition, as modified by City of Redmond Standard Specifications and Details.

g) Group A Public Water Supplies—Chapter 246-290 Washington Administrative Code.

h) City of Redmond Standards, Specifications and Details, prepared by the City of Redmond, latest edition.

i) Criteria for Sewage Works Design prepared by the Washington State Department of Ecology, latest edition.

j) Cross Connection Control Manual, Accepted Procedures and Practice, prepared by the, Pacific Northwest Section American Water Works Association, latest edition.

k) Uniform Plumbing Code (UPC) prepared by International Association of Plumbing and Mechanical Officials, latest edition.

4. REFERENCED UTILITY PLANS

a) Redmond Water System Plan (latest edition)

b) Redmond General Sewer Plan (latest edition)

SECTION II UTILITY DRAWING FORMAT AND CONTENT

For Private Development projects, an abbreviated form for the items in this section is included in the Coordinated Civil Review (CCR) checklist. Please follow the latest edition of the CCR checklist if there is a discrepancy between the two documents.

1. **Material and Size**
   Plans are to be prepared in electronic format. The following formats are acceptable: MicroStation (*.dgn); AutoCAD (*.dwg), and other CAD programs (*.dwg). Final construction drawings for extensions of the water and sewer system shall be 22" x 34" Mylar originals. Vellum, paper, sepia reproductions, or photographic reproductions are not acceptable

2. **Drawing Content**
   Drawings for water and sewer shall contain complete and comprehensive information necessary to review the design and to construct the improvements. Show all relevant topographic survey data and information from other project drawings such as, existing and proposed grading, storm drainage, street and surface improvements, other utilities, landscape drawings, potholing data etc., on the water and sewer drawings. Provide alignments with all water mains and sanitary sewer, and use the alignment in the profile grid.

3. **Title Block/Drawing Title**
   In the drawing title block please include the name, address and phone number of the project developer and project engineer. In addition to the engineer's standard title block on the bottom or right side of drawing, include a drawing title generally centered on the top of the sheet containing the project name, section, township, and range, the number of lots or units in the project, the water system pressure zone and the Metro connection manhole.

4. **Vicinity Map**
   Include a vicinity map showing the general location of the project on the first sheet of the water/sewer drawings, if not provided elsewhere in the plan package.

5. **Approval Block**
   Include the standard city approval block located in the lower right-hand corner on each sheet of the drawing set.

6. **Drawing Scale**
   Horizontal scale shall be 1" = 20'. Vertical scale shall be 1" = 5'.

7. **Datum**
City of Redmond elevations are based on the NAVD 88 datum. Provide a minimum of two (2) City of Redmond benchmarks on the first sheet of the water/sewer drawings that the survey is tied to. Sewer inverts shall not be used as benchmarks.

8. **North Arrow/Bar Scale**
Include a north arrow and bar scale placed in the same location on each drawing with north oriented to the top or left of each drawing.

9. **Drawing Layout**
Lay out drawings to present the design in a clear and logical manner. It is advisable to discuss plan layout prior to preparation of a large project with the Development Services Division to provide input on the initial layout. Provide match lines and cross references at all appropriate locations.

10. **Profiles**
Profiles are required for both water and sanitary sewer Locate profiles on plan sheets oriented directly above or below the plan view.

11. **Profile Information**
Indicate finished grade above the utility and accurately depict utility crossings showing the clearance. Show physical characteristics of the utilities true- to- scale including waterline deflection, pipe diameter, pipe slope, manhole depths, and other pertinent information. Show all existing and proposed utility crossings in profile, provide pothole information for existing utilities crossing the proposed water and sewer lines unless asbuilt survey can be provided to verify the elevations do not conflict and/or are deemed unnecessary by the City. Use alignment stationing on the profile grid.

12. **Plan View Information**
Indicate and identify all existing and proposed buildings, structures, utility systems (water, sewer, storm, power, phone, gas, cable TV, fiber optics, duct banks, etc.), street improvements and paving, stream crossings, mailboxes, light poles and other known physical features within the project area which will affect the design and construction of the water and sewer improvements. Identify all utilities to be abandoned within and adjacent to the project area and provide information on the abandonment procedure. If an existing utility line is greater than 12-inches in diameter, show the utility with its actual width on the drawing. Pothole information for existing utilities within close proximity of the proposed water and sewer lines may be required, at the discretion of the City, unless record drawing survey can be provided to verify the elevations do not conflict and/or are deemed unnecessary by the City.

13. Professional **Engineer / Licensed Fire Sprinkler Designer Stamp**
Construction drawings for all piping and appurtenances that will become the property of the City of Redmond are to be prepared, signed and stamped by a civil engineer with current registration in the State of Washington prior to submittal and

review by the City. Private fire sprinkler designs are to be signed and stamped by a Fire Sprinkler Designer with current State of Washington license.

14. **Legend**
Include a legend of symbols used to show clarity.

15. **Property Data**
Include all property lines, with dimensions and bearings, ownership lines, street right-of-way lines, lot numbers, block numbers, plat names, and street names.

16. **Stationing / Coordinates**
Include both centerline stationing and offsets and state plane coordinates using NAD 83-91 survey control for all mains and appurtenances.

17. **Phased Project Drawings**
Phased projects require drawings which depict all construction necessary to complete each phase independently.

18. **Multi-Family Projects**
Include building numbers and number of units per building on multi-family projects construction drawings.

SECTION III ADMINISTRATIVE REQUIREMENTS (private development only)

Before completion of the project and prior to issuance of any water and sewer permits, there are several administrative requirements relative to the public water and wastewater systems. For additional details pertaining to administrative requirements contact the Development Engineering Division at (425)556-2840.

Administrative requirements include, but are not limited to, the following items:

1. Bill of Sale

2. Asset Summary

3. Easements

4. Temporary Maintenance Agreement

5. Abandon Plant table

6. Maintenance Guarantee

7. Performance Guarantee

8. Reimbursement Agreements
   Portions of a system extension, either potable water or sanitary sewer, may benefit other properties and meet the criteria to be eligible for a reimbursement agreement. In order to be eligible for reimbursement, the City must receive a completed reimbursement agreement application prior to approval of construction drawings and the agreement must be fully executed by the City prior to commencement of construction of the facility. Any approved reimbursement fees associated with a parcel must be paid prior to sale of water or side sewer permits and or prior to plat/short plat recording. (RMC 13.12).

9. Record Drawings
   Refer to Development Services Record Drawing Process, CIP Record Drawing Process, and City of Redmond Record Drawing Requirements (latest edition) for complete information on the submittal and review processes.

SECTION IV WATER MAIN DESIGN REQUIREMENTS

1. GENERAL

The system will be designed to have sufficient capacity to minimize pressure variations, provide minimum residual pressure of 40 psi at each meter during periods of maximum use, and provide sufficient volumes of water at adequate pressure to satisfy the expected maximum instantaneous demand plus fire flow.

In general, water system extensions are to be designed to incorporate the recommendations of the latest edition of the Water System Plan for the City of Redmond.

2. CAPACITY AND SIZING REQUIREMENTS

a. Design capacities and main sizing shall be determined by considering of the following factors:

1) The proposed development and adjacent areas.

2) Current and projected populations within the areas to be served.

3) Current and projected land use within the areas to be served.

4) Commercial, multi-family, industrial, or institutional users to be served.

5) Changes in any of the above factors which are likely to occur within a foreseeable time period.

b. In the absence of project specific data, refer to the latest edition of the City's Water System Plan for water demand information. In addition, use the following fire flow requirements for projects:

1) Fire flow of **1,500 gpm at 20 psi** residual pressure in residential areas.

2) Fire flow of **3,500 gpm at 20 psi** residual pressure in multi-family, commercial and industrial areas.

3) The maximum velocity in a pipe will be 10 fps. (For example, if more than one fire hydrant is required within the water line extension then a 12-inch diameter pipe must be used.)

c. Main Sizes (diameter)

1)	2"	-	not to be used as part of the distribution system.
2)	3"	-	not to be used as part of the distribution system.
3)	4"	-	not to be used as part of the distribution system except at the end of cul-de-sac mains after the last fire hydrant.
4)	6"	-	not to be used as part of the distribution system except as fire hydrant runs.
5)	8"	-	minimum size for permanently dead-ended mains supplying fire hydrants, for local distribution mains in residential areas, and for minor transmission mains.
6)	10"	-	not to be used as part of the distribution system.
7)	12" or Larger	-	as required for transmission (feeder) mains. 12-inch diameter is the minimum size required in commercial, industrial, and multi-family housing.

3. WATER MAIN LOCATIONS

a. **General**

The standard (preferred) location for a water main is within the roadway rights-of-way of public streets. Water mains can be installed within a 20 foot wide City of Redmond water main easement across privately owned property, when necessary, and only if approved by the City. When located in easement areas, water mains shall be located within the paved drive lanes of access corridors. Water mains in non-paved areas may be allowed only on a case-by-case basis. Properties that are redeveloping or undergoing additional development shall be required to meet current location standards. This may include the abandonment of existing mains and installation of new mains, in accordance with current standards.

b. **Streets**

Standard locations for water mains within public streets, private streets, road tracts, or parking areas are on the north and east sides of the centerlines. To the greatest extent possible, locate water mains 10 feet from centerline when the pavement section is 36 feet in width or greater. Place water mains 8 feet from the curb face if the pavement width is narrower than 36 feet. The location of the water main within right-of-way or private

streets shall minimize the placement of utility covers within wheel tracks of vehicles. Alternate locations to this requirement may be made in order to minimize the cutting and replacing of pavement, to avoid conflicts with replacing of pavement, to avoid conflicts with other underground facilities, to permit sanitary sewers to be installed on the "low side" of streets, or for other circumstances with the approval by the City.

c. **Variations**

As nearly as practical, mains are to be installed on a particular street with the distance from the property line and/or centerline varied as little as possible.

d. **Horizontal Clearance – Utilities, Excluding Sewer**

The minimum standard horizontal clearance between water mains and stormwater pipes, gas mains, fire sprinkler mains, power, phone and other underground utility facilities (including vaults, duct banks, etc.), shall be 5 feet. (Clearance is defined as being measured from the outside wall of pipe for 12-inch diameter or larger pipe and centerline for smaller than 12-inch pipe.)

e. **Horizontal Clearance - Sewer**

Water mains shall be installed a minimum horizontal distance of 10 feet from sanitary sewer mains, or in accordance with the design requirements and regulations adopted by the Washington State Department of Ecology, regarding water main/sanitary sewer horizontal separation.

f. **Vertical Clearance – Utilities, Excluding Sewer**

The standard vertical clearance between walls of water main pipelines and stormwater pipe and pipelines/cables/conduits of other utility facilities, except sanitary sewers, is 12-inches. Utility duct banks encased in concrete, power and signal vaults, other franchise utilities/pipelines/cables/conduits, and concrete-formed pads for utility-related equipment such as power and signal cabinets or light pole bases shall be placed under water mains or appurtenances. Where 12-inch vertical separation cannot be achieved, special construction techniques to protect each utility are required. Use of Dow Plastics Ethafoam 220 pad between the utilities is acceptable with a minimum of 6-inch vertical separation is required. (Refer to City of Redmond Standard Specifications 7-04.3(2) for product information.)

g. **Vertical Clearance - Sewer**

Locate water mains over sanitary sewers, providing a minimum of 18 inches of vertical clearance between the walls of these pipelines or in accordance with the design requirements and regulations adopted by the Washington State Department of Ecology, regarding water main/sanitary sewer vertical clearance, shall be followed.

h. **Vertical Clearance – Electrical Wires**

Where overhanging electrical wires cross a water utility easement, a minimum above ground vertical clearance shall be provided and maintained in accordance with the Utility Provider vertical clearance requirements.

i. **Crossing Angles - Utilities**

Water mains are to cross other pipelines/cables/conduits/stormwater pipe at right angles (90 degrees). Other pipelines/cables/conduits/stormwater pipe are to cross water mains at right angles (90 degrees).

j. **Depth of Cover**

The standard cover over 8-inch diameter and smaller water mains shall be 36 inches and 48 inches for 12-inch diameter and larger pipe. 60 inches is the maximum cover allowed over water mains where conflicts with other utilities require the water main to be deeper.

k. **Easement Widths**

Public water main easements shall be 20 feet in width, 10 feet each side of the centerline of the pipe. Show easements on construction drawings and identify the easement widths. Easements around fire hydrants, water meter boxes and other water appurtenances shall be 10 feet in all directions. Building overhangs, underground garages, elevated and other permanent structures shall not extend over or under the easement areas. In areas of the City where a 2 foot building modulation is allowed, easement widths may be decreased to 5 feet, measured from the outside of the meter vault.

l. **Looping**

Looping ensures a well-gridded water system that provides redundancy and reliability of service for new and existing customers. Water mains shall be looped where required by the City.

m. **Potholing**

To minimize conflicts in the field, all existing utilities at the location of the proposed water main and service line crossings shall be potholed prior to approval of site plan entitlement. The City shall determine the extent of potholing for design of facilities where clearance requirements are deemed critical. Potholing in City right-of-way requires a permit, approved traffic control plans, and a performance bond before commencing work.

4. VALVE REQUIREMENTS

a. **Valve Type**

Valves 2” through 12” shall be resilient seat/wedge gate valves. Valves larger than 12” shall be butterfly valves. All valves shall meet the requirements of the latest edition of the City of Redmond Standard

Specifications and Details. On construction drawings, show butterfly valve operating nuts located on the right side of the tee or cross as you approach the center from any direction.

b. **Valve Size**
Valve size shall be the same as the main in which installed.

c. **Valve Locations**
Distribution system valves are to be located as an assembly on **all** branches of a tee or cross. The spacing of valves shall be such that the length of any one (1) shut-down in commercial, industrial and multi-family areas does not exceed 800 feet, and in other areas 1,200 feet. The spacing of valves is to be such that no more than two (2) fire hydrants are removed from service with any separate main shutdown.

d. **Air Valves**
Combination air release and vacuum valves shall be installed on all high points of water mains. Locate the box, which contains the valve and the standpipe, outside the traveled way in a landscape area, preferably behind the curb and sidewalk at property line intersections but within the public right-of-way or waterline easement. In urban streetscapes where landscape areas are not available, install air valves within the furnishing zones of sidewalks. Air release and vacuum valve assemblies are to be installed in accordance with the latest edition of the City of Redmond Standard Specifications and Details.

e. **Blowoffs**
Terminate dead-end mains with a blowoff assembly or fire hydrant. All low points of a main shall have a blowoff assembly or fire hydrant. Locate blow-off assemblies outside the traveled way, behind the curb and sidewalk, either within public right-of-way or water line easement. Blowoff assemblies on pipe 12-inch diameter and larger shall be a fire hydrant. Fire hydrant blowoffs at the termination of dead-end mains to be extended in the future shall be painted blue. Fire hydrant blowoffs at low points shall be painted yellow. (Refer to paint specifications listed in the City's Standard Specifications.)

5. BACKFLOW PREVENTION

a. Locations and size of backflow prevention devices (aka backflow preventers) shall be shown on the construction drawings. Backflow preventers shall be installed in accordance with the latest editions of the American Water Works Association (AWWA) Cross Connection Control Manual and the Uniform Plumbing Code (UPC). If the backflow preventer is to be installed within a vault it shall be located on the exterior of the

building. A detailed design shall be included with the construction drawings delineating the vault layout, piping configuration, gravity drain and appurtenances. For backflow preventers within a building, the construction drawings should call out the location of the device in the building. Contact the Cross Connection Control Program at (425)556-2817 for questions regarding backflow prevention.

6. FIRE FLOW/HYDRAULIC ANALYSIS

a. The required level of service for fire flow is 1,500 gpm for standard single-family residential areas of the City and 3,500 gpm in commercial, industrial and multi-family housing areas. A hydraulic analysis to determine fire flow to a specific property may be requested by contacting the Environmental and Utility Services Division via email to genpw@redmond.gov or via phone at (425)556-2701.

7. FIRE HYDRANT REQUIREMENTS

a. The location of fire hydrants will be determined on a project by project basis in accordance with the Redmond Fire Marshal requirements. The following criteria provides general guidance, but the specific determination of the Fire Marshal shall govern:

   1) Maximum hydrant spacing in single-family residential plats is 600 feet with the hydrants preferably located at intersections and within 350 feet to the center of any building lot (including flag lots). Where structures on a dead-end access are over 300 feet from a hydrant, an additional hydrant may be required to be placed within 300 feet and placed in relation to the overall development and existing hydrant layout.

   2) Maximum hydrant spacing in commercial, industrial and multi-family residential developments is 300 feet and with no more than 150 feet traveled distance to any portion of the exterior wall of any structure.

b. The City of Redmond Fire Department and the Public Works Department jointly approve fire hydrant locations. Fire hydrants shall have a minimum setback from curb face as shown on the City of Redmond Standard Details. The easement area around the fire hydrant is 10 feet in all directions.

c. The minimum waterline size from the main to the hydrant is 6-inches in diameter if the length of the line is less than or equal to 50 feet. If the length exceeds 50 feet, the minimum line size shall be 8 inches in diameter.

d. Existing fire hydrants that are to be relocated shall not be reused in the water system and shall be physically replaced with a new fire hydrant and any necessary components of the hydrant assembly.

8. SERVICE CONNECTIONS

a. **New Water Service Connections**

Water service connections including service saddle, service line, meter setter, meter box and appurtenances are to be installed as part of the construction of new water main extensions and shall be installed at the locations shown on the approved construction drawings.

Water service connections for meters 2-inches and smaller shall utilize corporation stop connections. Meters larger than 2-inches, shall install a tee and gate valve for connection to the main.

b. **Existing Water Service Connection Abandonment**

Existing water service connections, 2 inches or smaller, that are not to be used shall be physically removed from the water main. Remove the saddle, corporation stop, service line, meter setter and box. A 12" wide stainless steel repair band shall be installed on the water main.

Existing water service connections, larger than 2-inches, that are not to be used shall be physically removed by blind flanging the tee and removing the gate valve, service line, vault, and drain line.

Additional requirements, depending on the existing and future conditions may be imposed based on specific circumstances. An example of the additional requirements for abandonment could be to remove the entire water service, including the tee or corporation stop, and replace it with a section of straight pipe with couplers on each end.

9. METERS

a. **Standard Sizes**

The typical sizes of meters which may be used are ⅝" x ¾", 1", 1-1/2" and 2". The use of larger meter sizes requires specific approval by the City. Larger meter sizes require the use of concrete vaults. Refer to Standard Details for specific vault sizes and specific requirements. When showing larger sized meters on construction drawings, use actual vault sizes.

b. **Meter Locations - General**

Locate meter boxes or meter vaults within a landscape area. In a designated urban streetscape (such as Downtown, Overlake, and Marymoor) where landscape areas may not available, meter boxes or vaults are permitted in hard surface areas, such as concrete. In those instances, special traffic bearing boxes/vaults equipped with non-skid lids are required.

Meters shall not be located in areas where special access is required (i.e. behind gated access, padlocked fences, etc..) or under any form of overhang such as an awning or 2nd floor of building structures.

c. **Multiple Meter Assemblies**

For adjacent residential lots/parcels install multiple service connections in as many situations as possible. The proposed meter layouts shall be shown on the approved construction drawings. Private water service lines from the meters to the houses shall be placed outside of City right-of-way and shall be shown on the construction drawings.

d. **Meter Location - Residential**

Locate meters in front of the lot/parcel to be served in a landscape (soft) area. All materials comprising the service connection shall be located within the public street right-of-way or public water line easement, whichever is applicable, with the front edge of the meter box being adjacent to the back of curb or sidewalk. Meter boxes shall be located to allow ease in the periodic reading of the meter and shall be placed as close to the property line as possible. Meter boxes shall not be placed within a sidewalk, driveway or other hard surface areas without prior approval by the Review Engineer. In those instances, special traffic bearing boxes/vaults with non-skid lids are required. For meter boxes located adjacent to driveway edges, maintain a minimum separation of 18" to the nearest box edge to prevent the meters from being driven over by vehicles.

e. **Meter Location - Commercial/Multi-Family**

In commercial and multi-family developments locate meter boxes or vaults in a landscape (soft) area behind the back of curb or sidewalk of a vehicle travel aisle and not behind parking spaces or other obstructions. Meters should be located to allow ease in the periodic reading of the meter. Meter boxes/vaults shall not be placed within a sidewalk, driveway or other hard surface areas without prior approval by the Review Engineer. In a designated urban streetscape (Downtown and Overlake) where landscape areas are not available, meter boxes or vaults are permitted in hard surface areas, such as concrete. In those instances, special traffic bearing boxes/vaults with non-skid lids are required.

f. **Exempt Meters**

Exempt meters installed downstream of a city-owned meter are allowable and can be used for irrigation, cooling towers, and certain commercial applications when approved by the Review Engineer. Exempt meters are privately owned, maintained, and repaired by the property owner and shall be accessible to the City for periodic reading. Meters to be installed shall be purchased from the City. Meters, service lines, meter setters, and boxes to be used are the same as specified for City use. For cooling tower installations, a radio MXU is to be installed on the outside of the building located in the area near the domestic meter. Wiring and other items to accommodate periodic reading/reporting are the responsibility of the property owner.

g. **Installation of Water Meters**

Water meters 2-inches and smaller shall be installed by the City upon application, payment of fees required by other city codes and resolutions, and completion of all administrative requirements. Meters 3-inches and larger are installed by the developer and locked off until payment of fees and completion of administrative requirements have been accomplished.

10. CONNECTIONS TO EXISTING WATER MAINS

In general, connections of proposed water mains to existing water mains shall be made by cut-in type procedures. Connections to the existing systems are also made by tapping the existing water main while under pressure and still in service. Both types of connections are subject to City approval. Cut-in tees and crosses are required to provide for suitable valving at the assembly and the City's water system. Cut-in tees or crosses require valves to be installed on each branch. Use of ductile iron (DI) spools (10 ft. min.) and couplers to connect to the existing pipe are required. Tapping tees may be considered where adequate existing main line valving is available and where deemed appropriate by the City.

For connection to asbestos cement (AC) water mains, cut-in connections and valves, DI spools (10 ft. min.), and couplers are required.

11. MISCELLANEOUS

a. **Pipe Callouts**

Show pipe size in the plan and profile views. Provide dimensional information to locate all appurtenances needs to be shown (for construction and for later maintenance).

b. **Valve at Connection**
Install a new valve at the end of an existing main which is to be extended in order to facilitate disinfection and testing of the new main.

c. **Valve Callouts**
Delineate the type and size of valves to be used.

d. **Meter Callouts**
Show the location, service line size, size and type of meter for all meters. This includes domestic, irrigation and backflow, and dual purpose meters.

e. **Fitting Callouts**
All fittings including tees, crosses, bends, sleeves, etc., are to be shown in plan and profile. Identify the joint connections of each fitting in plan view with the appropriate dimensional information. Generally, all valves to fitting connections shall be flanged and fitting to pipe connections shall be mechanical joint.

In situations where multiple fittings are to be used, fittings are not to be bolted together. Space fittings a minimum of 5 feet apart. If a pipe joint must be installed between fittings, restrain the joint.

A push-on pipe joint is not permitted within 5 feet of a fitting.

f. **Restrained Joints**
Restrained jointing systems are required in areas of unsuitable soils, areas of fill placement, complex thrust conditions, fire hydrant lines, fire protection systems or other locations where deemed necessary by the City.

g. **Vertical Bends**
Vertical bends are not allowed in the water system unless approved by the Review Engineer.

h. **Poly Wrap**
Poly wrap may be required for pipes in areas where soil corrosion is a problem. Poly wrap will be required for all fittings placed in control density fill (CDF). (Minimum of 1 foot of gravel shall be provided around poly wrap prior to CDF).

i. **Individual PRVs**
If the area has a high static pressure (over 80 psi), the plans must indicate the need for individual pressure reducing valves.

j. **Trees**
Trees shall be located a minimum 8 feet horizontally from City-owned water mains, service lines, meter boxes, fire hydrants, and other water

appurtenances. For large meter vaults, separation is measured to nearest edge of vault.

k. **Unstable Soils**

Remove unsuitable and unstable soil, such as peat, from under pipes. Applicant shall provide a geotechnical report for review in conjunction with the construction plans when requested by the City. The geotechnical report shall include recommendations for special requirements that are to be included on the construction drawings necessary for installation of utilities in accordance with City of Redmond specifications. .

l. **A.C. Pipe**

Existing A.C. pipe shall be required to be removed and replaced with ductile iron when crossed under or over by other utilities or where grading or other construction activities may subject the pipe to damage or loss of support. The pipe replacement shall be a minimum of 10 feet each side of any utility crossing. Where multiple A.C. pipe sections are being replaced due to utility crossings and/or construction activities, the City may require additional sections of pipe to be replaced to minimize creating an area prone to failure. The approved construction drawings shall delineate the replacement area. However, actual field conditions may require additional pipe to be replaced at the City's discretion.

Removal and replacement of A.C. pipe with ductile iron pipe shall also be required when the minimum pipe size requirement for the type of development necessitates the upsizing of the pipe.

Cutting and tapping of an A.C. main requires the operator to have asbestos cement work practices and procedures certification. Disposal of the removed A.C. pipe is required and shall be in accordance with the Puget Sound Clean Air Agency (PSCAA) requirements. A permit from PSCAA to perform the work is required prior to construction drawing approval. The contractor shall provide documentation of the permit and the verification of the proper disposal to the City prior to project acceptance.

m. **Building Footings**

Locate public water mains at least 10 feet from structures or footings. Building footings are to be located/designed such that the footing will not bear on the pipe. In general, locate footings below the soil failure plane defined by a 1:1 slope extended up from a point 2 feet horizontal from the pipe invert (ie - the bottom edge of the utility trench nearest the footing) to ground surface.

n. **Rockeries/Retaining Walls**

Rockeries or retaining walls shall not cross or be within easement areas for water mains or other water appurtenances. Crossings under a rockery or retaining wall shall require special construction techniques, including but

not limited to, installation of steel casings, casing spacers, restrained gaskets and end seals. The approved plans shall indicate the required casing thickness, casing spacer size, quantity and clearances, and specify other construction techniques such that no load is transferred to the pipe.

The foundation of rockeries or retaining walls parallel (or adjacent) to water mains shall be located such that no load shall bear on the pipe. The foundation shall be located below the soil failure plane defined by a 1:1 slope extended up from a point 2-feet horizontal from the pipe invert (ie - the bottom edge of the utility trench nearest the foundation) to ground surface. Locate foundations outside of the utility easement.

o. **Any water main and appurtenances that are removed during construction shall not be reused on any part of the water system**.

SECTION V SEWER MAIN DESIGN REQUIREMENTS

1. GENERAL

Design of sanitary sewers must, at a minimum, comply with the "Criteria for Sewage Works Design" as published by the State of Washington Department of Ecology. Any exceptions to the design requirements require separate approval.

In general, sewer system extensions are to be designed to incorporate the recommendations of the latest edition of the General Sewer Plan for the City of Redmond.

2. CAPACITY AND SIZING REQUIREMENTS

a. Design capacities and main sizing will be determined for specific proposed developments by considering the following factors:

   1) The proposed development and adjacent areas.

   2) Current and projected population within the areas to be served.

   3) Current and projected land use within the areas to be served.

   4) Commercial, multiple-family, or institutional users to be served.

   5) Changes in any of the above factors which are likely to occur within a foreseeable time period.

b. In the absence of project specific data, utilize the flows outlined in the latest edition of the General Sewer Plan for single family, multi-family, retail, industrial, Inflow and Infiltration (I/I), and peaking factors.

c. These assumptions shall be used to design new extensions and evaluate existing systems. Submission of design calculations will not ordinarily be required except where portions of the system will need to be extended to serve additional areas or at the discretion of the City.

d. The minimum size for an extension of a city sewer main is 8-inch diameter. Main sizes greater than 8-inch will be required when design flows will fill an 8-inch pipe at the design slope or when a larger pipe has been used upstream. Use of a larger pipe to meet minimum slopes is not allowed unless the increase in pipe size is necessary to support the anticipated flow.

e. Sewer pipe material shall be in accordance with the City's Standard Specifications 7-17.2.

3. SEWER MAIN LOCATIONS

a. **General**

The standard location for a sewer main is within the rights-of-way of public streets. Sewer mains shall be installed within a 20 foot wide City of Redmond sewer main easement across privately owned property, when necessary, and only if approved by the City. When located in easement areas, sewer mains will be located within the drive lanes of access corridors. Sewer mains in non-paved areas are not allowed but may be approved by the City on a case-by-case basis. Properties that are redeveloping or undergoing additional development shall be required to meet current location standards. This may include the abandonment of existing mains and installation of new mains, in accordance with current standards.

b. **Streets**

Sewer mains within public streets, private streets, access tracts or parking areas shall be located such that manholes and pipe are south and west of centerline and 8 feet from curb face. In curved street sections, additional manholes shall be required.

c. **Horizontal Clearance – Utilities, Excluding Water**

The standard horizontal clearance between sewer mains and stormwater pipes, gas mains, fire sprinkler mains, power, phone and other underground utility facilities, including vaults, is 5 feet. (Clearance is measured from the outside wall of pipe for 12-inch diameter or larger pipe and centerline for smaller than 12-inch pipe.)

d. **Horizontal Clearance - Water**

Sewer mains shall be installed a minimum horizontal distance of 10 feet from water mains, or in accordance with the design requirements and regulations adopted by the Washington State Department of Ecology, regarding water main/sanitary sewer horizontal separation.

e. **Vertical Clearance – Utilities, Excluding Water**

The standard vertical clearance between walls of sewer mains and stormwater pipe and pipelines/cables/conduits of other utility facilities, except water, is 12-inches. Utility duct banks encased in concrete, power and signal vaults and other franchise utilities/pipelines/cables/conduits, and concrete-formed pads for utility-related equipment such as power and signal cabinets or light pole bases shall be placed under sewer mains, wherever possible. Where 12-inch vertical separation cannot be achieved, special construction techniques to protect each utility are required. Use of Dow

Plastics Ethafoam 220 pad between the utilities is acceptable but a minimum of 6-inch vertical separation is required.

f. **Vertical Clearance - Water**

Locate sanitary sewer mains under water mains, providing a minimum of 18 inches of vertical clearance between the walls of these pipelines. Where this specified clearance cannot be met, the design requirements and regulations adopted by the Washington State Department of Ecology, regarding water main/sanitary sewer vertical clearance, shall be followed.

g. **Crossing Angles - Utilities**

Sewer mains are to cross other pipelines/cables/conduits/stormwater pipe as close to right angles (90 degrees) as possible. Other pipelines/cables/conduits/stormwater pipe are to cross sewer mains as close to right angles (90 degrees) as possible.

h. **Minimum Cover**

The preferred cover over sewer mains is 7 feet in order to ensure gravity service and provide normal vertical separation between water and sewer mains. The minimum cover over ductile iron sewer mains is 4 feet in both paved and unpaved areas; minimum cover over other sewer mains is 5 feet in both paved and unpaved areas. Ductile iron sewer mains shall be Class 52 DI with Protecto 401 or SewerSafe linings. Refer to Standard Specifications for additional information.

i. **Easement Widths**

Public sewer main easements shall be 20 feet in width, 10 feet each side of the centerline of the pipe. Show easements on the construction drawings and identify the easement widths. Building overhangs, elevated and other permanent structures are not allowed within the easement areas.

j. **Access Roads**

All manholes shall be accessible to the City maintenance vehicles. If not located in a vehicle access way, then access by an improved roadway surface must be provided. Access roads shall have a minimum paved width of 14 feet with a 2-foot gravel shoulder on each side.

For manholes that require maintenance by an eductor truck, the preferred configuration is to have the eductor truck approach a structure opening with the front of the vehicle with limited maneuvering required from the nearby street. Access requiring backing maneuvers require approval by the Review Engineer. Acceptable access includes an improved roadway surface within 10 feet of a manhole or vault opening with overhead clearance to 20 feet to allow for boom operation. Materials for construction of an improved roadway surface can include asphalt concrete or Portland cement concrete. Maintenance access roads shall comply with the current version of Redmond Standard Detail DG-11. Access roads

shall have a maximum slope of 15%, except at access points (such as manholes or vault openings). Access points shall be designed such that an eductor truck can perform maintenance operations while parked with a maximum slope of 10% parallel to the truck and 2% cross slope with the truck. Either through-access or a turnaround is required.

Design drawings shall demonstrate how the City's eductor trucks can access all areas that require maintenance. Details shall be provided to ensure full clearance of all parts of the vehicle when navigating changes in grade or turning.

k. **Potholing**

To minimize conflicts in the field, all existing utilities at the location of the proposed sewer main and side sewers shall be potholed prior to approval of site plan entitlement. The City shall determine the extent of potholing required on a case-by-case basis. A City of Redmond Right-of-Way permit, including approved traffic control plans, is required before potholing within right-of-way or City easements.

4. MANHOLE REQUIREMENTS

a. **Manhole Spacing**

Manholes are to be installed at a maximum of 350-foot spacing. Manholes are to be installed at the end of all dead-end mains and junctions.

b. **Profile Call Outs**

Manhole callouts in the profile are to include manhole number, type, size, stationing, rim and invert elevations, pipe size and compass locations of penetrations, and are to be shown complete for each manhole shown on the plans. Inlet pipe crowns shall be 1/10th higher than outlet pipe crowns.

Example:

MH #2, Type I-48"
Station 13 + 42 - 5' LT

Rim	364.50			
I.E.	348.75	-	8"	N in
I.E.	348.95	-	6"	S in
I.E.	359.75	-	8"	E in Drop Connection
I.E.	348.75	-	8"	E in
I.E.	348.65	-	8"	W out

c. **Plan Callouts**

Manhole callouts in the plan view are to include manhole number, stationing, type, and size.

d. **Manhole Numbering**

Upon first submittal of the construction drawings for review, the City of Redmond will provide the numbering convention for wastewater manholes which shall be incorporated onto the construction drawings. These numbers must be legible and not interfere with wastewater appurtenances.

e. **Knockouts**

Provide knockouts and channeling in manholes where future extensions are anticipated. These shall be shown on the plans.

f. **Drop Manholes**

Drop manholes are allowed on a case-by-case basis with City approval, if the drop is 5 feet or greater when connecting to existing manhole structure. Drop manholes in new construction are allowed only in conjunction with a deep trunk extension. Drops shall be outside drops, constructed of ductile iron pipe. In addition, ductile iron piping will be required for the entire main to the next upstream manhole.

g. **Maximum Depth**

The maximum depth of a manhole without special detailed design is 25 feet.

h. **Ladder**

Locate the ladder and eccentric cone directly over the outlet pipe.

5. SIDE SEWER REQUIREMENTS

a. **Size and Slope**

Side sewer stubs shall be minimum 6-inches in diameter and extended to the property or easement line. The minimum side sewer slope is 2%. When the slope is greater than 2% show the invert elevation at the property line. For side sewer stubs larger than 6-inches in diameter, manholes shall be used for the connection to the sewer main.

b. **Finish Floor Elevations**

Show the minimum finish floor elevations on all lots and buildings. The minimum finished floor shall be 5.0 feet above the side sewer invert at the property line and may be greater depending on the distance to the structure.

c. **Side Sewer Connections**

All projects shall install new side sewers to the main. Existing side sewers shall not be re-used. Existing side sewers shall be abandoned at the main or manhole.

6-inch side sewer pipes from homes or buildings shall connect to 8-inch or larger mainlines with tee connections. Side sewer connections to manholes

are not allowed, except at dead end manholes that will not be extended in the future.

For side sewers larger than 6-inches, manholes shall be used for the connection to an 8-inch or larger sewer main.

d. **Double Services**

Double services for single family residences are to be wyed within the lots being served. The maximum allowable differential between the floor elevations of the residences is 2 feet. A joint use side sewer agreement must be provided.

e. **Service to Properties**

Side sewer stubs shall be provided for all platted lots. Stubs to unplatted land shall be provided as required by the Review Engineer. Multiple side sewers shall not be used in lieu of extending a sewer main. Side sewers shall generally be perpendicular to the street centerline.

f. **Side Sewer Location**

Locate side sewers on the platted lot to be serviced and run directly from the building to the sewer main. Side sewers on adjacent lots shall not be installed in a common trench.

g. **Side Sewer Length**

Side sewers shall be a maximum of 150 feet in length, unless otherwise approved.

h. **Cleanouts**

Provide a cleanout at every bend and at minimum 100-foot increment.

i. **Backwater Valves**

Install backwater valves on all side sewers where the finish floor elevation of the building is lower than the invert elevation of the upstream manhole.

j. **Side Sewer Abandonment**

Existing side sewers that are no longer needed shall be abandoned at the sewer main. The side sewer shall be physically disconnected by using one of the following methods:

1) Plugging or capping the existing side sewer tee at the main;
2) Cutting the side sewer pipe at the outside wall of the manhole, grouting the penetration and rechanneling the manhole; or
3) Removing the side sewer at the main when no tee exists and repairing the sewer main with a repair band suited for the pipe material or cutting out the tee and inserting a 5 foot section of PVC pipe with couplings.

6. CONNECTIONS TO EXISTING SEWERS

Connections to existing sewers for main extensions will be made by connecting to an existing manhole or constructing a new manhole over an existing pipeline. Drawings showing connections to existing manholes shall require core-drilling and rechanneling. For drawings which show a new manhole installed over an existing sewer, include a detail of construction for building over the pipe or use the City's saddle manhole detail, if appropriate. Saddle manholes shall not be placed over existing AC or concrete pipes. Existing AC or concrete pipes shall be replaced if a saddle manhole is used.

7. MISCELLANEOUS

a. **Pipe Callouts**

Show pipe size and manhole to manhole length in the plan view. Show pipe size, manhole to manhole length, pipe material, slope in %, and pipe class or strength (if not standard) in the profile. Pipe material shall not change between manholes. Pipe slopes are to be designed to tenths of a percentage. Establish slopes then calculate inverts. Do not set inverts then calculate slopes.

b. **Slope on Dead End Run**

Required minimum slope is 2% on the last manhole to manhole section of a dead-end run, unless otherwise approved by the City.

c. **Minimum Slopes**

Minimum slopes on main lines are:

8"	=	0.0050 ft./ft.
10"	=	0.0032 ft./ft.
12"	=	0.0025 ft./ft.

d. **Steep Slopes**

Pipe designs on slopes of 20% or greater, require the use of ductile iron pipe (SewerSafe or Protecto 401), hill holders and pipe anchors which shall be identified and detailed on the construction drawings..

e. **Deep Sewers**

Deep sewers (>15 feet) shall include submittal of pipe strength design data or calculations when requested. Use ductile iron pipe (SewerSafe or Protecto 401) when the pipe invert is greater than 15 feet below finished grade.

f. **Unstable Soils**

Remove unsuitable and unstable soil, such as peat, from under pipes. Applicant shall provide a geotechnical report for review in conjunction with

the construction plans when requested by the City. The geotechnical report shall include recommendations for special requirements that are to be included on the construction drawings necessary for installation of utilities in accordance with City of Redmond specifications.

g. **Trees**

Trees shall be located a minimum 8 feet horizontally from City-owned sewer mains, side sewer, and other sewer appurtenances.

h. **A.C. Pipe**

Existing A.C. pipe shall be required to be removed and replaced with ductile iron when crossed under or over by other utilities or where grading or other construction activities may subject the pipe to damage or loss of support. The pipe replacement shall be a minimum of 10 feet each side of any utility crossing. Where multiple A.C. pipe sections are being replaced due to utility crossings and/or construction activities, the City may require additional sections of pipe to be replaced to minimize creating an area prone to failure. The approved construction drawings shall delineate the replacement area. However, actual field conditions may require additional pipe to be replaced at the City's discretion.

Removal and replacement of A.C. pipe with ductile iron pipe shall also be required when the minimum pipe size requirement for the type of development necessitates the upsizing of the pipe.

Cutting and tapping of an A.C. main requires the operator to have asbestos cement work practices and procedures certification. Disposal of the removed A.C. pipe is required and shall be in accordance with the Puget Sound Clean Air Agency (PSCAA) requirements. A permit from PSCAA to perform the work is required prior to construction drawing approval. The contractor shall provide documentation of the permit and the verification of the proper disposal to the City prior to project acceptance.

i. **Building Footings**

Locate public sewers at least 10 feet from structures or footings. Building footings are to be designed, or sewers located, such that the footing will not bear on the pipe. In general, locate footings below the soil failure plane defined by a 1:1 slope extended up from a point 2 feet horizontal from the pipe invert invert (ie - the bottom edge of the utility trench nearest the footing) to ground surface.

j **Rockeries/Retaining Walls**

Rockeries or retaining walls are not to cross or be in close proximity to sewer mains or side sewers. Where no alternatives exist, crossings under a rockery or retaining wall will require special construction techniques, including but not limited to, installation of steel casings, casing spacers, restrained gaskets and end seals. The Engineer-of-record shall design the

casing thickness, casing spacer size, quantity and clearances, and specify other construction techniques such that no load shall be transferred to the pipe.

The foundation of rockeries or retaining walls parallel (or adjacent) to sewer mains shall be located such that no load shall bear on the pipe. The foundation shall be located below the soil failure plane defined by a 1:1 slope extended up from a point 2 feet horizontal from the pipe invert (ie - the bottom edge of the utility trench nearest the foundation) to ground surface. Locate foundations outside of the utility easement.

k. **In general, any sewer main, manhole, or appurtenances removed during construction shall not be reused on any part of the sewer system.**

SECTION VI SPECIAL APPURTENANCES

1. GENERAL

From time to time, special appurtenances will be required for various development projects including, but not limited to, sump pumps, pressure reducing stations, backflow preventers, booster pump stations, sewage pump stations, grinder pumps, oil-water separators, and grease interceptors. Calculations and designs for these appurtenances will be reviewed and approved on a case-by-case basis.

a. Sump Pumps

Sump pumps are to be avoided but are sometimes necessary for extremely deep utility vaults when required to discharge to the storm system and a gravity system can be demonstrated to be unfeasible. Special approval with easements and agreements apply and shall be required be in place prior to construction drawing approval.

b. Pressure Reducing Stations

Location and size of pressure reducing stations are determined by the Environmental and Utility Services Division. A pressure reducing station design shall include detailed plans and sections drawn at a horizontal and vertical scale of 1/2" = 1', delineating the vault layout and elevations, piping configuration, gravity drain and appurtenances, and elevation of all piping entering and exiting the vault. Notes referencing standard details without a detailed drawing are not acceptable. Refer to the latest edition of the City of Redmond Standard Specifications and Details for pertinent design information.

c. Pump Stations

Special conditions requiring booster pump station and sewage pump station shall require separate applications for those specific facilities for review and approval by the City. Design criteria will be dictated by the particular application and will require coordination with the City.

d. Grinder Pumps

Grinder pump applications are restricted to single-family residences and single commercial buildings which are physically unable to connect to the sanitary sewer system by gravity. For single-family residential applications, each grinder pump must have its own individual force main. The pressure discharge line must connect to a gravity side sewer from the sewer main. A maximum of four (4) pressure lines are allowed to manifold into one (1) gravity side sewer connection.

e. **Oil-Water Separators**

Oil-water separators treat oily wastewater before the water is discharged to the sanitary sewer. Oil-water separators are required for underground parking structures, gas stations, and for all facilities where there is potential for the discharge of oily contaminated water. In addition, no grease, oil, sand, liquid waste containing grease or flammable material or other harmful ingredients in excessive amount may be discharged into a public sewer without the installation of a pretreatment process. Designs shall follow criteria established by the City and King County Wastewater Treatment Division.

f. **Grease Interceptors**

Grease interceptors are required for all commercial buildings with kitchen and/or cafeteria facilities. In addition, no grease, oil, sand, liquid waste containing grease or flammable material or other harmful ingredients in excessive amounts shall be discharged into any public sewer without the installation of a grease interceptor. The sizing of the interceptor shall be in accordance with the latest edition of the UPC recognized by the City. The Building Division is responsible for approving the design and inspecting the installation of grease interceptors. For permitting questions, sizing criteria, or other information contact: (425) 444-2425.

g. **Septic Tanks**

New on-site septic systems are not allowed in the City's service area. Existing septic systems on a parcel to be developed shall be shown on the construction drawings. If the location of the existing septic systems is unknown, contact the King County Health Department at (206) 296-4920, to see if a record drawing exists. All existing septic systems shall be removed or abandoned. Removal of the drainfield and septic tank may be required by the City. If the existing system is to be abandoned in place, abandonment shall be done in accordance with King County Health Department requirements.

SECTION VII EASEMENTS

1. **GENERAL**

a. All easements needed for water and sewer main extensions are to be provided by the property owner in the name of the City. Show required easements on the construction drawings. Submit easement legal description(s) or plat markup for review at the time construction drawings are submitted for review. Easements must be executed prior to construction drawing approval, except when they are included with the final plat or short plat recording documents.

b. Easement widths are a minimum of 20 feet, 10 feet on all sides of pipelines or appurtenances.

c. Easements are to be prepared on the City of Redmond standard forms.

d. if the easement is to be recorded with the plat or short plat document, a standard City of Redmond dedication statement must be included in the documents.

e. Buildings, structures, garages, carports, dumpster enclosures, decks, fences, rockeries, retaining walls, or other permanent structures are not permitted in easement areas.

f. The planting of trees, shrubs or vegetation having root patterns which may cause damage to or interfere with the utilities to be placed within the easement area, shall not be allowed.

g. Easement areas shall not be landscaped or beautified in any way which would unreasonably increase the cost to the City for restoration.

h. New easements, in accordance with current standards, are to be granted for properties which are redeveloping or undergoing tenant improvements.

i. Before a project is accepted by the City, revised easements with the legal description of the as-built locations of the water and sewer extensions are to be provided, reviewed, and approved by the City.

SECTION VIII WATER/SEWER SERVICE AREA

City of Redmond water and sewer service area covers the area within City limits. The boundaries are as follows:

Roughly, the area east of 132nd Ave NE, south of NE 124th St, west of 196th Ave NE, north of NE 20th St, and excluding Marymoor Park and Lake Sammamish.

The City provides water and sewer service to customers outside of City limits. The City's Novelty Hill service area began in the late 1990s. The area includes Redmond Ridge, Redmond Ridge East, and Trilogy Urban Planned Developments northeast of the City in unincorporated King County along Novelty Hill Rd. The Novelty Hill service area boundary is as follows:

Redmond Ridge and Redmond Ridge East are roughly the area east of 220th Avenue N.E., south of Novelty Hill Road, west of 244th Ave NE and north of NE 80th St.

Trilogy is roughly the area east of 228th Avenue N.E., north of Novelty Hill Road, west of 248th Ave NE and south of NE 141st St (power lines).

Note: General parcel information for King County properties located in both incorporated and unincorporated areas can be obtained via the County's website. The King County GIS Center has an interactive mapping tool (iMap) that displays this information in the form of maps, tables, and text allowing visitors to search for a property using a parcel number, a street address, or a street intersection. Visit the County's website or follow the link listed for more information: https://www.kingcounty.gov/services/gis/Maps/imap.aspx

SECTION IX RECORD DRAWINGS

1. **GENERAL**

The construction drawings are to be revised to incorporate information pertaining to the water and sewer system improvement as it was constructed. The record drawings will meet the following minimum requirements.

(a) The record drawings will provide the size, length and material of the as-constructed pipelines between fittings and manholes.

(b) The record drawings will provide the size and joint type of each fitting and appurtenance actually installed.

(c) The record drawings will provide the actual horizontal and vertical constructed water and sewer mains, fittings and appurtenances, correcting the location data provided in the drawings.

(d) The record drawings will indicate the size, location and type (whether single or double) of all water and sewer service connection stubs installed by the contractor.

(e) The record drawings will indicate areas of excessive cover and any other unique feature of the project.

(f) The record drawings will be clearly denoted as such, with as-constructed information shown as a revision to the original design.

(g) The record drawing location of easements will match the final legal descriptions of the easements granted to the City.

The information listed above is meant to be general in nature to provide the engineer/surveyor with what is required for record drawing submittal. More comprehensive information is outlined in the latest addition of the City's Record Drawing Requirements. Refer to this document for more explicit details.

SECTION X STANDARD WATER/WASTEWATER NOTES

The following notes are to be placed on the approved construction drawing:

WATER/WASTEWATER NOTES

GENERAL

1. Any Administrative Engineering Deviation Process regarding the water and sewer improvements shall be submitted to the City of Redmond Development Engineering Division for approval prior to implementation in the field.

2. All work and materials shall conform to the Standard Specifications and Details of the City of Redmond. Water and Sewer Specifications and Details shall be the specifications and details in effect on the date of approval of these construction drawings.

3. The contractor shall be responsible for locating all existing underground utilities. Call underground locate service, 1-800-424-5555 for utility marking. callbeforeyoudig.org/washington

4. No work shall commence prior to a pre-construction conference at the City of Redmond.

5. Coordinate with landscaping improvements.

6. No trees shall be planted within eight (8) feet of water or sewer improvements.

7. City of Redmond Design Requirements – Water and Wastewater System Extensions

WATER

1. All fire hydrants shall be covered with a burlap sack until the water system has been placed into service.

2. Fire hydrants shall be equipped with Storz connectors.

SEWER

1. Side sewers shall have a minimum slope of 2%.

2. New sanitary sewer mains shall be plugged and not put into service until lines have been cleaned, flushed and tested.

SECTION XI GLOSSARY

Appurtenances – An accessory used in utility installations including, but not limited to, sump pumps, pressure reducing stations, pump stations, grinder pumps, oil water separators, grease interceptors, and septic tanks.

City – City of Redmond or it's designated representative.

Contractor – Person, partnership, firm or corporation contracted to do the work under these documents. This also includes the contractor's agents, employees, or subcontractors.

Details – City of Redmond Standard Details or additional drawings prepared to further explain the work to be done.

Developer – Any individual, company, partnership, corporation, or group that has made, or intends to make, application to the City to construct a connection or extension to the City's water and/or sanitary sewer systems.

Engineer-of-record – Professional Engineer with current registration in the State of Washington that stamps and signs the construction drawings.

Review Engineer – City representative that reviews utility drawings for compliance with City standards, specifications and engineering practices.

Specifications – City of Redmond Standard Specifications or the prescribed directions, requirements, explanations, terms and provisions pertaining to the various features of the work to be done, manner and method of performance, or materials to be utilized.

King County
Shannon Braddock
King County Executive
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Seattle, WA 98104
206-296-9600 Fax 206-296-0194
TTY Relay: 711
www.kingcounty.gov

August 28, 2025

The Honorable Girmay Zahilay
Chair, King County Council
Room 1200
C O U R T H O U S E

Dear Councilmember Zahilay:

This letter transmits a proposed Ordinance that would, if enacted, approve the City of Redmond 2024 Water System Plan, dated May 2024 (Plan). This letter and enclosed matrix describe the results of the Utilities Technical Review Committee's (UTRC's) review of the Plan and its consistency with King County requirements.

The Revised Code of Washington (RCW) 70A.100.050 and King County Code (KCC) 13.24 require approval of the Plan before it becomes effective. Approval of the plan also provides State regulatory agencies with the determination that the Plan is consistent with the King County Comprehensive Plan (KCCP) and implementing development regulations, required under RCW 43.20.260.

The UTRC reviewed the Plan for conformance with KCC and recommended approval on June 18, 2025. The enclosed matrix provides additional information regarding the Plan and compliance with KCC requirements and consistency with the KCCP.

I appreciate the City's cooperation in submitting the Plan and working through the UTRC review process.

Thank you for your consideration of this proposed Ordinance.

If your staff have any questions, please contact Leon Richardson, Director, Department of Local Services, at 206-263-3332.

Sincerely,



for

Shannon Braddock
King County Executive

Enclosure

cc: King County Councilmembers
ATTN: Stephanie Cirkovich, Chief of Staff
Melani Hay, Clerk of the Council
Karan Gill, Deputy Executive, Chief of Staff, Office of the Executive
Stephanie Pure, Council Relations Director, Office of the Executive
Dwight Dively, Director, Office of Performance, Strategy and Budget
Leon Richardson, Director, Department of Local Services
Jim Chan, Division Director, Department of Local Services Permitting Division

2025 FISCAL NOTE ATTACHMENT 3

Ordinance/Motion: 2025-XXXX
Title: City of Redmond 2024 Water System Plan
Affected Agency and/or Agencies: DLS-Permitting
Note Prepared By: Daniel Cardwell
Date Prepared: 6/26/25
Note Reviewed By: Bonnie L. Fluckinger
Date Reviewed: 8/4/25

Description of request:

An ordinance approving the City of Redmond 2024 Water System Plan dated May 2025. The King County Code (KCC 13.24.010) requires King County approval of the Plan before it becomes effective.

Revenue to:

Agency	Fund Code	Revenue Source	2025	2026-2027	2028-2029
DLS Permitting	1340	n/a	0	0	0
TOTAL			**0**	**0**	**0**

Expenditures from:

Agency	Fund Code	Department	2025	2026-2027	2028-2029
DLS Permitting	1340	DLS	0	0	0
TOTAL			**0**	**0**	**0**

Expenditures by Categories

	2025	2026-2027	2028-2029
	0	0	0
TOTAL	**0**	**0**	**0**

Does this legislation require a budget supplemental? Yes/No

Notes and Assumptions:

There is no fiscal impact to the County.

City of Redmond 2024 Water System Plan (May 2025) Review Matrix

Service Area

The City of Redmond is located approximately 10 miles east/northeast of Seattle at the north end of Lake Sammamish. The City has been providing public water supply since the early 1900s. The service area encompasses the City of Redmond's municipal boundaries as well as the Redmond Ridge and Trilogy Urban Planned Developments within unincorporated King County.

The Redmond water system provides water service to a residential population of approximately 87,500 via approximately 19,600 individual metered service connections.

Water System

The City's water system includes:

- Approximately 340 miles of distribution mains;
- 10 storage facilities (three tanks are joint-use facilities with the cities of Bellevue and Kirkland); and
- Seven supply connections to the regional supply system.

Redmond's water comes from wells owned and operated by the City as well as water produced from Seattle's Tolt River source. The City's five wells provide approximately 40 percent of its supply. The remaining supply is provided through the City's membership with the Cascade Water Alliance (Cascade), which delivers regional water supply contracted from Seattle Public Utilities.

Water Use Efficiency

The City participates in a regional conservation program administered by Cascade. Conservation programs typically run on a six-year cycle where new goals and associated programs must be reestablished. Cascade most recently updated and adopted its conservation program for 2019 through 2022.

Redmond does not calculate conservation savings specific to its service area. It is estimated that Cascade's conservation program saved approximately 227,892 gallons per day by the end of 2021, which is approximately 57 percent of the program savings goal.

Cascade's conservation program includes:

- educational opportunities for school age students as well as adults;
- free training to residents to learn about yard care, watershed health, drip irrigation, and other water saving topics;
- irrigation assessments;
- training to residents who are interested in monitoring local streams for watershed health, and
- rebates for ENERGY STAR certified fixtures.

The City has supplemented Cascade's program with some of its own actions, including:

- being proactive about leak control, and
- including water consumption history on customer bills.

Distribution System Leakages (DSL)

The service area's DSL for the past three years has been eight percent, on average. This average includes the water produced and purchased.

System Deficiencies or Capacity Limitations

Water Supply: Over the 20-year planning period, the water source capacity in the Rose Hill service area is expected to be insufficient to meet maximum daily demands if the sources operate continuously for 24 hours. Capacity of the North Rose Hill Reservoir and Booster Pump Station is also limited.

Standby Storage: Currently, there is surplus standby storage in the combined In-City Service Area of about 0.68 million gallons. However, by 2033, this surplus will turn into a deficit of approximately 3.3 million gallons, increasing to a deficit of 7.4 million gallons by 2043. These projections are based on the City's standby storage standard of 400 gallons per day per Equivalent Residential Unit (gpd/ERU). If the Department of Health's (DOH's) lower standard of 200 gpd/ERU is used instead, no storage deficiencies are expected within the 20-year planning horizon.

Distribution System: An analysis of the existing system and future demands indicates that there are some segments of the system that have or will have low pressure. This low pressure is attributed to the existing topography; it is not caused by the reduction in pressure as the water flows through the distribution system.

Available Fire Flow: The fire flow throughout the water system generally exceeds the required minimums. However, some neighborhoods developed in the 1970s or earlier have fire flow availability below the levels the Fire Department would require if homes were built today. As water demands increase, the number of areas with inadequate fire flow is also growing. The infrastructure in these older neighborhoods is about 40 years old and shows signs of aging. Eventually, the pipes in these areas will be replaced as part of Redmond's water system replacement program. Future projects will include increased fire flow availability as a key design requirement. Neighborhoods with low fire flow may be prioritized in the pipe replacement schedule.

Capital Improvement Plan (CIP) & Financial Analysis

The Plan's 10-year CIP includes approximately $71 million in improvements for projects. The identified projects are categorized as:

- Water Supply Projects – improvements related to enhancing or protecting existing sources of supply.
- Water Storage and Pumping Projects – improvements related to maintaining existing pumping/storage facilities and construction of new facilities to address future storage volume deficiencies.
- Water Distribution System Projects – distribution system improvements, primarily related to piping and valving, that serve to increase fire flow availability in targeted areas, increase overall reliability in the transmission/distribution system, and provide for ongoing maintenance of pipeline facilities.
- Kirkland Joint Use Projects – improvement projects shared with the City of Kirkland.
- Bellevue Joint Use Projects – improvement projects shared with the City of Bellevue.
- Maintenance and Operations Center – improvements related to the City's maintenance and operations center. These improvements include a campus design and construction, a fuel storage tank replacement, and security improvements.

The Financial Program provides future water utility revenues and expenditures for 2023 through 2032. The estimated revenues assume a water ERU growth rate of 1.58 percent. The program also assumes an annual rate increase. While the Financial Program assumes specific rate increases for each year, the City will be reviewing rate requirements for its water utility before establishing the future rates. The estimated revenues show that the City can sufficiently fund the projects in its CIP program over the 10-year planning cycle through its revenue sources.

The Financial Program provides an analysis on the affordability of the City's water charges or rates. The analysis concludes the current rates and assumed future rates meet the affordability threshold.

Water Reuse

The City's aquifer has been identified as highly susceptible to surficial contamination. The City limits the use of reclaimed water with its critical aquifer recharge area (CARA) to only uses that discharge to sanitary sewer. This limitation was adopted as the City states there is insufficient data to determine that reclaimed water effluent from the Brightwater wastewater treatment plant does not pose health risks to use within a shallow, unconfined, alluvial aquifer system.

Due to concerns with impacts to the water quality of its aquifer, the high cost of additional distribution infrastructure, and the investments it has made in securing potable water as a member of the Cascade Water Alliance, the City does not plan to invest its utility construction funds for the construction of a reclaimed water delivery system. The City may consider proposals from other stakeholders if using alternative funding sources and addressing the concerns associated with impacts to its aquifer recharge area.

Plan Adoption by the City

The Redmond City Council approved the water system plan through Ordinance No. 3183 on November 19, 2024.

SEPA

The City completed a State Environmental Policy Act checklist and subsequently issued a Determination of Nonsignificance on August 1, 2023; there were no appeals.

A review of the specific statutes, rules, codes and policies to the water system plan is as follows:

A. General water plan, King County Code (KCC) 13.24.010 and chapter 13.28		**Comments/findings**
(1)	Review is applicable to water utilities distributing or obtaining water in unincorporated King County, and/or utilities that are special purpose districts created pursuant to Title 57 Revised Code of Washington (RCW). Is there a need to meet the consistency requirements of RCW 43.20.260?	• The City provides water in unincorporated King County. • The Washington State Department of Health (DOH) needs to demonstrate consistency for the Plan under RCW 43.20.260.
(2)	Consistency with King County Comprehensive Plan (KCCP) and development regulations, and policies including KCC 21A.28.040 development standards, provision of adequate supplies for anticipated growth and development.	• The Plan is consistent.
(3)	Infrastructure for existing and future service areas based on adopted land use map.	• The Plan recognizes the adopted zoning of each of the jurisdictions. • The modeling that identifies future needed infrastructure improvements incorporates growth projections reflective of the adopted zoning and growth targets.
(4)	Review proposals for modified or expanded service areas based on compliance with utility's approved plan and ability to meet duty to serve requirement.	• The City is not proposing any modification to its Retail Service area.

(5)	Sufficient information to demonstrate the ability to provide service consistent with the requirements of all applicable statutes, codes, rules, and regulations.	• The Plan demonstrates an ability to provide service consistent with applicable statutes, codes, rules, and regulations. • The City's water supply strategy includes using its own groundwater resources and purchase of capacity from regional supplies. • The Plan provides detailed information on the operational and preventative maintenance activities that demonstrates the City's ability to provide service consistent with applicable provisions.
(6)	Monitor and review effectiveness of purveyor conservation plans if within area covered by an approved Coordinated Water System Plan (CWSP).	• The City's Service Area is within the East King County Coordinated Water System Plan. • The City participates in a regional conservation program administered by the Cascade Water Alliance (Cascade). • Cascade's conservation program has saved approximately 227,892 gallons per day, approximately 57 percent of the program's saving goal. • Redmond does not calculate conservation savings specific to its service area.
B. Consistency requirements: KCC 13.24.060		**Comments/findings**
(7)	State and local health requirements.	• The water purveyor meets state and local health requirements per reporting in the SENTRY system.
(8)	Creation and maintenance of logical service areas.	• The service area represents the City's municipal boundaries and the unincorporated area of Redmond Ridge and Trilogy Urban Planned Developments (Novelty Hill service area).
(9)	Elimination or prevention of duplicate facilities.	• The City's water system shares boundaries and water service facilities with neighboring water purveyors. • The City has various agreements with neighboring purveyors addressing water interties and shared water facilities.
(10)	Promotion of most healthful and reliable services to the public.	• Water purveyed by the District complies with DOH requirements.
(11)	Provision of service at a reasonable cost and maximization of use of public facilities.	• The Financial Program analyzed the affordability of the City's water charges or rates and concluded that the current rates and assumed future rates meet the affordability threshold.
(12)	King County Comprehensive Plan and other pertinent County-adopted plans and policies.	• There is consistency between the City's Plan and the King County Comprehensive Plan.

(13)	Basin-wide or multi-basin water plans, sewerage plans, or both when approved by the Washington State Department of Ecology (Ecology) or Department of Health (DOH).	• The Plan references the East King County Coordinated Water System Plan and Cascade contracts and planning documents. • The City does not treat wastewater.
(14)	Applicable State water quality, water conservation, and waste management standards.	• Applicable standards are met.
(15)	Water Resources Act (RCW 90.54).	• The City continues to participate in Cascade's conservation program. • Cascade most recently updated and adopted its conservation program for 2019 through 2022. • Cascade plans to update its water use efficiency program and goals.
(16)	Growth Management Act (GMA) (RCW 36.70A).	• The retail service area, as of end of 2021, has approximately 19,580 metered connections. • The City receives an "unspecified" allotted maximum number of connections from DOH. • Most of the service area is within the Urban Growth Area.
(17)	Groundwater management plans.	• The City purchases surface water from Cascade which originates at Seattle Public Utility's Tolt Reservoir.
(18)	Federally approved habitat conservation plans and recovery plans under the Endangered Species Act (ESA).	• The City does not directly draw on surface water; it is obtained through an agreement with Cascade. • The purchased surface water originates at Seattle Public Utility's Tolt Reservoir.
(19)	Requirements for salmon recovery under Ch. 77.85 RCW, and other plans, including regional water supply or water resource management plans.	• See #18 above.
C: Countywide Planning Policies		**Comments/findings**
(20)	FW-5: Adopt comprehensive plans that are consistent with the Countywide Planning Policies as required by the Growth Management Act.	• The Plan is consistent with Countywide Planning Policies.
(21)	DP-14: All jurisdictions shall accommodate housing and employment targets by ensuring water, sewer, transportation, and other infrastructure plans and investments among agencies, including special purpose districts, are consistent in location and timing with adopted targets as well as regional and countywide plans.	• The City's Plan demonstrates that it can accommodate its proportional share of population and employment targets within its municipal boundaries and unincorporated King County within its service area.

(22)	PF-3: Coordinate among jurisdictions and service providers to provide reliable and cost-effective services to the public.	• The City has interlocal agreements for five interties with four adjacent water purveyors. • The City has coordinated with Northeast Sammamish Water & Sewer District and Union Hill Water Association, with interties for emergency supply. • The City and Sammamish Plateau Water & Sewer District has an interlocal agreement to allow Sammamish Water & Sewer District to access its water supply through an intertie with Cascade. • The City has agreements with neighboring purveyors for other joint facilities and services. • The City has an agreement as a member of the Cascade Water Alliance and has access to contracted water supply.
(23)	PF-5: Develop plans for long-term water provision to support growth and to address the potential impacts of climate change on regional water resources.	• The increased water usage associated with projected population growth within the City's service area can be met through water accessed through Cascade.
(24)	PF-8: Plan and locate water systems in the Rural Area that are appropriate for rural uses and densities and do not increase the development potential of the Rural Area.	• The City's retail service area includes a very small area in the Rural Area. The water system plan has no influence on the allowed densities and does not increase development potential in the Rural Area.
(25)	PF-9: Recognize and support agreements with water purveyors in adjacent cities and counties to promote effective conveyance of water supplies and to secure adequate supplies for emergencies.	• The City has interties with Northeast Sammamish Water & Sewer District and Union Hill Water Association, for emergency supply.
(26)	PF-10: Implement water conservation and efficiency efforts to protect natural resources, reduce environmental impacts, and support a sustainable long-term water supply to serve the growing population.	• The District's three-year rolling average distribution system loss (DSL) has been 8 percent. • The distribution system loss is within or meets State standards of 10 percent, per WAC Ch. 246-290. • The City participates in a regional conservation program administered by Cascade. • The City has supplemented Cascade's program with some of its own actions.
(27)	PF- 11: Encourage water reuse and reclamation, especially for high-volume non-potable water users such as parks, schools, and golf courses.	• The City has restricted use of reclaimed water within its Critical Area Recharge Area (CARA) to uses that discharge to a sanitary sewer system due to its susceptibility to surficial contamination.

D: King County Comprehensive Plan (KCCP)		Comments/findings
(28)	F-306: If a service provider declares, in its capital facilities plan, an inability to meet service needs within service area, King County and the service provider shall remedy the deficiency through a joint planning process.	• Not applicable: the City did not identify an inability to meet service needs within its service area.
(29)	F-402: In the Rural Area, services provided by agencies shall support a rural level of development and not facilitate urbanization.	• The City's retail service area includes a very small area in the Rural Area. The water system plan has no influence on the allowed densities and does not increase development potential in the Rural Area.
(30)	F-406: Capital facility plans and capital improvement programs prepared by all other agencies for services to unincorporated King County are consistent with the KC Comprehensive Plan.	• The modeling that identified potential capital improvements assumes the primary unincorporated area served by the City is built out in a manner consistent with the KCCP.
(31)	F-480: King County should support coordination of regional water supply planning, sales of excess water supplies among municipalities in the region, water quality programs and water conservation, reuse and reclaimed water programs to support growth in the UGA and ensuring water availability for resource lands.	• The City is a member of the Cascade Alliance. Through its membership, it participates in a regional conservation program and accesses a majority of its water through a regional water source which originates at Seattle Public Utility's Tolt Reservoir.
(32)	F-483: Water utilities that obtain water from, or distribute water in unincorporated King County, and water utilities formed as special purpose districts under Title 57 RCW are required to submit water system plans to the county for review and approval and shall describe in their plans how they intend to meet their duty to provide service within their retail service area.	• The City provides water to unincorporated areas. • The Plan addresses Duty to Serve and the local appeal process.
(33)	F-494: Water system plans for large purveyors shall include an evaluation of recycled water use opportunities.	• The City has completed a King County Water Reclamation Evaluation Checklist. • An excerpt from the 2018 Cascade Water Alliance/King County reclaimed water study is included with the Evaluation Checklist. This study provides a summary of potential reclaimed water demands.

(34)	F-497: In reviewing proposals for modified and expanded service area boundaries for municipal water suppliers, as defined under Chapter 90.03 RCW, the UTRC shall consider: a. Compliance by the water system with its water system comprehensive plan, including water conservation elements; b. Whether it can meet its duty to provide service within its service area, as required under chapter 43.20 RCW; and c. Consistency with the service provisions of any applicable Coordinated Water System Plan, as adopted in King County Code Chapter 13.28.	• Not applicable: the City is not changing its water service area.
(35)	F-498: King County shall not approve a water system plan with a proposed retail service area where the water system is unable to provide timely and reasonable service for one or more of the reasons identified 43.20.260 RCW.	• The Plan addresses Duty to Serve and the local appeal process. • The City has sufficient water rights to provide the service. • The City has sufficient capacity to serve the water in a safe and reliable manner as determined by DOH. • Each proposed development project determines the consistency with the requirements of any comprehensive plans or development regulations adopted under chapter 36.70A RCW or any other applicable comprehensive plan, land use plan, or development regulation adopted by the City.
(36)	F-499: Public drinking water system surface water reservoirs and their watersheds should be managed primarily for the protection of drinking water, but should allow for multiple uses, including recreation, when such uses do not jeopardize drinking water quality standards. Public watersheds are managed to protect downstream fish and agriculture resources.	• Not applicable: the City does not control any surface water reservoirs or watersheds.
(37)	F-500: Groundwater-based public water supplies should be protected by preventing land uses that may adversely affect groundwater quality or quantity to the extent that the supply might be jeopardized. The County shall protect the quality and quantity of groundwater used as water supplies through implementation of Policies E-445 through E-451 where applicable.	• The City has a Well Head Protection Program.

King County

Metropolitan King County Council
Local Services and Land Use Committee

STAFF REPORT

Agenda Item:	5	**Name:**	Nick Bowman
Proposed No.:	2025-0360	**Date:**	January 21, 2026

SUBJECT

An ordinance relating to the King County regional E-911 program governance and reporting.

SUMMARY

Proposed Ordinance 2025-0360 would amend two prior E-911 related ordinances to repeal the defunct interim E-911 advisory group and no longer require submission of an annual report regarding implementation of the E-911 Strategic Plan, as well as other technical changes.

BACKGROUND

Enhanced 911 (E-911) System. Under state law, counties must implement a countywide E-911 emergency communication system, with the goal of providing E-911 throughout the state.[1] King County's E-911 system is a partnership between the County and eleven independent PSAPs,[2] which provide 911 call answering and dispatch services for local jurisdictions. The E-911 Program Office is housed in King County's Department of Information Technology (KCIT) and is responsible for ensuring correct routing of a 911 call to the appropriate Public Safety Answering Point (PSAP).[3] Each PSAP is responsible for the 911 call answering, interrogation, and dispatch of appropriate public safety agencies.

The program is primarily funded by excise taxes from land line, wireless, and Voice-over-Internet-Protocol (VoIP) phones. A portion of these excise taxes are distributed to each PSAP to defray the costs of 911 call handling. In 2024, using a hybrid combination of both E-911 and NG911 technologies, King County PSAP's processed 1,829,490 voice calls and 17,553 text calls to 911.[4]

[1] RCW 38.52.510
[2] In late 2023, the City of Bothell chose to close the city's PSAP and transfer 911 services to NORCOM 911, reducing the number of PSAPs from 12 to 11.
[3] Ordinance 18551, adopted in July 2017, moved the E-911 Program Office from the Office of Emergency Management in the Department of Executive Services to KCIT.
[4] King County Regional E-911 Strategic Plan 2024 Annual Report

Regional E-911 Strategic Plan. In July 2016, the Executive appointed, and the Council confirmed, a 16-member multijurisdictional Leadership Group tasked with completing an E-911 a Strategic Plan by December 31, 2017.[5] The Leadership Group was supported by a formal staff Planning Group, which was appointed to consider recommendations from three task forces (Technology and Operations, Finance, and Governance).

On November 9, 2017, the Leadership Group voted unanimously to approve the Strategic Plan and in January 2018, the Council approved the King County Regional E-911 Strategic Plan.[6] The Plan establishes the vision, mission, values, goals, core services, and principles for the regional E-911 system. The Plan also recommended a new regional governance structure led by a Regional Advisory Governing Board, a 10-year technology strategy focused around modernizing and centralizing the E-911 platform, and a 10-year financial plan focused on achieving financial sustainability for the E-911 system.[7] Under the governance and finance recommendations, the Strategic Plan further called for the development of a new formal agreement between the County and the PSAPs, as well as the development of comprehensive financial management policies.

In 2021, the Council approved an interlocal agreement between the County and the PSAPs, which formally established a comprehensive funding policy, strategic goals, and conflict resolution processes.[8]

Financial Sustainability. In response to recommendations in the Regional E-911 Strategic Plan, the Regional Advisory Governing Board formed a Financial Workgroup, which has identified one-time and ongoing program efficiencies and has developed funding policies intended to reduce costs. Over the longer term, other funding sources are being investigated, including a potential increase to the excise tax[9] or a voter-approved increase to the sales and use tax.[10] Based on the financial sustainability work to date, the 2026-2027 budget projects ongoing positive fund balance and are forecasted to be sustainable through 2031.

ANALYSIS

Proposed Ordinance 2025-0360 would amend and repeal sections of Ordinances 18139 and Ordinance 18695 relating to E-911 program governance and the E-911 Strategic Plan.

The proposed ordinance would repeal Section 4 of Ordinance 18139 that established the Interim E-911 Advisory Group, whose purpose was to “advise and consult with the King County E-911 program office regarding technology, financial and system operational issues until completion of the E-911strategic plan and implementation of an ongoing decision making and/or governance system.” Repealing the Interim E-911 Advisory Group would be a technical change with no operational impacts as the group

[5] Motion 14679
[6] Ordinance 18695
[7] The governance structure recommended by the Strategic Plan was established via Ordinance 18695
[8] Ordinance 19255
[9] RCW 82.14B.030. An increase to the excise tax would require approval by the State Legislature.
[10] RCW 82.14.420 allows local sales and use tax for emergency communications systems and facilities.

was replaced by the Regional E-911 Advisory Governance Board established under Ordinance 18695 in 2018.

The proposed ordinance would also repeal Section 3 of Ordinance 18695 which requires the E-911 Program Office to submit an annual report to the Council's Regional Policy Committee on the implementation of the E-911 Strategic Plan. The 2024 E-911 Annual Report states that all objectives outlined in the Strategic Plan[11] that are within the County's authority to implement have been successfully achieved, thereby meeting all reporting requirements established under Ordinance 18695. According to the Executive, the County will continue to actively pursue the outstanding revenue reform objectives outlined in the Strategic Plan which require Washington State Legislative approval.

In response to Council staff inquires regarding the E-911 program's on-going work with state partners toward revenue reforms, Executive staff provided the following information: "In mid-2025, the State Advisory Committee created an ad hoc financial subcommittee to address funding for 911 statewide. This committee is working on a long-term strategy to address funding for 911 to include excise tax increases and other possible revenue sources for long-term sustainability. King County E-911 has two managers who participate in the financial subcommittee and actively advise and advocate for revenue reforms that would benefit the County."

Executive staff further notes that future reporting on the E-911 program's completed strategic objectives and milestones will continue to the Council via the annual King County Strategic Information Technology Plan (SITP).

INVITED

- Jami Hoppen, Government Relations and Outreach Manager, King County Regional Services/911 Program Office

ATTACHMENTS

1. Proposed Ordinance 2025-0360
2. Transmittal Letter
3. Fiscal Note

[11] 2026-RPT0001

1200 King County Courthouse
516 Third Avenue
Seattle, WA 98104

KING COUNTY

Signature Report

Ordinance

Proposed No. 2025-0360.1 **Sponsors** Dunn

AN ORDINANCE relating to the King County regional E-911 advisory governance board; amending Ordinance 18695, Section 2, and repealing Ordinance 18139, Section 4, and Ordinance 18695, Section 3.

BE IT ORDAINED BY THE COUNCIL OF KING COUNTY:

SECTION 1. Ordinance 18695, Section 2 is hereby amended to read as follows:

The governance and decision structure of the King County regional E-911 advisory governance board is approved as set forth in the King County Regional E-911 Strategic Plan, Attachment A to ((~~this ordinance~~)) Ordinance 18695, along with the Appendices, Attachment B to ((~~this ordinance~~)) Ordinance 18695. The King County regional E-911 advisory governance board shall inform and advise the King County E-911 program office, the King County executive and the King County council, on subjects that ((~~effect~~)) affect the King County regional E-911 system and operations and finances of the public safety access points. ((~~The Interim E-911 advisory group, established in Ordinance 18139, will be repealed, once this ordinance is enacted, in accordance with Ordinance 18139, Section 5.C.~~))

SECTION 2. The following are hereby repealed:

A. Ordinance 18139, Section 4; and

B. Ordinance 18695, Section 3.

KING COUNTY COUNCIL
KING COUNTY, WASHINGTON

_____

Sarah Perry, Chair

ATTEST:

_____

Melani Pedroza, Clerk of the Council

APPROVED this _____ day of _____, _____.

_____

Girmay Zahilay, County Executive

Attachments: None

King County
Shannon Braddock
King County Executive
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November 21, 2025

The Honorable Girmay Zahilay
Chair, King County Council
Room 1200
C O U R T H O U S E

Dear Councilmember Zahilay:

This letter transmits the final King County Regional E-911 Strategic Plan 2024 Annual Report as required by King County Ordinance 18695 and a proposed Ordinance that would, if approved, repeal Section 4 of Ordinance 18139 which requires an annual report on implementation of the E-911 Strategic Plan, and Section 3 of Ordinance 18695, which would repeal the Interim E-911 Advisory Group. The Regional E-911 Strategic Plan has been fully implemented.

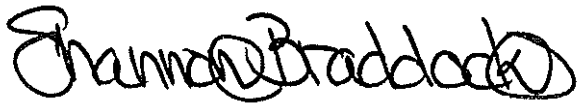
Reporting on the E-911 program's completed strategic objectives and milestones will continue to the King County Council via the annual King County Strategic Information Technology Plan (SITP).

As required, the enclosed King County Regional E-911 Strategic Plan 2024 Annual Report provides status updates on the implementation of the recommendations of the E-911 Strategic Plan on the governance and decision structure, technology investment strategy, and 10-year sustainable financial plan. By year end 2024, all objectives in the Strategic Plan were completed under budget and ahead of schedule. This milestone accomplishment completes the requirement in Ordinance 18695 and provides for the King County E-911 Program Office to move its annual reporting under the King County Department of Information Technology structure via the SITP.

Thank you for your consideration of this report and proposed Ordinance.

If your staff have questions, please contact Stephen Heard, Acting Director, Department of Information Technology (KCIT), at 206-477-5728.

Sincerely,



Shannon Braddock
King County Executive

Enclosure

cc: King County Councilmembers
ATTN: Stephanie Cirkovich, Chief of Staff, King County Council
Melani Hay, Clerk of the Council
Stephanie Pure, Council Relations Director, Office of the Executive
Stephen Heard, Director, Department of Information Technology
Jami Hoppen, Government Relations Manager, Department of Information Technology

2025 FISCAL NOTE ATTACHMENT 3

Ordinance/Motion:
Title: An Ordinance Updating Provisions of Ordinance 18695 Concerning the Regional E-911 Strategic Plan and the King County regional E-911 advisory governance board

Affected Agency and/or Agencies: KCIT

Note Prepared By: Junko Keesecker

Date Prepared: 9/5/2025

Note Reviewed By:

Date Reviewed:

Description of request:

A proposed ordinance is amending Ordinance 18695 to update the requirements related to King County Regional E-911 Strategic plan requirement and the King County regional E-911 advisory governance board. The ordinance carries no fiscal impact.

Revenue to:

Agency	Fund Code	Revenue Source	2025	2026-2027	2028-2029
Department of Information Technology (KCIT)	1110				
TOTAL			**0**	**0**	**0**

Expenditures from:

Agency	Fund Code	Department	2025	2026-2027	2028-2029
Department of Information Technology (KCIT)	1110	KCIT			
TOTAL			**0**	**0**	**0**

Expenditures by Categories

	2025	2026-2027	2028-2029
TOTAL	**0**	**0**	**0**

Does this legislation require a budget supplemental? Yes/No

Notes and Assumptions:

King County

Metropolitan King County Council
Local Services and Land Use Committee

STAFF REPORT

Agenda Item:	6	**Name:**	Gene Paul
Proposed No.:	2025-0285	**Date:**	January 21, 2026

SUBJECT

Proposed Ordinance 2025-0285 would approve and adopt the 2025-2030 King County Regional Hazard Mitigation Plan.

SUMMARY

Proposed Ordinance 2025-0285 would adopt the 2025-2030 King County Regional Hazard Mitigation Plan (RHMP). A mitigation plan is a tool for reducing risks to people, property, and the environment as well as enhancing community resilience prior to a natural or human-caused disaster. The federal government requires local governments such as King County to create a local mitigation plan and update the plan every five years in order to be eligible for funding through the Hazard Mitigation Grant Program (HMGP), other mitigation grant programs, and federal Public Assistance funding related to infrastructure repairs from federally-declared disasters. The Code of Federal Regulations contains specific requirements for plan elements. The Federal Emergency Management Agency (FEMA) has given pre-adoption approval for the 2025-2030 RHMP, indicating that the County's plan meets the federal requirements.

This plan, in addition to being the plan for unincorporated King County, would also serve as the base plan for other jurisdictions in King County. These jurisdictions would then develop their own annexes to the RHMP, with a focus on hazard mitigation in their own areas. The update to the RHMP included multiple inter-jurisdictional workshops and public outreach events.

The plan contains a discussion of eight natural hazards and six human-caused hazards that threaten King County, identifies one overarching goal, and develops 36 mitigation strategies to advance this goal and reduce vulnerability to hazards. The plan also lays out a process for evaluating and prioritizing strategies and individual projects within the mitigation strategies.

King County first adopted a hazard mitigation plan in 2004, with updates adopted in 2009, 2015, and 2020. The 2020-2025 plan expired on September 30, 2025.

BACKGROUND

Hazard mitigation is defined as "any sustained action taken to reduce or eliminate the long-term risk to human life and property from hazards."[1] The federal government requires local governments such as King County to create a local mitigation plan and update the plan every five years in order to be eligible for funding through the Hazard Mitigation Grant Program (HMGP), other mitigation grant programs, and federal Public Assistance funding related to infrastructure repairs from federally-declared disasters.

The Code of Federal Regulations requires that these local hazard mitigation plans be created through a public process and contain the following elements:

- Documentation of the planning process used to develop the plan, including how it was prepared, who was involved, and how the public was involved;
- A risk assessment that includes a description of the hazards a jurisdiction faces and its vulnerability to those hazards;
- A description of the vulnerability to the hazards identified and their impacts on the community;
- A mitigation strategy describing hazard mitigation goals, specific actions that can be taken to reduce vulnerability, and a plan for how to implement these actions; and
- A plan maintenance process describing the method and schedule of updating the plan on a five-year basis, ongoing public participation, and integration of plan elements into other jurisdictional plans.

The plan must be reviewed by the State and FEMA and also be formally adopted by the governing body of the local jurisdiction.[2] Both the State and FEMA have provided preliminary approval of the updated RHMP.

In 2004, King County adopted its first Regional Hazard Mitigation Plan (RHMP), after a collaborative regional planning effort.[3] The King County Council adopted updates to the plan in 2009, 2015, and 2020.[4] The 2020-2025 plan expired on September 30, 2025.

ANALYSIS

Proposed Ordinance 2025-0285 would adopt the 2025-2030 King County Regional Hazard Mitigation Plan, which is Attachment A to the Proposed Ordinance. The plan's overarching goal is to create a framework that reduces the impact and susceptibility of the identified hazards on people, property, and the environment, prioritizing historically underserved communities. This plan, in addition to being the plan for unincorporated

[1] 44 CFR 201.2
[2] 44 CFR 201.6
[3] Ordinance 15038
[4] Ordinances 16715, 17996, and 19160 respectively.

King County, would also serve as the base plan for other jurisdictions in King County. These jurisdictions would then develop their own annexes to the RHMP, with a focus on hazard mitigation in their own areas.

Update Process and Public Outreach. The Office of Emergency Management (OEM), the County agency responsible for hazard mitigation planning, conducted a planning process to complete this update. The efforts included a core planning team of OEM staff and a steering committee that was a multi-agency, multi-jurisdictional team that included representatives of various King County agencies, cities, and water and school districts. The steering committee met ten times between February 2024 and January 2025 to assess progress and guide critical decisions on the planning efforts. The planning team also received input from subject matter experts that included the County Fire Chiefs Association, County Police Chiefs Association, Washington Association of Water & Sewer Districts, the King County Emergency Management Advisory Committee and relevant County, State and federal agencies. Finally, OEM also invited 50 planning partners from neighboring jurisdictions and special districts to participate in a series of workshops and meetings to develop the base plan and support those jurisdictions in developing their own annexes to the plan.

For public outreach on the plan, OEM conducted outreach through both online surveys and in-person tabling events. 135 people participated in the primary public survey that was available for six months from June to November 2024. Additionally, a survey questionnaire connected to the semi-annual ALERT King County test in September 2024 garnered close to 1,200 responses about hazards. The in-person tabling occurred from May to November 2024 at 34 community events throughout the County with approximately 3,000 event attendees. Over 700 community members engaged with the plan through the tabling events. A full list of outreach events can be found beginning on page 2-17 of the RHMP.

Key Revisions from 2020-2025 RHMP. The 2025-2030 plan has several key revisions when compared to the 2020-2025 version. First, the plan was updated to comply with the most recent FEMA standards for the RHMP. By doing so, the plan now addresses climate change considerations throughout. Second, the risk assessments have been adjusted to better support emergency managers, who are the primary audience of the plan, by incorporating the latest data and tools and producing more detailed and accurate assessments.

While the 2020-2025 plan met the standards of the Emergency Management Accreditation Program (EMAP), the 2025-2030 plan specifically details, beginning on page 1-4, how the plan meets the accreditation standards. The EMAP standards used in the plan also improved the methodology for ranking hazards with an enhanced scoring approach that provided a more robust evaluation of hazards. By incorporating these standards into the plan, the County can maintain its current EMAP accreditation and is well positioned for reaccreditation in 2027.

According to the 2025-2030 RHMP, the updated plan "places a stronger emphasis on equity and social justice" than previous plans by integrating equity and social justice principles into the considerations of risk and vulnerability and using those principles to shape mitigation priorities to reduce risk for historically underserved communities who have also been more severely impacted by hazards.[5] The plan includes a community profile of the County for the first time and the demographics and data in the profile allowed the planning team to more accurately understand vulnerable populations that would benefit from prioritizing in the mitigation strategies.[6]

Risk Assessments. The 2025-2030 RHMP contains a risk assessment for eight natural hazards and six human-caused hazards. The 14 hazards remain the same from the 2020-2025 RHMP. They include:

- Avalanche
- Earthquake
- Flood
- Landslide
- Severe Weather
- Tsunami
- Volcano
- Wildfire
- Civil Disorder
- Cyber Incidents
- Dam Failure
- Hazardous Materials
- Health Incidents
- Terrorism

The planning team developed a new risk matrix for this RHMP to identify which hazards pose the greatest risk to the County and which areas or public assets are the most vulnerable. By examining the hazard (the location, probability, and magnitude of the event that can cause damage), the impacts on seven key types of County assets (the public, first responders, government operations, facilities and infrastructure, etc.), and vulnerability (susceptibility of injury, harm, damage, or economic loss), the assessments calculate a specific level of risk for people, property, the environment, and government operations, as well as an overall risk.

The results of this risk assessment are found on page 4-8 of the RHMP. Two hazards, severe weather and earthquake, were assessed to have an "extremely high" overall risk. Five other hazards, which include health incidents, hazardous materials, floods, dam failure, and cyber incidents, were assessed as a "high" overall risk. Six of the remaining hazards were considered "moderate" risks overall and only avalanche was assessed as a "low" overall risk.

Each hazard has a chapter devoted to it in the RHMP (chapters 5-18) where more detailed information that was used to develop the risk assessment is provided.

Capabilities. After the 14 chapters providing detailed descriptions of the most likely and most dangerous hazards to the County, the plan assesses the capabilities the County

[5] 2025-2030 RHMP, page 1-2
[6] 2025-2030 RHMP, page 3-6

has to reduce or mitigate the impacts of those hazards. The assessment begins with the plans, policies, and ordinances that already exist that can address or influence the impacts of hazards. Examples from this list include building and development codes, the Comprehensive Emergency Management Plan, the Continuity of Government Plan, the Comprehensive Plan, Stormwater Management Plan, and the Strategic Climate Action Plan. Next, the assessment identifies programs that implement hazard mitigation. These include community education efforts from OEM, the flood buyout program, the Flood Control District's Flood Warning Program, the National Flood Insurance Program, and the ShakeAlert earthquake warning system. The capabilities assessment then identifies the County departments and staffing that contribute to hazard mitigation. Finally, the assessment concludes with potential federal, state, and local funding sources for hazard mitigation projects.

Mitigation Goal and Strategies. The RHMP has one overarching goal, which is "to create a framework that reduces the impact and susceptibility of the identified hazards on people, property, and the environment, prioritizing historically underserved communities."[7]

Strategies. To accomplish this goal, the plan has 36 strategies which are "sets of coordinated actions that, taken together, address a risk or vulnerability. They are comprehensive, long-term, and designed to be regularly updated as actions are completed."[8] Each of these strategies include a long-term vision, objectives for the 2-year, 5-year, and long-term timeframes, implementation actions representing the specific work to be done, and performance measures.

Strategy Prioritization. The RHMP also contains an updated process for evaluating and prioritizing specific hazard mitigation strategies and projects. Each strategy was evaluated using the following criteria:

- Economics and Equity (project is designed to benefit, account for, and include vulnerable populations, especially those in the community most likely to suffer harm from a disaster and those likely to take longest to recover after a disaster)
- Multi-Jurisdictional (project is supported by multiple jurisdictions or agencies)
- Multiple-Beneficial (project has benefits beyond hazard risk reduction, including environmental, social, or economic benefits)
- Community Resilience and Long-Term Vulnerability Reduction (project is designed to increase community resilience and focus on the long-term impacts to vulnerable areas)
- Climate, Environment, and Sustainability (project helps people, property, and the environment become more resilient to the effects of climate change, regional growth, and development)

[7] 2025-2030 RHMP, page 20-1
[8] 2025-2030 RHMP, page 20-2

- Effectiveness (project is designed to attain the best-possible benefit-cost ratio)
- Urgent (project is urgently needed to reduce risk to lives and property)
- Shovel-Ready (project is largely ready to go, with few remaining roadblocks that could derail it)

For each of these criteria, a score of 0 through 4 was assessed, with 4 being "outstanding or beyond expectations," and 0 being "unsatisfactory." The scores for each criterion were then summed to get a final score for the strategy. The plan notes that prioritization scores "may not impact which strategies are implemented since many depend on exclusive funding sources."[9] The RHMP also indicates that the same prioritization process will be applied to projects annually for submission for FEMA hazard mitigation grants.

For the 36 strategies in the plan, nine are updated strategies from the 2020-2025 plan.[10] These include strategies related to GIS mapping, the County Flood Warning System, flood risk mapping, disaster skills training, and expanded language access to emergency messaging. There are also six strategies in the RHMP, such as the Community Wildfire Protection Plan and climate change and health adaptations, that also appear in the 2025 Strategic Climate Action Plan. According to the RHMP, this was done to ensure integration with SCAP, to ensure multiple avenues of implementation and monitoring, and to help relevant actions gain a higher profile with County departments. The remaining 21 strategies are new for this iteration of the RHMP. The plan does note that strategies can be added to the list throughout the lifecycle of the plan.

The summarized list of RHMP strategies can be found in the table beginning on page 20-17 of the document. The detailed description of each strategy containing the vision, objectives, actions, and performance measures begin on page 20-26.

Plan Monitoring and Maintenance. According to the RHMP, OEM will track the mitigation strategies using biannual convenings for County agencies and partner jurisdictions to collect progress updates for an annual report. Additionally, OEM will annually review, and potentially revise, the risk analysis contained in the RHMP. Additional strategies may be added to ensure the RHMP remains aligned with evolving goals and priorities but the plan notes that this will be done with community input and transparency.

[9] 2025-2030 RHMP, page 20-5

[10] The 2020-2025 RHMP had 39 strategy initiatives. 30 have been removed from the plan. Of those 30 removed strategies, 24 are considered to be ongoing actions that will continue outside of the RHMP strategy reporting, four were removed for making no progress, and two were completed.

INVITED

- Brendan Mccluskey, Director, King County Office of Emergency Management

ATTACHMENTS

1. Proposed Ordinance 2025-0285 (and its attachments)
2. Transmittal Letter
3. Fiscal Note

1200 King County Courthouse
516 Third Avenue
Seattle, WA 98104

KING COUNTY

Signature Report

Ordinance

Proposed No. 2025-0285.1 **Sponsors** Zahilay

AN ORDINANCE approving and adopting the updated 2025-2030 King County Regional Hazard Mitigation Plan, as approved by the Federal Emergency Management Agency.

BE IT ORDAINED BY THE COUNCIL OF KING COUNTY:

SECTION 1. **Findings:**

A. King County supports disaster mitigation efforts and regional disaster planning.

B. A locally adopted plan reviewed and approved by the Federal Emergency Management Agency ("FEMA") is required under the Disaster Mitigation Act of 2000.

C. Regular revisions and updates to the five year plan are required by FEMA.

D. In October 2004, Ordinance 15038 approved the county's initial five year Regional Hazard Mitigation Plan.

E. In December 2009, Ordinance 16715 approved an update to the Regional Hazard Mitigation Plan.

F. In March 2015, Ordinance 17996 approved the second update of the Regional Hazard Mitigation Plan.

G. In September 2020, Ordinance 19160 approved the revision and update of the Regional Hazard Mitigation Plan.

H. Another update to the plan is now required to comply with the Disaster Mitigation Act of 2000.

I. King County and other political subdivisions and organizations within King County have a cooperative interest in disaster mitigation planning efforts. Over sixty jurisdictions and other partners participated in the drafting of the update to the plan in Attachment A to this ordinance, the 2025-2030 King County Regional Hazard Mitigation Plan.

J. It is expected that over fifty jurisdictions will adopt the update as their base plan following FEMA approval.

K. FEMA approval of the plan enables the county to seek federal mitigation project funding related to potential hazards the region may experience and federal Public Assistance Program funding related to permanent repairs to infrastructure resulting from federally-declared disasters over the next five year planning period.

L. The enactment of this ordinance is required for final approval from FEMA.

SECTION 2. The updated 2025-2030 King County Regional Hazard Mitigation

Plan, as approved by the Federal Emergency Management Agency, Attachment A to this ordinance, is hereby approved and adopted.

KING COUNTY COUNCIL
KING COUNTY, WASHINGTON

_____

Sarah Perry, Chair

ATTEST:

_____

Melani Pedroza, Clerk of the Council

APPROVED this _____ day of _____, _____.

_____

Girmay Zahilay, County Executive

Attachments: A. 2025-2030 Regional Hazard Mitigation Plan



2025 - 2030

King County Regional Hazard Mitigation Plan



King County
Emergency Management



Acknowledgements

The King County Office of Emergency Management extends its sincere gratitude to our local, state, and national partners, non-governmental organizations, community members, and dedicated staff whose expertise, experience, and support were instrumental in the development of this plan. All contributions, big and small, are greatly appreciated.

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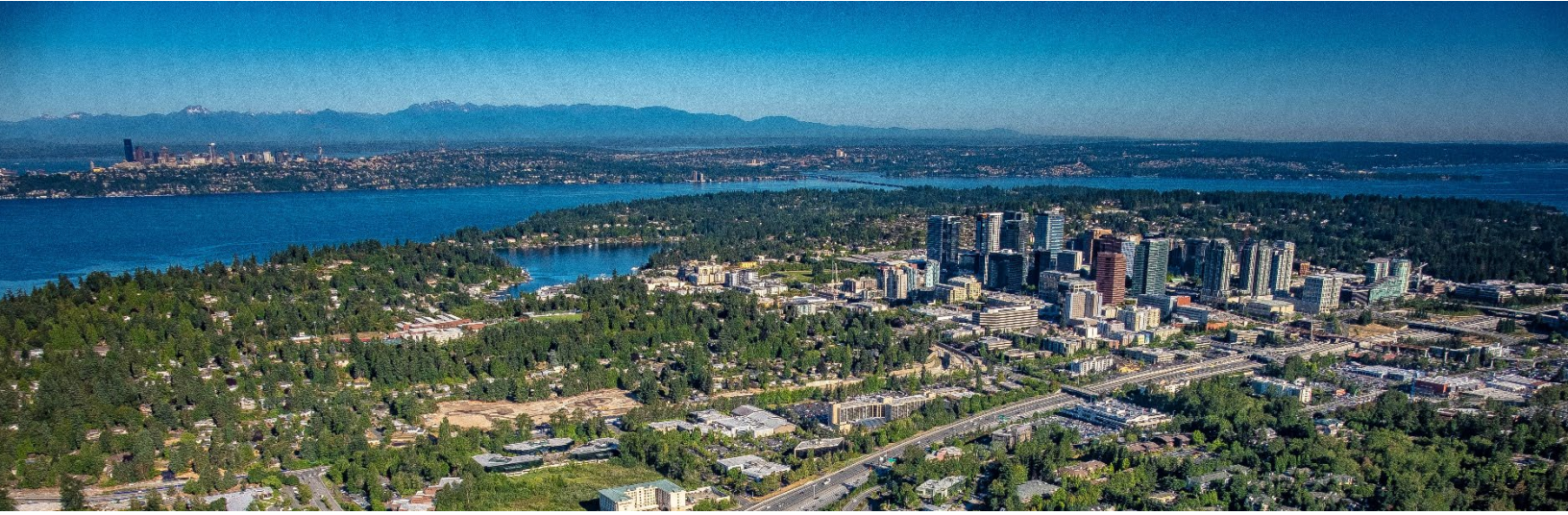
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Executive Summary

The King County Regional Hazard Mitigation Plan (RHMP) 2025-2030 serves as a strategic blueprint to safeguard the community and its assets from potential nature and human-induced hazards. In compliance with the Federal Emergency Management Agency (FEMA) and the Washington State Emergency Management Division (EMD) regulations, the plan ensures King County remains eligible for critical hazard mitigation funding and other resources.

The plan's overarching goal is to create a framework that reduces the impact and susceptibility of the identified hazards on people, property, and the environment, prioritizing historically underserved communities. To achieve this goal, the Core Planning Team worked to foster collaboration across local, state, and federal agencies, community organizations, and private sector partners. Collaboration is at the heart of this plan, working in partnership to identify and assess potential hazards and their impacts, determine high-risk areas and populations, integrate hazard mitigation into land use planning, and develop strategies to minimize risk.

Equity is a cornerstone of the King County Regional Hazard Mitigation Plan, ensuring that mitigation efforts prioritize those most vulnerable to the impacts of hazards. This includes focusing on communities that are historically underserved, such as low-income households, elderly residents, and individuals with disabilities. By recognizing the unique challenges faced by these populations, the plan strives to reduce disparities in risk exposure and access to resources.

Through comprehensive research, analysis, and collaboration, a set of targeted mitigation strategies has been developed, incorporating both structural and non-structural measures. Structural actions, such as retrofitting buildings and infrastructure, are complemented by non-structural approaches like land use planning and community engagement. Key mitigation actions identified include the development and implementation of floodplain management plans, improvements to emergency response capabilities, and the promotion of green infrastructure solutions to manage stormwater and reduce flood risks.

The significance of the 2025-2030 King County RHMP cannot be overstated. By identifying and addressing the region's most pressing hazards, the plan aims to protect lives and property, reduce the risk of injury, loss of life, and property damage, and enhance community resilience. This includes strengthening infrastructure, strengthening emergency response capabilities, and fostering social cohesion, ensuring that communities can better withstand, prepare, and recover from disasters.

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Chapter 1: Introduction

Mitigation planning is a vital strategic tool for reducing risk and enhancing community resilience to hazard events. It provides a platform for local partners to collaborate, assess potential risks, and build integrated mitigation strategies for risk reduction. The 2025 King County Regional Hazard Mitigation Plan explores the intersection of mitigation with prevention, protection, response, and recovery.

Hazard mitigation, a core mission within emergency management, goes beyond life safety by emphasizing that disaster impacts are not inevitable. While incidents will occur, their consequences are not predetermined. Through targeted investments in critical areas, we can strengthen the most vulnerable aspects of our community, enhancing resilience, and reducing the severity of future disasters.

The 2025 King County Regional Hazard Mitigation Plan complies with FEMA's local mitigation planning requirements outlined in Title 44, Part 201 of the Code of Federal Regulations (44 CFR 201) incorporating the latest policy updates that took effect in April 2025. The plan reassesses the risks and vulnerabilities associated with eight natural hazards and seven human-caused hazards, developing actionable strategies to mitigate these risks.

Serving as a base plan for all of King County, the plan also includes annexes from 50 jurisdictions, schools, and special districts, each contributing their specific analyses and mitigation actions tailored to their needs.

1.1 Mitigation Goal and Priorities



The goal of the 2025 King County Regional Hazard Mitigation Plan is to create a framework that reduces the impact and susceptibility of the identified hazards on people, property, and the environment, prioritizing historically underserved communities. This framework takes into account King County's 15 Determinants of Equity and Social Justice. These population-level indicators help

planners to better understand disparities and opportunities to make a difference across the communities we serve.

1.2 Revisions from 2020 Edition

When updating the 2020 RHMP, several key revisions and improvements have been made to enhance the plan's effectiveness and alignment with contemporary needs and requirements. The 2020 plan was fully rewritten and reformatted to comply with FEMA's 2022 updated local mitigation planning requirements. This includes the incorporation of new subsections addressing climate change considerations, and ensuring the plan accounts for the evolving impacts of climate change on hazards and vulnerability.

The risk assessments have been refocused to better support emergency managers, who are the primary audience of the plan. This shift ensures that the risk assessments are more directly relevant to the people responsible for preparedness and operations related to the hazards in King County. With advancements in science and technology since the development of the original plan, the 2025 edition benefits from newly available data and tools. These improvements enable a more detailed and accurate risk assessment, providing better insight into the County's hazard exposure and vulnerabilities. The methodology for ranking hazards has been refined to incorporate criteria from the Emergency Management Accreditation Program (EMAP). This enhanced scoring approach offers a more robust evaluation of hazards, better reflecting the County's risk landscape.

The 2025 plan places a stronger emphasis on equity and social justice, integrating these considerations into the understanding of risk and vulnerability. The County worked with various departments to identify vulnerable populations and include relevant data in a way that is operationally meaningful, ensuring that mitigation strategies address and reduce risks to these populations. Additionally, a community profile was introduced to this update, offering a deeper understanding of King County's demographics. This addition allows the plan to better identify and understand vulnerable populations in the region, ensuring that mitigation strategies can be tailored to meet the needs of these groups.

In anticipation of a significant increase in federal grants for natural hazard mitigation through the Disaster Recovery Reform Act, the plan includes a strategy to identify projects and project champions. This revision emphasizes capacity-building among planning partners and County agencies to better identify vulnerabilities, craft mitigation strategies, communicate the benefits of projects, and pursue funding opportunities effectively.

These revisions ensure that the 2025 Regional Hazard Mitigation Plan is more comprehensive, up-to-date, and aligned with local, regional, and federal priorities, while addressing the unique needs of vulnerable populations and the evolving risks posed by climate change.

1.3 Plan Guide

The base plan satisfies all requirements for King County plus many of the planning requirements for local planning partners. The plan is organized as follows.

Chapter 2 Planning Process

- The planning process section corresponds to Element A in the FEMA Mitigation Plan Review Guide and includes information on the planning process such as public outreach, meetings, and the planning timeline.

Chapter 3 Community Profile

- The community profile provides a detailed overview of King County's demographics, including population data, economic conditions, and historical context. It also highlights development trends, helping to identify potential vulnerabilities.

Chapter 4-18 Risk Assessments

- The risk assessment chapters include profiles of each profiled natural and human-caused hazard. These profiles are brief and are designed to provide an overview to emergency managers and other users of this plan. This section meets the requirements of Element B in the FEMA Mitigation Plan Review Guide.

Chapter 19 Capabilities Assessment

- The capabilities chapter meets requirements associated with coordinating the hazard mitigation program with other entities as well as information on available funding.

Chapter 20 Mitigation Strategies

- Hazard mitigation strategies are the key deliverable of this plan and include information on how strategies are identified, developed, and prioritized. This section meets the requirements in Element C of the FEMA Mitigation Plan Review Guide.

Chapter 21 Plan Maintenance

- The plan maintenance chapter outlines a framework for monitoring, evaluating, and updating the plan at regular intervals to ensure its relevance and accuracy throughout the 5-year period. Additionally, it provides a structured approach for tracking the progress and effectiveness of mitigation strategies.

Chapter 22 Plan Adoption

- The plan adoption chapter outlines the formal approval of the hazard mitigation plan by the King County Council, affirming the King County’s and annex jurisdiction's commitment to the outlined goals and actions.

1.4 EMAP Standards

The Emergency Management Accreditation Program (EMAP) is a national, standards-based assessment and accreditation process for emergency management programs. In the context of hazard mitigation, EMAP ensures the RHMP takes into account all the phases of emergency and disaster management: mitigation, protection, prevention, response, and recovery. These phases are addressed in the impact (or consequence) and vulnerability assessments, which are essential for evaluating hazards risk to various community components.

Each identified hazard includes a detailed quantitative summary of its overall impact, vulnerability, and risk on the respective chapter cover page, along with a qualitative summary provided at the end of the chapter. The RHMP narrative is tailored to local emergency managers, the primary audience, and emphasizes collaboration by involving them in the planning, implementation, and ongoing maintenance of the plan.

EMAP Section	2022 Standard	Location in Plan
4.1	**Hazard Identification, Risk Assessment, and Consequence Analysis**	
4.1.1	The Emergency Management Program identifies the natural and human-caused hazards that potentially impact the jurisdiction using multiple sources. The Emergency Management Program assesses the risk and vulnerability of the following:	
	(1) people;	Located in each hazard profile Chapters 5 through 18 both on the chapter cover page and under the section title *Vulnerability Assessment*. Definitions are found in Chapter 4, Section 2.
	(2) property;	
	(3) the environment; and	
	(4) its own operations from these hazards.	
4.1.2	The Emergency Management Program conducts a consequence analysis for the hazards identified in Standard 4.1.1 to consider the impact on the following:	
	(1) public;	Located in each hazard profile Chapters 5 through 18 both on the chapter cover page and under the section title
	(2) responders;	
	(3) continuity of operations, including continued delivery of services;	

	(4) property, facilities, and infrastructure;	*Impact Assessment*. Definitions are found in Chapter 4, Section 2.
	(5) environment;	
	(6) the economic condition of the jurisdiction; and	
	(7) public confidence in the jurisdiction's governance.	
4.1.3	The Emergency Management Program has a maintenance process for its Hazard Identification, and Risk Assessment (HIRA) identified in Standard 4.1.1, and the Consequence Analysis (CA) identified in Standard 4.1.2, including a method and schedule for evaluation and revision.	
	Maintenance Process (HIRA)	Maintenance process for HIRA and CA, including evaluation and revision, are located in Chapter 21, Section 1.
	Maintenance Process (CA)	
	Method and schedule evaluation	
	Method and schedule for revision	
4.2	**Hazard Mitigation**	
4.2.1	The Emergency Management Program has a plan to implement mitigation projects and sets priorities based upon loss reduction. The plan:	
	(1) is based on the natural and human-caused hazards identified in Standard 4.1.1 and the risk and consequences of those hazards;	Located in Chapter 4, Section 1.
	(2) is developed through formal planning processes involving Emergency Management	Located in Chapter 2, Sections 1 and 2.
4.2.2	The Emergency Management Program documents project ranking based upon the greatest opportunity for loss reduction and documents how specific mitigation actions contribute to overall risk reduction.	
	Priority Process	Located in Chapter 20, Section 4.
	Mitigation Actions	Located in Chapter 20, Section 7.

4.2.3	The Emergency Management Program utilizes a process to monitor the overall progress of the mitigation activities and documents completed initiatives and their resulting reduction or limitation of hazard impact on the jurisdiction.	
		Emergency Management Program monitoring is addressed in Chapter 21, Section 1.
4.2.4	The Emergency Management Program, consistent with the scope of the mitigation program, does the following:	
	(1) identifies ongoing mitigation opportunities and tracks repetitive loss;	Mitigation program tracking and technical assistance is addressed in Chapter 21, Section 1.
	(2) provides technical assistance in implementing mitigation codes and ordinances; and	
	(3) participates in jurisdictional and multi-jurisdictional mitigation efforts.	Multi-jurisdictional mitigation is addressed in Chapter 21, Section 2.
4.2.5	The Emergency Management Program has a maintenance process for the plan identified in Standard 4.2.1, including a method and schedule for evaluation and revision.	
		Maintenance process for the plan, including evaluation and revision, are located in Chapter 21, Section 1.

Chapter 2: Planning Process

The King County 2025 Regional Hazard Mitigation Plan (RHMP) follows the established planning guidelines of the Office of Emergency Management (OEM). This approach adheres to the standards of the Emergency Management Accreditation Program (EMAP) and FEMA's Comprehensive Preparedness Guide (CPG). The planning process embraced a whole-community approach, collaborating with a multiagency multijurisdictional steering committee. Consulting with subject matter experts through targeted focus groups, and actively engaged vulnerable communities through listening sessions to ensure comprehensive and inclusive input. Cities, tribes, special purpose districts, and school districts were invited to participate in this plan update. These jurisdictions and entities are critical to effective implementation of multi-jurisdictional mitigation projects.

2.1 Partner Engagement and Collaboration

Core Planning Team

The Core Planning Team, composed of key members from the King County Office of Emergency Management, played a pivotal role in guiding both the internal county process and supporting the planning efforts of individual cities. Their responsibilities included coordinating outreach activities, developing and reviewing plan drafts, contributing to the risk assessment, formulating mitigation goals and strategies, and overseeing the submission of the plan for local adoption.

Steering Committee

The Steering Committee, overseen by the Core Planning Team, is made up of different King County departments and representatives from participating jurisdictions and special districts including community planners, emergency managers, and subject matter experts. The committee supervised the writing of the plan and was consulted for final decisions made by the Core Planning Team. Individual departments developed their own strategies internally and then socialized the strategies with the other county participants.

Table 2-1 Planning Team Members

Name	Organization	Title
Core Planning Team		
Andrew Matthews	King County Emergency Management	Hazard Mitigation Program Coordinator

Nicole Johnson	King County Emergency Management	Senior Program Manager
Mercedes Stroeve	King County Emergency Management	Hazard Mitigation Planner
Steering Committee Members		
Addison Houston	KC Public Health	Climate Adaptation Strategist
Cat Robinson	Eastside Fire and Rescue	Emergency Coordinator
Cecelia Hayes	King County Department of Executive Services	Equity and Social Justice Program Manager
Colby Cavanaugh	City of Bothell	Emergency Manager
Deborah Neeham	City of Renton	Emergency Manager
Diane Pottinger	North City Water District	District Manager
Edan Edmunson	King County Emergency Management	Dam Safety Coordinator
Jared Schneider	City of Issaquah	Emergency Manager
Lara Whitely-Binder	King County Department of Natural Resources and Parks	Climate Preparedness Specialist
Laura Hendrix	King County Department of Natural Resources and Parks	Floodplain Management Program Manager
Lisa Figueroa	City of Redmond	Emergency Manager
Meisha Roberton	Riverview School District	Assistant Superintendent Business Program Manager

Sally Calengor	King County Emergency Management	Zone 3
Nathan Emory	King County Emergency Management	Extreme Weather Coordinator
Ryan Zavala	City of Shoreline	Emergency Manager
Sean Catanese	King County Risk Management	Risk Management
Sheri Badger	King County Emergency Management	Recovery Program Manager
Sunita Hall	King County Emergency Management	Zone 1
Will Lugo	City of SeaTac	Emergency Manager

The steering committee convened monthly to assess the progress of the core planning team and provide strategic guidance on critical decisions regarding the direction of the planning efforts. These meetings were held in-person at the King County Office of Emergency Management, with a virtual option also available to ensure broad participation.

Table 2-2 Steering Committee Meetings

DATE	SUMMARY
Feb 2024	**Introductions** Create outline for 2024/2025 update process; Review the new FEMA guidance and how it will affect the plan; Discuss other County wide plans we can incorporate; Begin creation of annex template.
Mar 2024	**Public outreach strategy** Strategize public outreach approach; Identify subject matter experts for risk assessment; Review Annex template; Examine example HMPs (i.e. Thurston County RHMP).
Apr 2024	**Equity and social justice (part 1)** Address how the RHMP will factor in equity in the planning and implantation; Review the Equity in Response Planning Tool; Update the Equity Matrix for scoring strategies; identify potential new partners and/or opportunities for collaboration.
May 2024	**Equity and social justice (part 2)**

	Continue to discuss how the RHMP will factor in equity in the planning and implantation; Continue to update the Equity Matrix for scoring strategies; Finalize outreach event schedule and locations.
June 2024	**Plan goals, priorities, and strategy (part 1)** Establish plan goals, priorities, and strategy prioritization method; Provide update on current risk profiles; Review public outreach survey flyer and questions.
July 2024	**Plan goals, priorities, and strategy (part 2)** Confirm RHMP goal, priorities, and strategy prioritization method.
Aug 2024	**Risk assessment** Review risk assessment matrix; organize risk assessment workshop identifying speakers; Create invite list of subject matter experts.
Oct 2024	**Impact and vulnerability assessment** Recap the risk assessment workshop; Identify plans and studies to incorporate into the risk assessments; Identify impacts and vulnerabilities.
Nov 2024	**Mitigation strategies** Review King County capabilities for mitigation efforts (i.e. policies, programs, staff, collaborations); Review previous mitigation strategies; Brainstorm new mitigation action opportunities.
Jan 2025	**Review draft base plan**

'Subject Matter Experts' Engagement

This region has benefitted significantly over the years from the partnerships and collaboration to address all the phases in emergency management (prevention, mitigation, preparedness, response, and recovery). The following discipline partners were sources of subject matter experts and/or the channels to share information and engage in emergency management planning efforts.

- King County Fire Chiefs Association
- King County Police Chiefs Association
- King County Office of Emergency Management
- Zone 1, 3 & 5 Emergency Managers
- Washington Association of Water & Sewer Districts
- Puget Sound Educational Service District
- King County Emergency Management Advisory Committee & Subcommittees
- King County partner agencies (Department of Natural Resources and Parks (DNRP), Public Health (PHSKC), Facilities Management Division (FMD), Executive Climate Office (ECO))
- Washington State departments (Emergency Management Division, Department of Natural Resources, Washington Geological Survey, Fusion Center, Department of Transportation)
- Federal agencies (National Oceanic and Atmospheric Administration (NOAA), National Weather Service (NWS), Northwest Avalanche Center (NWAC))

All subject matter experts, partners, and participating jurisdictions and special districts were directly invited to partake in the steering committee and be involved in the planning process.

2.2 Planning Steps

The hazard mitigation planning process is a systematic approach to identifying, assessing, and reducing the risks posed by natural and human-made hazards to a community. It is an essential part of building resilience, ensuring that future disaster impacts are minimized through strategic planning and collaboration. This process is divided into four distinct phases, each of which contributes to the development of a comprehensive mitigation plan.

Plan Coordination

The planning process begins with initial coordination and the establishment of a structured framework for development. This phase involves gathering key stakeholders and creating a foundation for the plan's development.

- **Initial Coordination:** Organizing the Core Planning Team and Steering Committee to help establish goals and planning process. The core planning team outlines the steps, timelines, and resources necessary to complete the mitigation plan. The steering committee, consisting of representatives from key agencies and local officials, oversees and guides the planning process.
- **Partner Development:** Identify and engage partners who will contribute to the process. These partners include local government agencies, non-governmental organizations (NGOs), community groups, and other entities with a vested interest in hazard mitigation.
- **Develop Outreach Strategy:** An outreach strategy is developed to engage the public and stakeholders through various channels. This may include meetings, social media, newsletters, and more. This includes a public survey to gather feedback from residents about their perceptions of hazards, mitigation needs, and priorities.

Assess Risk

Once the coordination phase is complete, the next step is to assess the hazards and risks that the community faces. This phase focuses on identifying and analyzing potential threats and their impacts.

- **Risk Assessment Methodology:** Identifies the natural and human-made hazards that may affect King County. This includes developing criteria for evaluating the severity, likelihood, and potential impacts of each hazard. This process helps ensure that all risks are adequately considered and prioritized. This is done by evaluating a comprehensive list of local, state, and federal data (see Chapter 4: Risk Assessment Overview).

- **Capability Assessment:** Evaluates the community's current capacity to respond to and manage the identified risks. This includes reviewing existing mitigation measures, resources, and expertise (see Chapter 19: Capabilities).

Mitigation Strategy

This phase focuses on developing strategies to reduce the identified risks. It is about determining actions that align with our goals, and establishing how the plan will be maintained.

- **Mitigation Strategy:** Craft detailed mitigation strategies in that align with the goal to reduce the impact and susceptibility of the identified hazards on people, property, and the environment, prioritizing historically underserved communities.

- **Identify Plan Maintenance:** Outline how the plan will be maintained and updated over time. This includes establishing a process for monitoring progress, updating risk data, and revising the plan as necessary.

Review & Adoption

The final phase of the hazard mitigation planning process involves reviewing and formalizing the plan, ensuring it meets regulatory requirements, and gaining official approval.

- **State Review:** The draft plan is submitted to the Washington Emergency Management Department (EMD) for review. The state ensures that the plan meets all applicable state regulations and is consistent with state hazard mitigation goals.

- **FEMA Review:** After state approval, the Federal Emergency Management Agency (FEMA) reviews the plan to ensure it meets federal standards and requirements for hazard mitigation planning.

- **Public Comment Period:** Following FEMA approval, the plan is made available to the public for 30-days to review and provide further input or concerns before the final plan is approved.

- **Council Approval:** The plan is submitted to King County Council for final approval. Once the governing body approve, the plan is officially adopted and becomes a living document that guides ongoing hazard mitigation efforts.

2.3 Jurisdiction Annex Process

KCOEM invited incorporated municipalities, Tribes, school districts, special districts, and other stakeholders to participate in the RHMP planning process. There are 29 participating jurisdictions and 21 special districts.

Jurisdictions	North Bend	King County Water District #125 (KCWD 125)
Beaux Arts Village	Redmond	Midway Sewer District
Bothell	Renton	North City Water District
Burien	Sammamish	Northeast Sammamish Sewer and Water District
Carnation	SeaTac	Renton School District
Clyde Hill	Shoreline	Riverview School District
Covington	Skykomish	Sammamish Plateau Water District
Des Moines	Snoqualmie	South King County Fire and Rescue
Duvall	Tukwila	Shoreline School District
Federal Way	Woodinville	Seattle Housing Authority
Hunts Point	**Special Districts**	Skyway Water and Sewer District
Issaquah	Cedar River Water & Sewer District	Soos Creek Water and Sewer District
Kenmore	Coal Creak Utility District	Valley Regional Fire Authority
Kent	Covington Water District	Vashon Island Fire and Rescue
Kirkland	King County Water District #19 (KCWD 19)	Woodinville Water District
Lake Forest Park	King County Water District #20 (KCWD 20)	
Maple Valley	King County Water District #90 (KCWD 90)	
Mercer Island		
Newcastle		

Individual jurisdictions and special districts participating in a multi-jurisdictional plan must meet the mitigation planning requirements, adopt the plan and provide documentation to FEMA through Washington State Emergency Management Department (EMD). Once the agency receives the jurisdiction's adoption, FEMA will issue an approval letter for the jurisdiction.

Each jurisdiction that chose to participate in the planning process and development of the plan was required to meet plan participation requirements defined at the first planning meeting. Those that were not able to participate in KCOEM's planning meetings had organized their own planning processes and have noted those meetings in their annex. The Core Planning Team hosted meetings for different phases of the planning process and presented at emergency management meetings in order to meet participants "where they're at" to provide updates on the planning process and gather input. Opportunities for participation include:

- **Kickoff Meeting:** First meeting to discuss the update of the RHMP and learn about FEMA's updated planning policy guide.
- **Steering Committee Meetings:** 9 total meetings providing committee members opportunity to contribute to the shaping of the planning process.
- **Annex Workshops:** 6 total workshops for participating jurisdictions and special districts to go through FEMA requirements for their RHMP annex.
- **Risk Assessment Workshops:** Review data on each of the identified hazards presented by subject matter experts and offering input on impacts and vulnerabilities.
- **Quarterly Emergency Management (EM) Meeting:** Review findings from the Risk Assessment Workshop and offering additional input on impacts and vulnerabilities.
- **Zone Meeting Presentation:** Discuss local, county, and state tools that help mitigate hazard risks and identify gaps in capabilities.
- **Co-Host Tabling Events:** Help to organize a community outreach event to discuss local and regional hazard risks.

Table 2-3 Jurisdictions and special districts participation in RHMP planning process

Jurisdiction	Kickoff Meeting	Steering Committee	Annex Workshops	Risk Assessment Workshop	Quarterly EM Meeting	Zone Meeting Presentation	Co-Host Tabling Events	Total
Beaux Arts Village								**0**
Bothell	1	1	1	1				**4**
Burien	1		1					**2**
Carnation			1				1	**2**
Clyde Hill	1							**1**
Covington	1		1		1	1		**4**
Des Moines	1		1		1		1	**4**
Duvall	1		1		1			**3**
Federal Way	1		2	1	1	1		**6**
Hunts Point								**0**
Issaquah		8	1					**9**
Kenmore	1							**1**

Jurisdiction	Kickoff Meeting	Steering Committee	Annex Workshops	Risk Assessment Workshop	Quarterly EM Meeting	Zone Meeting Presentation	Co-Host Tabling Events	Total
Kent					1			**1**
Kirkland	1		2		1	1		**3**
Lake Forest Park								**0**
Maple Valley			1			1		**2**
Mercer Island	1		2		1			**4**
Newcastle	1		2					**3**
North Bend								**0**
Redmond	1	4	1					**6**
Renton		8	2	1		1		**12**
Sammamish								**0**
SeaTac	1	**5**	1	1	1	1		**10**
Shoreline	1	**7**	3	1				**12**
Skykomish								**0**
Snoqualmie								**0**
Tukwila	1		1			1		**3**
Woodinville			1					**1**
Cedar River Water & Sewer District	1		4					**5**
Coal Creak Utility District	1		1					**2**
Covington Water District	1			1				**2**
King County Water District #19 (Vashon)								**0**
King County Water District #20 (Burien)								**0**
King County Water District #90 (East Renton)			2					**2**
King County Water District #125 (Tukwila)	1		1					**2**
Midway Sewer District			3					**3**
North City Water District		5	2	1				**8**
Northeast Sammamish Sewer and Water District		1	1					**2**
Renton School District								**0**
Riverview School District	1	1						**2**
Sammamish Plateau Water District	1		2					**3**
Shoreline School District								**0**
Seattle Housing Authority			1					**1**
Skyway Water and Sewer District	1	2	5	1				**9**
Soos Creek Water and Sewer District	1		4					**5**
South King County Fire and Rescue								**0**

Jurisdiction	Kickoff Meeting	Steering Committee	Annex Workshops	Risk Assessment Workshop	Quarterly EM Meeting	Zone Meeting Presentation	Co-Host Tabling Events	Total
Valley Regional Fire Authority								**0**
Vashon Island Fire and Rescue								**0**
Woodinville Water District	1		2					**3**
Grand Total	**23**	**42**	**53**	**8**	**7**	**7**	**2**	

Individual jurisdiction annexes were developed in partnership with King County, but with separate internal steering committees. The members of each jurisdiction's steering committee are documented in each annex.

Jurisdictions may join the regional hazard mitigation plan at any time by submitting a letter of intent to King County Emergency Management and completing the planning process and plan template. Each plan can be unique, and jurisdictions may do more than what is required in the template; however, this template is designed to help walk communities through the planning process in an accessible way. King County staff will provide technical assistance to planning partners, whenever possible.

The Core Planning Team hosted regular workshops for participating jurisdictions and special districts to go through FEMA requirements for their RHMP annex. These workshops were held on June 7th, June 14th, June 20th, July 11th, July 19th, and July 25th. There were over 50 attendees for the combined six workshops. Further support was offered to those seeking to apply for grant funding for their mitigation strategies.

Following the submission of the base plan in October 2025, King County will begin a second stage of outreach targeting those jurisdictions who missed the original submission deadline and those who were not previously involved. Among the second group, school districts will be proactively engaged and offered assistance in developing annexes to the hazard mitigation plan.

2.4 Timeline

The following timeline outlines key events and milestones for King County in the Regional Hazard Mitigation Plan Update. The planning process officially began in December 2023 and workshop, open to all planning partners. Following the kickoff, the Core Planning Team successfully facilitated 9 steering committee meetings, 6 planning workshops for jurisdictions annexing onto the plan, and engaged with over 60 subject matter experts to ensure a comprehensive and collaborative approach to the plan's development.

Table 2-4 Plan update timeline

Planning Activity	Date	Summary	Attendees
Plan Kickoff	Dec 2023	Conduct a kickoff meeting for the planning process, including discussions of expectations and the project timeline.	Designated county, city, and special district staff who are leading local plan updates
Steering Committee Meeting Kickoff	Feb 2024	Outline proposed planning process and timeline and approve plan and plan annex templates.	Steering committee
Outreach Strategy Meeting	Feb 2024	Meet with staff to identify outreach strategy	KCOEM staff
Steering Committee Meeting	Mar 2024	Identify public outreach sites and strategy	Steering committee
Steering Committee Meeting	Apr 2024	Integrating equity and social justice into the mitigation plan.	Steering committee
Steering Committee Meeting	May 2024	Integrating equity and social justice into the mitigation plan.	Steering committee
Annex Workshop	June 2024	Hosted 3 workshops the month of June to review the planning process and help local partners on mitigation planning questions	local jurisdiction partners
EMCC Meeting	June 2024	Mitigation strategy meeting discussions and identify points of contact in each agency	County departments
Steering Committee Meeting	June 2024	Establish plan goals, priorities, and strategy prioritization method	Steering committee
Annex Workshop	July 2024	Hosted 3 workshops the month of July to review the planning	local jurisdiction partners

		process and help local partners on mitigation planning questions	
Steering Committee Meeting	July 2024	Establish plan goals, priorities, and strategy prioritization method	Steering committee
Wildfire Strategy and Community Preparedness Discussion	July 2024	Discuss planning process, community outreach, funding opportunities, and mitigation strategies	Residents of North Bend, KC community members, local partners
Hazard Mitigation Workshop	July 2024	Work through the entire strategy development process from risk identification to mitigation projects.	County and local partners
Steering Committee Meeting	Aug 2024	Review mitigation capabilities	Steering committee
Mitigation Funding Workshop	Aug 2024	Work through process of developing a successful hazard mitigation grant application	County and local partners
Risk Assessment Workshop	Sept 2024	Review risk and vulnerability assessments	Subject matter experts
Steering Committee Meeting	Oct 2024	Review base plan and King County mitigation strategies	Steering committee
County Departments Strategy Coordination	Nov 2024	Meet with King County departments to go over all the mitigation strategies, eliminate gaps, and ensure consistent priorities.	County departments, including OEM, FMD, DNRP, PHSKC, KCIT, DES.
Steering Committee Meeting	Nov 2024	Review draft base plan	Steering committee
Mitigation Strategy Meetings	Dec 2024	Meet with internal planning partners (county departments)	DNRP, PHSKC, ECO, FMD

		to develop mitigation strategies.	
Steering Committee Meeting	Jan 2025	Review draft base plan	Steering committee
Submit to WA EMD and FEMA	Feb 2024	Submit full mitigation plan to FEMA for review	Planning Team
Plan Adoption	Sept 2025	King County Council vote to approve plan	King County Council
Plan Approval	Oct 2025	FEMA plan approval	FEMA Region 10

2.5 Outreach and Engagement

King County Office of Emergency Management (KCOEM) led an extensive public outreach campaign to gain public input for the RHMP. KCOEM uses public input to help prioritize which strategies listed in this plan should be implemented. The campaign included partnering with jurisdictions and community-based organizations to engage the public both through an online public survey and in-person tabling events.

2.5.1 Public Survey

The online survey was run from June 2024 to November 2024. It conducted on the platform "PublicInput" and saw a total 135 participants from all over the county. The top hazards listed were earthquake, extreme weather, and wildfire (including smoke impacts). To maximize outreach, the survey was promoted through the King County Emergency Blog and Department of Executive Services newsletters, advertised on the KCOEM Instagram page, and featured on the King County website banner. Additionally, printed copies of the survey were distributed at tabling events, community meetings, and shared with partners, jurisdictions, and entities involved in the planning process.

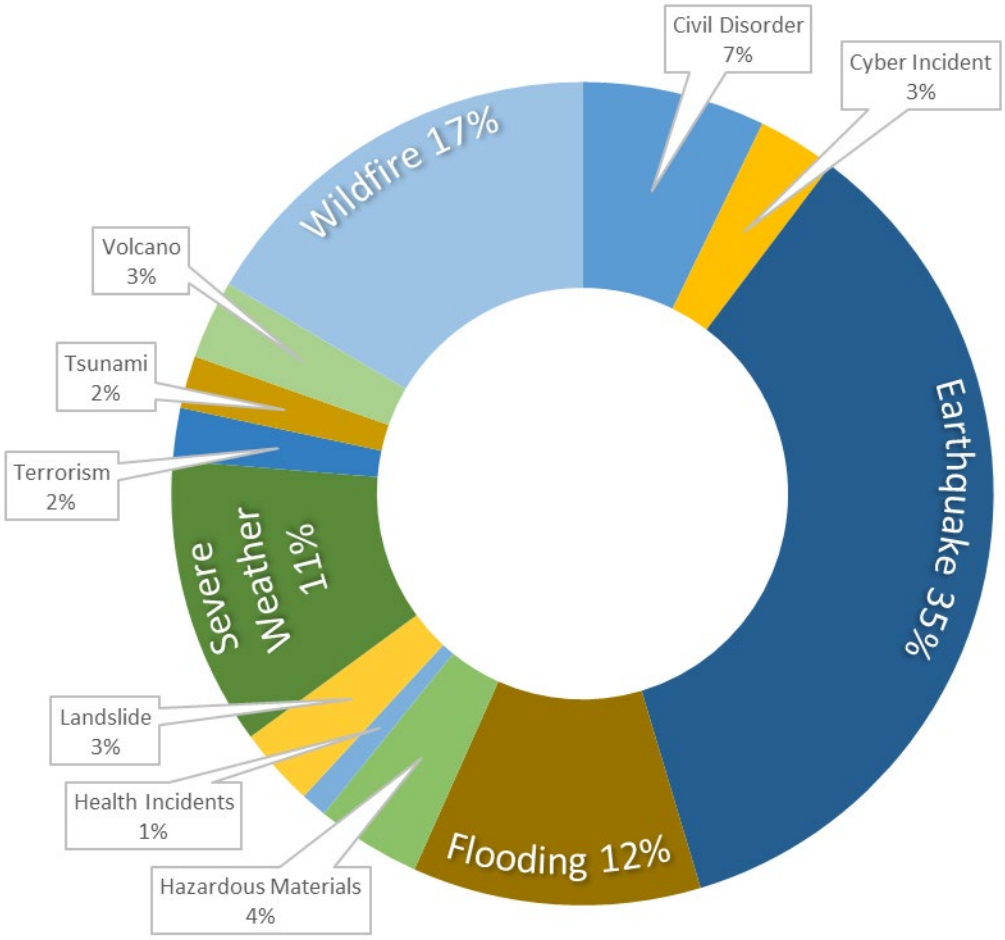
Survey questions include:

1. Where do you live?
2. What top three hazards are you most concerned about?
3. If your city had $1,000,000 to make your community safer from disasters, what would you spend it on?
4. If your city had $10,000 to make your community safer from disasters, what would you spend it on?

Figure 2-1 King County hazard survey flyer

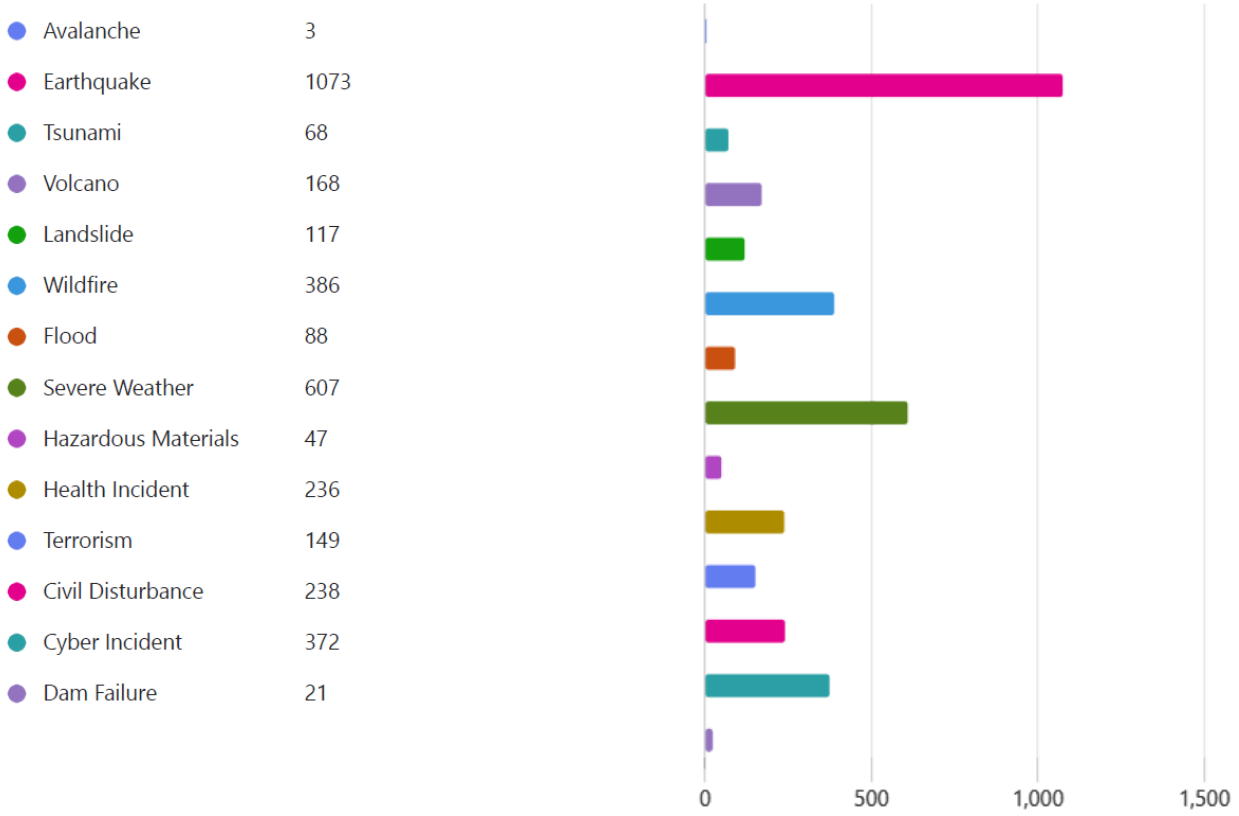


Figure 2-2 King County public survey results on top hazard concerns



In addition, on September 19, 2024, KCEOM conducted its semiannual Alert King County test and survey to opt in members of the Alert King County System. One of the survey questions asked participants, “What are the top three King County Hazards you are most concerned about?” The survey saw 1194 responses and the top three hazards were: 1. Earthquake 2. Extreme Weather and 3. Cyber Incident.

Figure 2-3 Alert King County survey results on hazard concerns



2.5.2 Tabling events

Figure 2-4 Public outreach tabling event in Kent, WA



KCOEM attended 34 community events across the county with approximately 3000 attendees (see Table 2-4).

At the events, we presented the survey using an interactive poster (see Figure 2-5). Attendees were invited to place dotted stickers on the locations where they live and on the hazards they were most concerned about. We also provided sticky notes for participants to write down actions they'd

like to see taken to mitigate these hazards. For children, we offered a spinning wheel featuring trivia questions on hazards and emergency preparedness to engage them in a fun and educational way.

These tabling events received input from over 700 community members in total, requesting information on which hazards they are most concerned about in their communities. Wildfire emerged as a top hazard in the more rural areas of North Bend and Black Diamond, whereas earthquake was the top hazard in the more urban areas of Seattle, Tukwila, and Des Moines. Community members in Redmond cited cyber incident as their top concern.

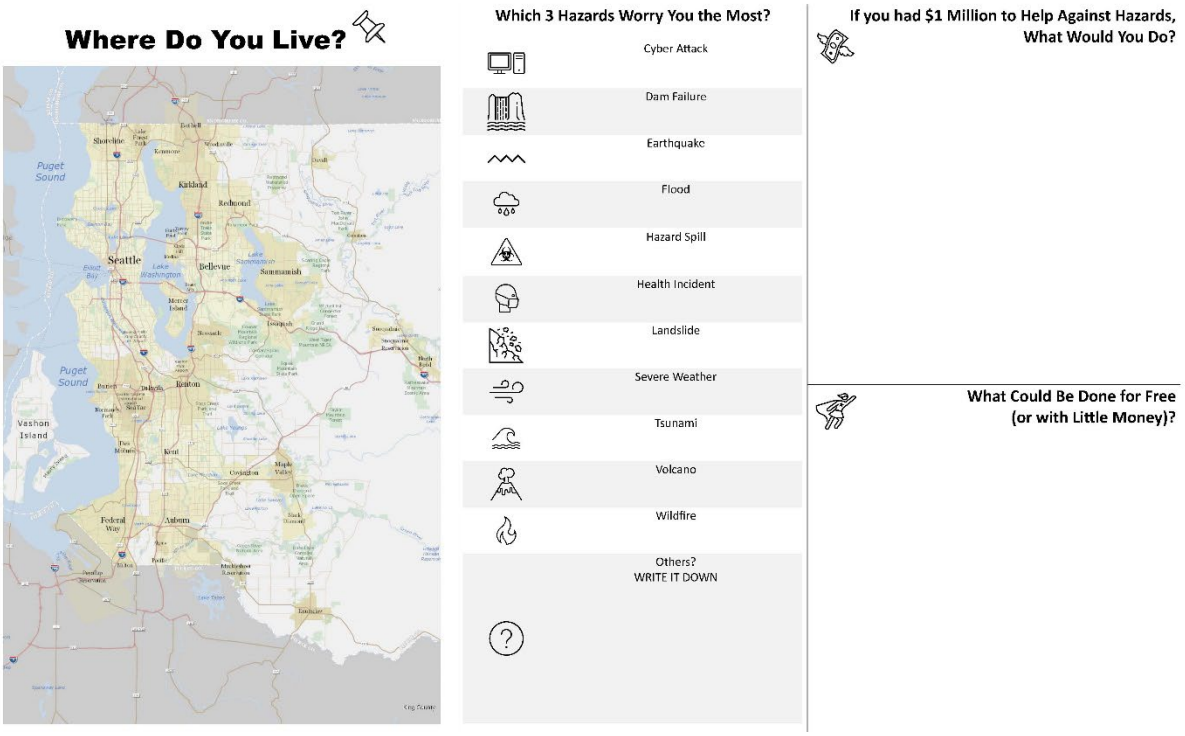
Many residents also shared personal stories of past events that left them vulnerable. For example, during snow and ice storms, Skyway residents often find themselves unable to travel due to the area's hilly terrain. This isolation is compounded by limited resources including the community only having one grocery store on the hilltop and one bus line that runs through the area. This makes access to food and services challenging, particularly during severe weather events.

Table 2-5 Public outreach tabling events, May 2024 – November 2024

Date	Event	Jurisdiction	Attendees
May 4, 2024	Pacific Islander Cultural Festival	Seattle	80-100
May 8, 2024	Skyway Public Library Resource Fair	Skyway	20
May 10, 2024	Auburn Valley Cities Resource Fair Tabling	Auburn	35
May 20, 2024	Chinese Cultural Festival	Seattle	150-200
May 29, 2024	Wildland Fire and Touch a Truck	Black Diamond	200
June 6, 2024	White Center Heights STEAM Carnival	White Center	80-100
June 15, 2024	Skykomish Tunnel Days	Skykomish	25
July 27, 2024	Community Resource Fair	Kent	60
July 30, 2024	Legislative Branch Picnic	Redmond	60
July 30, 2024	Des Moines Block Party	Des Moines	30
July 31, 2024	Marymoor - Movies in the Park/Go Green Night	Redmond	50
August 6, 2024	National Night Out	Carnation	55
August 6, 2024	National Night Out	Milton	100
August 14, 2024	Akin Children's Resource and Back to School	Kent	250
August 17, 2024	Skyway Health and Safety Fair	Skyway	40
August 17, 2024	Redmond Ridge Summer Festival	Redmond	150
August 26, 2024	Covington Wildfire Town Hall	Covington	70
September 12, 2024	Uwajimaya Seattle	Seattle	60
September 13, 2024	Uwajimaya Renton	Renton	100
September 14, 2024	Sammamish Emergency Preparedness Fair	Sammamish	70

September 14, 2024	NEMCo Preparedness Fair	Lake Forest Park	70
September 14, 2024	Maple Valley fire open house	Maple Valley	115
September 21, 2024	Love Train Community Block Party	Skyway	40
September 21, 2024	China Town Night Market	Seattle	100
September 26, 2024	Uwajimaya Bellevue	Bellevue	150
September 28, 2024	Carnation Be Dam Ready Evacuation Drill	Carnation	15
September 28, 2014	Maple Valley Emergency Preparedness Fair	Maple Valley	150
October 9, 2024	Highline College Resource Fair	Des Moines	200
October 11, 2024	Mother Africa Health and Wellness Fair	Kent	100
October 27, 2024	Skyway Farmers Market	Skyway	35
November 4, 2024	Muckleshoot Casino Resort Safety and Benefits Fair	Muckleshoot	200
November 13, 2024	Liberty Square Community Resource Fair	Renton	20
November 21, 2024	City of Carnation Open House	Carnation	10

Figure 2-5 Tabling event poster for public engagement



2.5.3 Continued Outreach

King County and its partner cities already maintains substantial public outreach capabilities, focusing on personal preparedness and education. Information on ongoing progress in implementing the hazard mitigation plan will be integrated into public outreach efforts. In the vertical integration of risk-reduction activities from personal to local to state and federal, it is important that the public understand how its activities support, and are supported by, larger-scale efforts.

The Core Planning Team will also continue to work with media and other agency partners to publicize mitigation success stories and help explain how we are safeguarding communities from the risk of hazard events. When possible, public tours of successfully completed mitigation projects will be organized to allow community members to see successful mitigation in action.

2.6 Plan Integration

When plans and planning processes are more integrated, it is possible to achieve greater impact through clearer definition, smarter investment, partnerships, and innovation. Successful integration requires coordination between planning efforts and, especially, cross-participation in planning processes. The goals of plan integration are to:

- Ensure consistency with jurisdiction priorities across all planning processes
- Leverage opportunities to further multi-benefit initiatives that are supported by multiple planning processes
- Achieve common measures of success for outcomes

The hazard mitigation plan can benefit from integration with planning processes that:

- Prioritize and invest in infrastructure
- Regulate development
- Set strategic direction for programs

To other planning processes, the hazard mitigation plan brings risk and vulnerability information to help prioritize projects and set development standards or regulations. The mitigation plan also comes with potential funding for investments in cost-effective risk-reduction projects. On the other hand, the mitigation plan depends on other plans and processes to implement many strategies. Since the mitigation plan is not itself a regulatory or budgetary document, strategies identified in the mitigation plan are often best implemented through those processes or programs.

The Core Planning Team leveraged a number of existing and ongoing planning processes and other documents, integrating data and strategies from state, regional, and county plans. This approach ensures alignment of priorities, synchronization of actions, and reduction of silos across jurisdictions. By coordinating hazard mitigation efforts at the regional and county levels, it is possible to address widespread hazards more effectively. Furthermore, by identifying common goals, there can be joint funding initiatives, sharing of resources, and coordinated efforts in implementing mitigation strategies. More information can be found in the Program Capabilities chapter of this plan.

- 2024 King County Comprehensive Plan
- 2024 King County Flood Management Plan
- Public Health - Seattle & King County 2024-2029 Strategic Plan
- 2023 Washington State Enhanced Hazard Mitigation Plan
- 2023 Hazardous Materials Response Plan
- Puget Sound Regional Council’s Vision 2050
- 2022 KC Wildfire Risk Reduction Strategy
- 2022 Washington Geological Survey:
- 2022 Washington Geological Survey: Tsunami Inundation, Current Speeds, and Arrival Times Simulated from a Large Seattle Fault Earthquake Scenario
- 2020 King County Strategic Climate Action Plan (SCAP)
- 2020-2025 KC Clean Water Healthy Habitat Strategic Plan
- 2019 King County Dam Inventory from the Washington State Department of Ecology
- 2017 Dam Safety Gap Analysis Report
- King County Equity and Social Justice Strategic Plan, 2016-2022

- 2016 Mapping of Potential Landslide Hazards along the River Corridors of King County, Washington

Furthermore, the RHMP will help inform plans and strategies put together by KCOEM including Prevention Protection Plan, Response Plan, Recovery Plan, and the Comprehensive Emergency Management Plan (CEMP).

Chapter 3: Community Profile

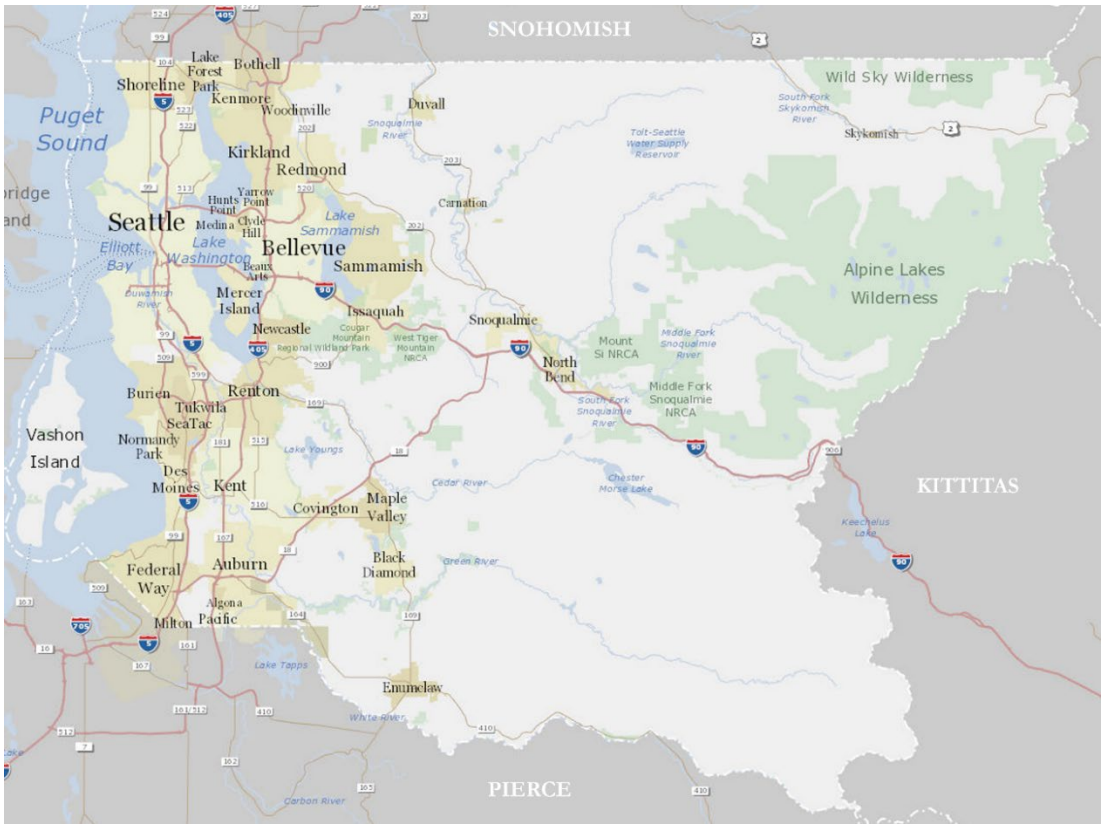
3.1 Geography

King County is located in western Washington, bordered by Snohomish County to the north, Pierce County to the south, and Kittitas County to the east. Its topography is incredibly varied, ranging from sea level along the Puget Sound in the west to mountain peaks approaching 8,000 feet in the Cascade Range to the east.

The county's human geography reflects this natural diversity, with densely populated urban areas along Puget Sound, suburban neighborhoods east of Lake Washington, rural communities to the southeast, and remote towns nestled in the Cascade foothills. King County is home to 39 cities and towns, and two tribal nations Muckleshoot and Snoqualmie Tribe.

Seattle, the county seat, is Washington state's largest city and serves as the cultural and economic hub of the region. King County is both the most populous county in the state and the most densely populated, ranking 12th largest in the nation.

Figure 3-1 King County geography



3.2 Climate

The Puget Sound and Cascade Range plays a key role in shaping its climate. The region is heavily influenced by maritime atmospheric conditions, with the mountains acting as natural barriers trapping in moisture. As moist air is forced upward by the Cascades, it cools and condenses, leading to heavy precipitation on the windward side of the mountains. In addition to its natural climate influences, the region is home to numerous urban centers and transportation networks that feature impermeable surfaces, which contribute to the urban heat island effect.

3.3 History

King County is a part of a larger area that has been the traditional aboriginal territory of the Coast Salish peoples, who continue to live around the Salish Sea in what is now Washington State and the Canadian province of British Columbia. These sovereign tribal nations enrich the region through environmental stewardship, cultural heritage, and economic development.[1]

Before European-American settlers arrived, the region's economy and culture were sustained by the Coast Salish peoples through practices like hunting, freshwater and saltwater fishing, and gathering plants for food and medicine. Waterways served as the primary means of transportation, fostering interconnectedness and commerce.

European-American settlement of the area now known as King County began in the 1840s. Natural resources – especially timber – played a major role in King County's early history. Maritime trade spurred the development and growth of Seattle, which was established in 1869. Seattle became an important stopping point for those hoping to prospect for gold in Alaska and the Yukon Territory at the close of the 19th century.[2]

In the 20th century, communities in King County were profoundly shaped by discriminatory practices, particularly in housing and employment. All minority groups in Seattle faced various forms of discrimination, including geographic segregation, inequitable access to jobs, and housing discrimination. Seattle's redlining practices, in particular, exacerbated racial and economic

[1] Metropolitan King County Council, "King County Comprehensive Plan" (December 2024): https://kingcounty.gov/en/dept/council/governance-leadership/county-council/useful-links/comprehensive-plan/2024

[2] Anneliese Vance-Sherman, Ph.D., "King County profile" *Washington Employment Security Department* (May 2022): p 1, https://esd.wa.gov/media/pdf/952/king20county20profile202022pdf/download?inline#:~:text=The%20county's%20median%20household%20income,the%20state%20at%209.8%20percent.

segregation, leaving neighborhoods like the Central District to suffer long-term disinvestment, declining property values, and substandard housing quality.[3]

The legacy of redlining continues to shape the built environment and ongoing inequalities in the region. Communities of color still face limited access to critical resources like education, healthcare, and job opportunities. Additionally, these neighborhoods often experience heightened exposure to environmental hazards, such as flooding, pollution, and the impacts of earthquakes.

3.4 Population

Table 3-1 2023 King County Demographics[4]

King County	King County Estimate
Total population	2,271,380
Under 5 years	5.0%
Median age (years)	37.7
Under 18 years	19.1%
65 years and over	14.5%
Male	50.6%
Female	49.4%
Owner-occupied	55.6%
Renter-occupied	44.4%
Gross Rent Median (dollars)	$ 2,043
Average household size	2.35
Median household income (dollars)	$120,824
Per capita income (dollars)	$72,488
High school graduate or higher	94.1%
Bachelor's degree or higher	58.3%
Employed	67.8%
Unemployment	3.0%

King County's population has increased by approximately 17 percent from 2010 to 2023. Since 2020, the population has grown by an average of 1,675 people annually, or 0.1%, a significant slowdown compared to the 1.1% average annual increase from 2017 to 2020. The slowdown in population growth is primarily due to fewer people are being born in King County than before, and more people have been leaving the area than moving in.

Most of King County's residents are of working age, with the largest share of residents (17 percent) being 30 to 39 years old. Approximately 20 percent (449,242) of King County's population is 17 years old or younger. Unincorporated King County residents are older on average than King County residents.

The per capita income in King County exceeds $72,000, while the median household income is over $120,000. Income distribution is varied, with 20% of the population earning less than $50,000, 22% earning between $50,000 and $100,000, 29% earning between $100,000 and $200,000, and 29% earning over $200,000. While the data shows King County to be overall affluence, a significant portion of low-income households

[3] City of Seattle, "Redlining in Seattle" *Seattle Municipal Archives* (n.d.): https://www.seattle.gov/cityarchives/exhibits-and-education/online-exhibits/redlining-in-seattle
[4] US Census Bureau, "DP02: Selected Social Characteristics", "DP03: Selected Economic Characteristics", DP04: Selected Housing Characteristics", "DP05: ACS Demographic and Housing Estimates" *American Community Survey* (2023)

face substantial housing challenges. In 2023, 70% of low-income households in King County spent more than 30% of their income on housing.[5] This financial strain makes it difficult for these households to afford other essential needs, such as food, healthcare, and transportation.

Figure 3-2 2020 US Decennial Census, King County Race and ethnicity Data

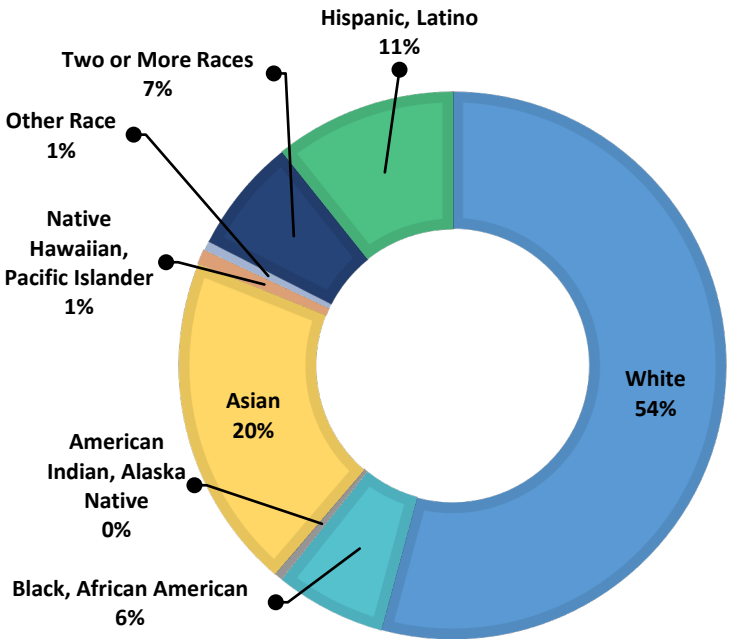


Figure 3-2 shows King County's 2020 Decennial Census data on race and ethnicity. Between 2010 and 2020, King County saw significant increases in racial diversity, particularly large growth in the Asian (60 percent) and Hispanic/Latino community (41 percent). Communities that saw a decline in population include White (1.6 percent) and American Indian/Alaskan Native population (8.7 percent). It's important to note that U.S. Census has historically faced challenges when it comes to accurately capturing Native American populations, especially those living on reservations.

Vulnerable Populations and Population-Based Vulnerability

Population vulnerability (or social vulnerability) measures factors that theoretically increase the likelihood of a population to suffer more losses during disasters or recover more slowly after being impacted. There is a growing body of work on this kind of vulnerability; however, how the data is reported can obscure the root causes of vulnerability when converted into an index or score. Knowing the root causes of vulnerability and how those vulnerabilities contribute to losses during disasters is critical for hazard mitigation professionals since each cause may require a unique strategy to address. For example, if the vulnerability results from language differences, then this can be addressed with robust translation and outreach services.

Communities that consider population-based vulnerability and social justice, often do it as an overlay – examining the impacts of a proposed project on vulnerable populations, for example, after the project has already been prioritized or mapping the location of vulnerable populations in accordance with some composite score and institutionally-defined definition of vulnerability. It is

[5] King County, "Regional Affordable Housing Dashboard" (November 2024): https://kingcounty.gov/en/dept/dchs/human-social-services/housing-homeless-services/affordable-housing-committee/regional-affordable-housing-dashboard

unclear if mapping alone, if awareness alone, has had much impact on where the bulk of resources are directed.

For this analysis, we examine the best available data of factors that have been found to lead to increased losses or recovery times following hazard events. This is to establish areas with different kinds of heightened vulnerability. We then overlay data on race, ethnicity, and income. This is to establish where equity may be a concern, where causes of vulnerability overlap with historically underrepresented minority populations.

Determinants of Population Vulnerability

Factors that were identified through research and by the planning team as critical determinants of vulnerability. However, Good data at the appropriate scale was not available for all the below factors. Maps of a selection of these factors, along with priority hazard areas, follow the list of variables.

Population factors

(population-based measures)

- Home Ownership Status
- Age
- Unemployment, Income
- Wealth, Access and Functional Needs/Disability
- Dependence on public transportation
- Language other than English spoken at home
- No health insurance
- Hazard insurance coverage
- Minimum wage employment/service sector employment,
- Families with dependents
- Living in poverty
- Crime rate
- Years of schooling completed

Accessibility & capital factors

(access/infrastructure meaures/ social capital)

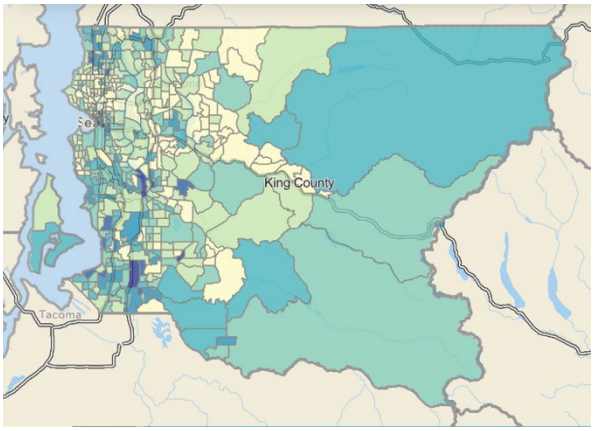
- Access to services
- Quality of public facilities
- Access to phone + internet
- Average age of housing
- Average commute time/distance to work
- Per capita government spending
- Neighborhood engagement

Meta-factors

(Determinants of equity)

- Race, ethnicity
- Age
- Income
- Immigrant, refugee status

The following maps are gathered from FEMA's Resilience Analysis and Planning Tool (RAPT) with quantitative insight from the 2023 US Census American Community Survey 1-Year estimates. They illustrate several of the above variables associated with greater hazard risk along with high hazard areas and non-white populations. This is just a selection of potential variables and illustrates how high-hazard areas, factors associated with hazard risk, and communities of color or with higher rates of disability may overlap. The highest population-risk areas in King County tend to be areas south of Seattle in the Green River Valley. These areas also are areas with the highest hazard risk. Investments that target critical public infrastructure and support structures in these communities would likely have the best cost-benefit ratio. Investments in these areas would have the added benefit of also promoting more equitable access to high-quality infrastructure and services for populations historically underserved by public investment.

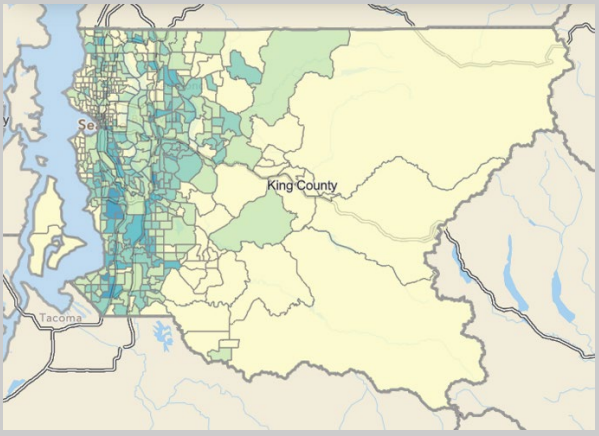


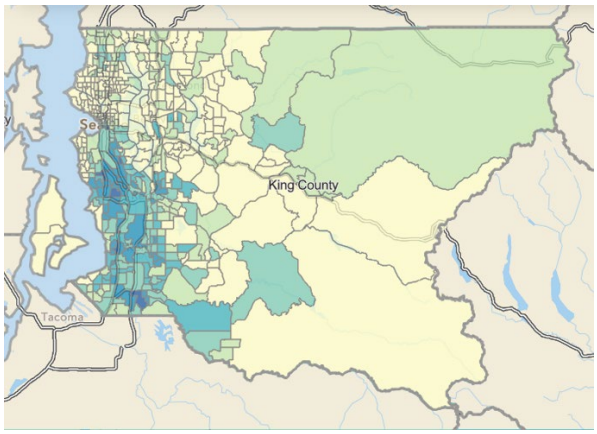
People with access and functional needs/disabilities 10.5%

Concentrated populations in Kent, Algona, Pacific, Renton, Shoreline, and Kenmore. These individuals may require additional support in areas such as mobility, communication, or daily living activities.

Limited English 11%

Residing primarily in Bellevue, Newcastle, Renton, Federal Way, Burien, and Seattle. Limited English proficiency can affect individuals' ability to access essential services such as healthcare, education, and employment opportunities. This population includes immigrants, refugees, and non-native English speakers who may face language barriers in navigating day-to-day life, emphasizing the need for culturally competent services and language assistance programs in these areas.



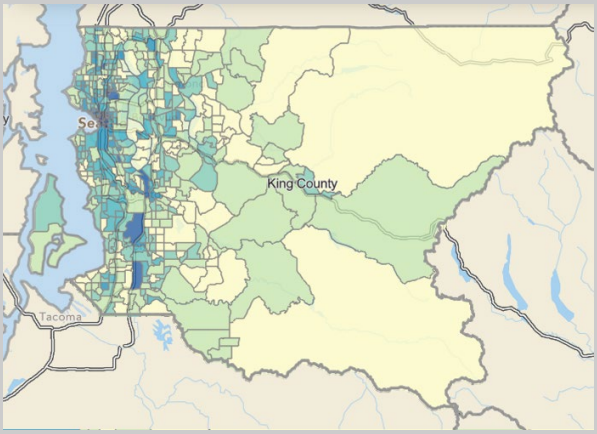


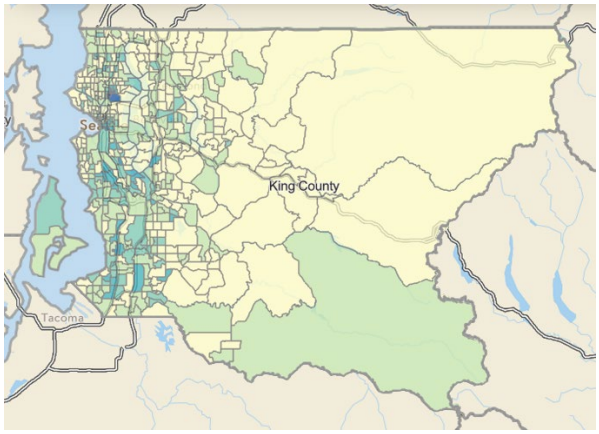
No high school diploma

Trend is shown in south Seattle, Tukwila, SeaTac, Des Moines, Algona, and Auburn. This demographic often faces greater barriers to employment and economic mobility. Lack of a high school diploma can limit access to better-paying jobs and higher education opportunities, contributing to socioeconomic disparities in these communities.

Don't own a vehicle 11.9%

Higher concentration in Seattle, Renton, Kent, and Auburn. While the city of Seattle has a robust transit network, cities such as Renton, Kent, and Auburn are more limited and would require connections to the Sound Transit Light Rail, or train stations (connecting to Sound transit buses or the Sounder commuter rail) to better connect to the region. Lack of vehicle ownership can limit access to job opportunities, healthcare, education, and essential services, particularly in areas with limited public transportation options.



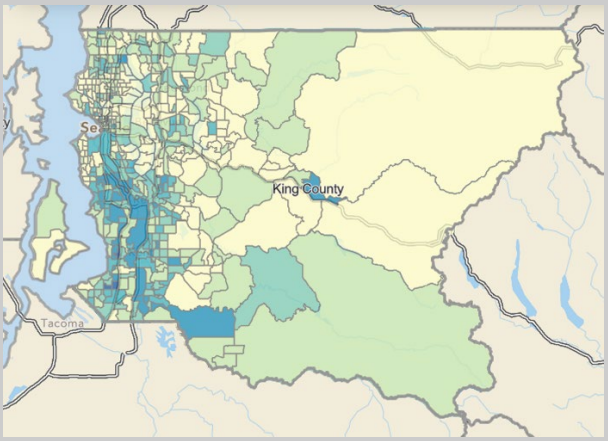


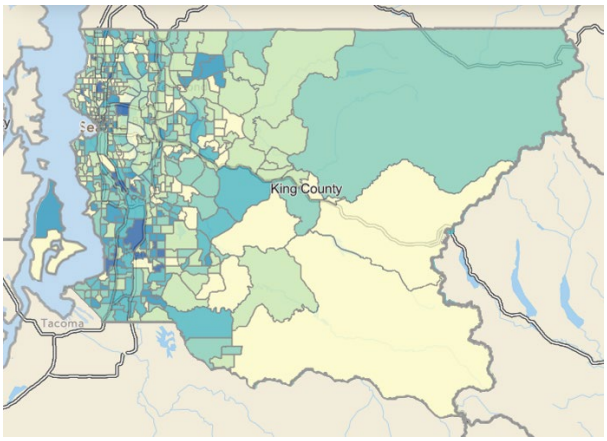
Below the poverty line

8.8% of individuals, 10.8% of children under 18 years old, 5.1% of families are living below the poverty line. Those facing these economic challenges experience a higher cost burden which can limit their access to education, healthcare, housing and food security.

No health insurance coverage 4.9%

Primarily reported with people who reside in South King County, lack of health insurance can result in individuals delaying or avoiding necessary medical care, which may lead to worsened health outcomes and higher costs in the long term.





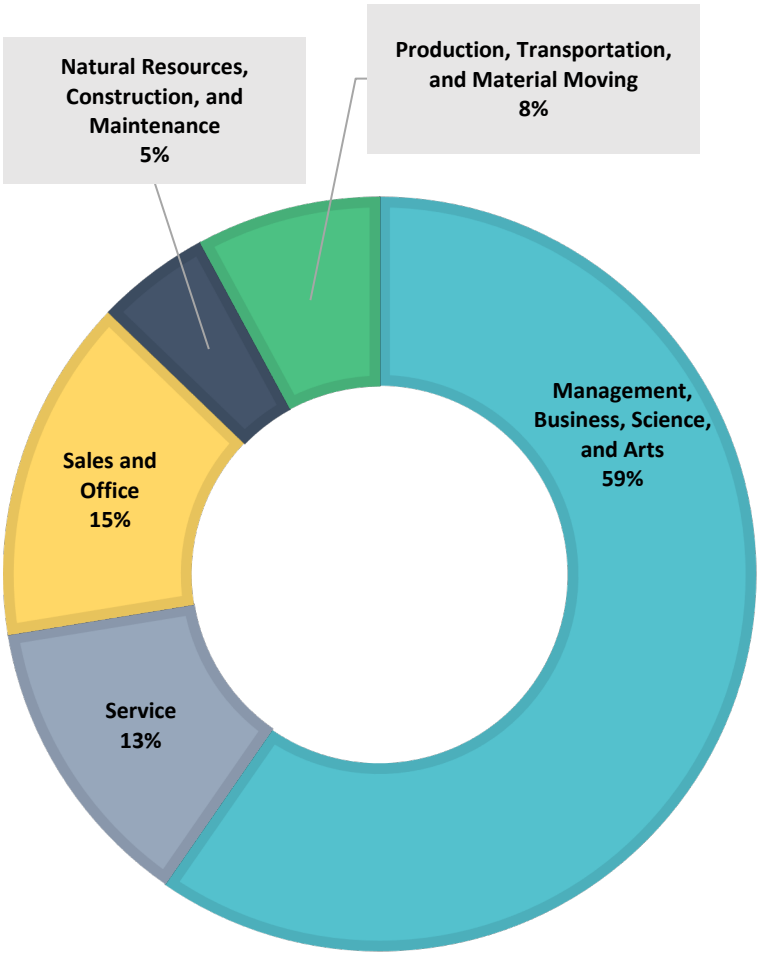
Unemployment 3%

Seen in communities such as Vashon, Skykomish, and Redmond. This can be the result of a lack of diverse work opportunities. Unemployment can pose several risks to individuals, families, and communities. These risks extend beyond financial instability and can have long-term effects on health, mental well-being, and overall societal outcomes.

The results from this analysis will be used to promote more effective, equitable disaster mitigation, response, and recovery by identifying key vulnerabilities and areas that may require additional investment. This analysis will also help identify areas where public infrastructure is older or less resilient, or where hazard risk is greater, so that additional investments can be targeted in those areas.

3.5 Economy

Figure 3-3 2023 US Census data, King County Industries



Throughout the 1990s, the county underwent extraordinary gains in employment, population and wages. Despite the county's increasing cost of living, especially in housing, the high-tech job boom lured well-educated newcomers to the area; a pattern that has continued to the present day. King County continues to hold a strong national reputation as a hub for information technology development.[6]

King County is culturally diverse and aims to be a place where people from a variety of backgrounds can feel at home. The geographic orientation of King County on the Pacific Rim and the presence of an active natural deep-water port reinforce strong economic ties to East Asian markets. In 2008, King County nonfarm employment reached a peak in excess of 1.2 million jobs before joining the rest of the nation in recession. Job growth was strong and stable from 2010 to 2019. Total nonfarm employment in King County climbed to nearly 1.47 million over the long economic expansion. The pandemic-induced recession of 2020 interrupted the long arc of local employment growth. From February to April 2020, total nonfarm employment plummeted by about 166,600 jobs – more than 11.0 percent. Total employment since April 2020 has shown remarkable recovery, with a great deal of variation by industry. Total employment continues to expand. As of March 2022 (preliminary), businesses located in King County collectively supplied nearly 1.46 million jobs – about 10,000 shy of pre-pandemic levels. King County is characterized by a diverse economy. Major industry sectors in King County supplying

[6] Anneliese Vance-Sherman, Ph.D., "King County profile" *Washington Employment Security Department* (May 2022): p 2, https://esd.wa.gov/media/pdf/952/king20county20profile202022pdf/download?inline#:~:text=The%20county's%20median%20household%20income,the%20state%20at%209.8%20percent.

more than 100,000 estimated jobs in 2021 include professional and business services, education and health services, retail trade, government, information, and leisure and hospitality.

Prior to the pandemic-induced recession of 2020, King County was well-situated, with long-term growth observed in all major industry sectors. The COVID-19 pandemic disrupted all industries at a local level, with employment patterns varying substantially from one industry to the next. Leisure and hospitality lost the largest number of jobs of any sector (65,100 jobs from February to May, not seasonally adjusted). As of March 2022, this set of industries was still down 44,000 jobs or about 30 percent. At the other end of the continuum, industries such as information and professional and business services, maintained or even expanded employment levels, even early on, insulated by the ability to establish telecommuting arrangements for their workforces. King County's information sector added 700 jobs during the initial months of the pandemic. As of March 2022, employment in the information sector was 15,500 above the level observed in March 2020. Comparing March 2022 against March 2020, the following industries have fully recovered or expanded total employment: professional and business services (up 15,600 jobs), information (up 15,500 jobs) retail trade (up 9,000 jobs), financial activities (up 4,000 jobs), and construction (up 1,400 jobs).

Referencing the same time frame, the following industries have yet to recover the number of jobs lost in the pandemic recession: leisure and hospitality (down 19,400 jobs), manufacturing (down 9,900 jobs), government (down 9,200 jobs), other services (down 8,600), wholesale trade (down 3,700 jobs), transportation, education and health services (down 2,800 jobs), and warehousing and utilities (down 1,400 jobs).

3.6 Development Trends

Over the past decade, King County saw steady population growth, particularly in Seattle and its surrounding cities including Bothell, Kent, Renton, Shoreline, Lynnwood, Redmond, SeaTac. The demand for housing close to transit hubs, job centers, and amenities spurred the construction of high-rise apartments and condominiums in downtown Seattle and other urban areas. The Washington State Office of Financial Management projects that King County's population will grow by 24.6%, reaching 2,887,137 people by 2044. In contrast, the population of unincorporated King County is expected to grow more slowly, increasing by 7.3% to 266,301 people by 2044.

As demand for housing increased, King County also faced challenges with affordability. Housing prices surged, especially in Seattle, due to high demand, limited supply, and low interest rates. Many residents moved further out from the city center, due to rising costs in Seattle, leading to increased development in suburban areas like Bothell, Renton, Shoreline, and Kent. There was a notable shift toward suburban apartments, townhomes, and single-family homes that catered to those seeking more affordable living options. To accommodate the housing needs of both current and future residents, King County is required by the Growth Management Act and the Countywide Planning Policies to plan for housing that serves a range of income levels, from moderate to

extremely low-income households. This includes provisions for emergency housing, shelters, and permanent supportive housing. By 2044, urban unincorporated King County will need an additional 5,412 housing units, along with 1,034 new emergency housing beds to meet short-term housing needs.[7]

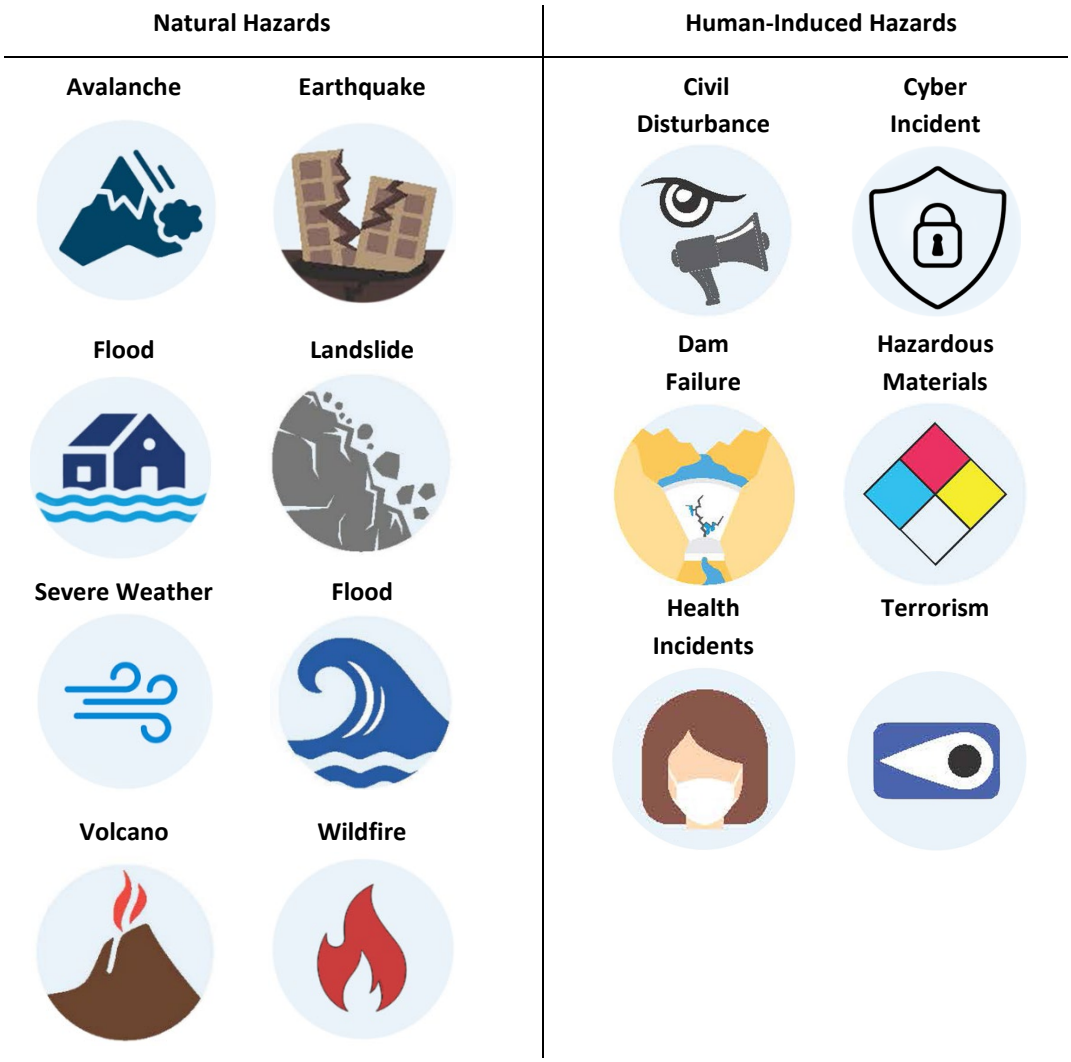
The 2024 King County Comprehensive Plan Maintaining the urban growth boundaries and developing within this area. The plan focuses on maintaining urban growth boundaries and encouraging development within these areas. Zoning updates will expand middle housing options, such as duplexes and triplexes, and offer increased incentives for affordable housing. It will also address temporary farmworker housing needs. Environmental protections are part of the plan, with policies aimed at promoting green energy, climate action, and improving infrastructure resilience against flooding and wildfires.

[7] Metropolitan King County Council, "King County Comprehensive Plan" (December 2024): https://kingcounty.gov/en/dept/council/governance-leadership/county-council/useful-links/comprehensive-plan/2024

Chapter 4: Risk Assessment Overview

4.1 Overview

The King County Regional Hazard Mitigation Plan identifies 14 hazards, including 8 natural hazards and 6 human-induced threats. The list of hazards was developed through an examination of the previous RHMP, local hazard mitigation plans, and hazard events in the last five years. The list was cross referenced with FEMA's National Risk Index (NRI), a tool that assesses natural hazards and community risk factors. Based on insights from these sources and recent trends in hazard events, we retained the same list of hazards from the 2020 plan.



A risk assessment was conducted with subject matter experts for each hazard. Risk assessment is the process of measuring the potential loss of life, personal injury, economic injury, and property damage resulting from hazards.

Risk profile structure

- **Description:** This section provides clear, concise definitions of the specific hazard being assessed. It includes scientific and technical terms related to the hazard and its characteristics, ensuring a shared understanding for all stakeholders involved.

- **Location:** This section identifies and outlines geographical regions that are particularly vulnerable to the hazard. It highlights areas that are more likely to experience higher levels of risk based on historical data, topography, weather patterns, and other relevant factors.

- **Magnitude:** This defines the scale of the hazard's potential effects. For example, in the case of an earthquake, magnitude might be measured by the Richter scale, or in a flood, it could be measured by the depth of inundation or the amount of rainfall. This provides a basis for understanding how severe the hazard could be in terms of its physical, economic, and social impact.

- **Previous Occurrences:** This section provides a historical record of previous occurrences of the hazard in the area. It includes dates, locations, and the severity of past events, offering valuable insights into the frequency and extent of the hazard, as well as the impacts on people, property, and infrastructure.

- **Probability of Future Occurrences:** This section forecasts the likelihood of the hazard occurring in the future. It may include statistical probabilities based on historical data, trends, and modeling.

- **Climate Change Considerations:** This section examines how climate change might influence the frequency, intensity, or characteristics of the hazard.

- **Impact Assessment:** This section evaluates the specific consequences of the hazard on various sectors, using a structured table format.

- **Vulnerability Assessment:** This section outlines the vulnerabilities in different sectors. It identifies which groups or resources are most at risk and why. Stats and Specifics on What Is at Risk: Specific data, such as population demographics, infrastructure condition, or environmental features, are included here.

4.2 Methodology

Table 4-1 Hazard risk assessment methodology

HAZARD RISK ASSESSMENT *Risk = Hazard (Severity) x Impact (Exposure) x Vulnerability (Susceptibility)*		
	Location	Hazard
	Probability	
	Extent/Magnitude	
	Public	Impact
	Responders	
	Continuity of Operations (COO)	
	Property, Facilities, and Infrastructure (PFI)	
	Environment	
	Economy	
	Public Confidence in Governance (PCG)	
	Vulnerable Population	Vulnerability
	Property	
	Environment	
	Operations	
	People	Risk
	Property	
	Environment	
	Operations	
	Overall Risk	

Measurement	
1	Low
2	Moderate
3	High
4	Very High

The Core Planning Team developed a risk matrix to assess hazards, their impacts on county assets, and the vulnerabilities of these assets across various dimensions (see Table 4-1). The purpose of this risk assessment is to identify which hazards pose the greatest risk and which areas and assets are most vulnerable. The matrix incorporates Emergency Management Accreditation Program (EMAP) standards to quantify the hazard impacts on county assets and assess their vulnerability. It provides a snapshot of each hazard's impact and is complemented with qualitative insight to guide mitigation action. It contains key details to enable emergency managers to plan for and responding to disasters effectively. The matrix is broken up into three categories that equate to total risk. Risk depends on all three factors: the *hazard* that can cause damage, *exposure* to the hazard and the *vulnerability* of the exposed population. Risk is the estimated impact that a hazard would have on people, services, facilities, and structures in a community. It refers to the likelihood of a hazard event resulting in an adverse condition that causes injury or damage.

4.2.1 Hazard Assessment

A hazard is an act or phenomenon that has the potential to produce harm or other undesirable consequences to a person or thing. Hazards exist with or without the presence of people and land development. Earthquakes, hurricanes, tornadoes, and other geological and meteorological events have been occurring for a very long time, and the natural environment adapted to their impacts. Hazard identification is the process of identifying hazards that threaten a given area. The likelihood and severity of the 14 hazards were measured in the following ways.

- **Location** – The percentage of the people and property within the planning area impacted by the event, and the degree to which they are impacted.

LOCATION			
1 - Negligible	2 - Limited	3 – Critical	4 - Catastrophic
Less than 10% - Few if any injuries or illness. Minor quality of life lost with little or no property damage. Brief interruption of essential facilities and services for less than four hours.	10-24% - minor injuries and illness. Minor, short term property damage that does not threaten structural stability. Shutdown of essential facilities and services for 4 to 24 hours.	25-49% - Serious injury and illness. Major or long-term property damage, that threatens structural stability. Shutdown of essential facilities and services for 24 to 72 hours.	More than 50% - Multiple deaths. Property destroyed or damaged beyond repair. Complete shutdown of essential facilities and services for 3 days or more.

- **Probability** – Probability of a hazard event occurring in the future was assessed based on the number of times the hazard event occurred divided by the period of record. If the hazard lacked a definitive historical record, the probability was assessed qualitatively based on regional history and other contributing factors.

PROBABILITY			
1 - Unlikely	2 - Possible	3 – Likely	4 - Highly Likely
Less than 1% probability in the next 100 years.	Between 1% and 10% probability in the next year, or at least one chance in the next 100 years.	between 10% and 100% probability in the next year, or at least one chance in the next 10 years.	Greater than 1 event per year (frequency greater than 1).

- **Extent/Magnitude** – Magnitude measures the strength of a hazard event. It was calculated for each hazard using available property damage data using the following equation: Property Damage / Number of Incidents) / $ of Building Stock Exposure = Magnitude. In some cases, the HAZUS model provided specific people/dollar impact data. For other hazards, a GIS exposure analysis was conducted.

EXTENT/MAGNITUDE			
1 - Negligible	2 - Limited	3 – Critical	4 - Catastrophic
Less than 5% - Very minor impact to people, property, economy, and continuity of government at 90%.	6-24% - Injuries or illnesses minor in nature, with only slight property damage and minimal loss associated with economic impact; continuity of government only slightly impacted, with 80% functionality.	25-49% - Injuries result in some permanent disability; 25-49% of the population impacted; moderate property damage; moderate impact to economy, with loss of revenue and facility impact; government at 50% operational capacity with service disruption more than one week, but less than a month.	More than 50% - Injuries and illness resulting in permanent disability and death to more than 50% of the population; severe property damage greater than 50%; economy significantly impacted as a result of loss of buildings, content, inventory; government significantly impacted; limited services provided, with disruption anticipated to last beyond one month.

4.2.2 Impact Assessment

The impact assessment examines seven key types of county assets located with a hazard area, incorporating both asset exposure and event magnitude to determine the overall impact. These assets are identified by the Emergency Management Accreditation Program (EMAP) consequence analysis for the hazards specified in Standard 4.1.1.

- **Public:** The impact on public health and safety is gauged by the number of people exposed and the magnitude of the hazard. A low-impact scenario involves minimal health and safety concerns, leading to minor inconveniences or temporary disruptions. In contrast, a very high-impact event can cause extensive health issues, significant fatalities, and severe public safety disruptions, potentially overwhelming healthcare systems and necessitating extensive emergency responses.
- **Responders:** The impact on emergency services - including fire, police, and EMS – is determined by the number of emergency requests and the magnitude of the event, which influences response times and resource allocation. A low impact would involve minor delays or disruptions with manageable resource demands. In a very high impact scenario,

responders face severe delays, overwhelming resource demands, and may struggle to provide adequate emergency services.

- **Continuity of Operations (COO):** This includes the operational stability of King County government functions, assessing disruptions and their effects on essential services and processes. A low impact involves minor disruptions with manageable effects on essential services and processes. A very high impact entails severe and widespread disruptions, potentially leading to a complete breakdown in essential services and prolonged recovery periods.
- **Property, Facilities, and Infrastructure (PFI):** The impact on private property includes damage to housing, critical infrastructure, roadways, and utilities. Low impact means minimal damage or inconvenience to property with little long-term effect. Very high impact results in severe and widespread damage to properties and infrastructure, causing significant financial losses and prolonged recovery.
- **Environment:** Hazards can affect natural resources, including wildlife, vegetation, and ecosystems, leading to changes in landscapes, waterways, and environmental systems. A low impact involves minor environmental changes with negligible effects on wildlife and natural systems. A very high impact indicates severe and widespread environmental destruction with long-term effects on natural resources, wildlife, and ecosystems, requiring substantial recovery and restoration efforts.
- **Economy:** Economic impacts encompass disruptions to business operations and economic assets, affecting overall financial stability. A low impact entails minimal disruption to business operations and economic assets with minor financial effects. Very high impact signifies severe and widespread economic disruption with major financial losses, potentially leading to long-term economic instability and extended recovery periods.
- **Public Confidence in Governance (PCG):** The perception of government effectiveness during and after a hazard event can influence public trust and confidence in emergency preparedness and response efforts. A low impact involves minor concerns about government response with little effect on overall public trust. A very high impact entails a severe loss of public confidence and trust in government, potentially leading to widespread criticism and long-term reputational damage.

4.2.3 Vulnerability Assessment

Vulnerability is susceptibility to physical injury, harm, damage, or economic loss. It depends on an asset's construction, contents, and economic value of its functions. Vulnerability assessment provides the extent of injury and damages that may result from a hazard event of a given intensity in a given area.

The Emergency Management Program identifies the natural and human-caused hazards that potentially impact the jurisdiction using multiple sources. The Emergency Management Program assesses the risk and vulnerability of the following:

- **Vulnerable Populations:** Communities limit to preparing and preventing impact to a hazard event.
- **Property:** Properties limit to withstanding and maintaining integrity to a hazard event.
- **Environment:** Environments limitation to preventing degradation during and following a disaster.
- **Operations:** lifelines that have limited capacity and resources to properly respond to a hazard event.

4.2.4 Risk Calculation

When calculating risk, we're looking at most likely scenario accounting for currently capabilities and regulations (reference chapter 19 for capabilities).

People

To assess the total risk to people, we consider hazard assessments, potential impacts on individuals, responders, and the economy, as well as the concentration of vulnerable populations who have limited ability to prepare for or respond to a hazard event.

Property

In evaluating the total risk to property, we consider hazard assessments, the potential impacts on buildings, facilities, infrastructure, the environment, and the economy. Additionally, we assess the ability of properties to withstand and maintain structural integrity during and after a hazard event.

Environment

When assessing the risk to the environment, we account for hazard assessments, potential environmental impacts, and economic consequences. We also evaluate the environment's capacity to prevent degradation during and after a disaster.

Operations

To determine the total risk to operations, we consider hazard assessments, the impact on the continuity of government functions, the economy, and public confidence in the government. We also assess the vulnerability of critical operations, such as lifeline services, which may have limited capacity and resources to respond effectively to a hazard event.

Overall Risk

The overall risk is determined by combining the risks to people, property, environment, and operations.

4.3 Risk Assessment Results

Table 4-2 King County risk assessment results

		Avalanche	Civil Disorder	Cyber Incident	Dam Failure	Earthquake	Flood	Hazardous Materials	Health Incident	Landslide	Severe Weather	Terrorism	Tsunami	Volcano	Wildfire
Hazard	Location	1	1	3	2	4	3	3	4	2	4	1	2	1	2
	Probability	2	3	4	2	3	4	3	3	3	4	2	2	2	3
	Extent/ Magnitude	2	2	3	3	4	2	3	3	2	3	3	3	3	3
Impact	Public	1	2	1	2	3	2	2	3	1	3	2	2	2	3
	Responders	1	3	2	2	3	2	3	3	1	3	2	2	2	3
	Continuity of Government	1	2	3	2	4	3	2	3	1	3	2	1	1	1
	Property, Facilities, and Infrastructure	1	2	2	3	4	3	2	1	2	3	2	1	1	3
	Environment	1	1	1	3	3	2	3	1	3	3	2	2	2	2
	Economy	1	2	3	3	4	3	1	3	2	2	2	1	2	3
	Public Confidence in Governance	1	3	4	3	4	3	2	3	2	2	2	1	2	3
Vulnerability	People	1	2	2	2	4	2	3	4	1	3	2	2	3	2
	Property	1	3	2	2	4	3	2	1	2	3	2	1	1	2
	Environment	1	1	2	2	3	2	3	1	2	2	2	2	2	2
	Operations	1	3	3	2	4	3	2	2	1	2	2	1	2	1
Risk	People	1	2	3	2	4	3	3	2	2	3	2	2	2	3
	Property	1	2	3	3	4	3	2	2	2	3	2	2	2	3
	Environment	1	2	3	3	4	3	3	3	2	3	2	2	2	3
	Operations	1	2	3	2	4	3	2	3	2	3	2	2	2	2
Overall Risk		Low	Moderate	High	High	Extremely High	High	High	High	Moderate	Extremely High	Moderate	Moderate	Moderate	Moderate

4.4 GIS Data

Geographic Information System (GIS) data was taken from a variety of King County, Washington State, and federal sources. The data was sourced via King County GIS, including layers owned by both GIS and by other entities. Some of the GIS data analyzed in completing this risk assessment include:

Title	Description	Source
Active Faults	Known active faults in the Puget Sound region	WA State Department of Natural Resources (DNR)
Wastewater Systems	King County wastewater treatment and conveyance systems	King County Department of Natural Resources and Parks Water Treatment Division (DNRP)
Water Supply Facilities	Seattle water supply facilities and conveyance systems. These are used to supply Seattle as well as many cities.	City of Seattle Public Utilities
Bridges	King County-maintained bridges	King County Roads
Rail Routes	All rail routes, including BNSF and Sound Transit	King County GIS
Transit Routes	Metro transit routes	King County Metro
Arterials	Arterial streets	King County Roads
Levees and Revetments	County-maintained flood protection structures.	DNRP, King County Flood Control District
BPA Transmission Lines	Bonneville Power Administration power transmission systems	Bonneville Power Administration
Historic Buildings	Designated historic buildings	King County GIS
Schools	School facilities	King County GIS
Government Buildings	King County government buildings	King County GIS, Facilities Management Division

Hospitals and Medic Units	Hospitals and medic unit locations	King County GIS
Pharmacies	Pharmacy locations	King County GIS
First Responder Facilities	Locations of fire, police, and EMS	King County GIS
City Boundaries	City jurisdictional boundaries	King County GIS
Rivers and Lakes	Waterbodies	King County GIS
Building Address Points	Building address points and age	King County Assessor
Building Age	Building address points and age	King County Assessor
Volcanic Hazard Areas	Lahar, lava flow, and lahar sediment areas	WA DNR, U.S. Geological Survey
Landslide Hazard Areas	Lidar-based landslide inventory mapping	WA DNR
Preliminary 100-year Floodplain	1% annual chance, special flood hazard area as mapped by FEMA. Will take effect as the regulatory floodplain in 2020.	FEMA, King County Flood Control District
Floodways	The regulatory areas including the channel and adjacent land areas that must be preserved in order to discharge the base flood without increasing the water surface elevation by more than a designated height.	FEMA, King County Flood Control District
Liquefaction Potential	Areas of NEHRP soil classes D, E, and F.	WA DNR
Landslide Buffer Areas	Buffers of 50 feet around known landslide areas.	King County GIS
Statewide Roads	State and federal highways	King County GIS

Health Insurance Coverage	Individuals with health insurance, by Census Tract	US Census, American Community Survey (ACS)
Travel Time to Work	Travel time to work on average by Census Tract	US Census, ACS
Means of Transportation to Work	Means of transportation to work, by percent, by Census Tract	US Census, ACS
Race	Self-identified race	US Census, ACS
Ethnicity	Self-identified ethnicity	US Census, ACS
Income	Income (range)	US Census, ACS
Languages	Languages other than English spoken at home	US Census, ACS
Disability Status	Counts of disabled persons	King County GIS
Education	Educational attainment by years, by Census Tract	US Census, ACS
Tenure	Housing tenure (ownership) status	King County GIS
HAZUS for earthquake (Seattle Fault, Cascadia Subduction Zone)	HAZUS runs for Seattle Fault 7.1 and Cascadia Subduction Zone 9.0 scenarios	FEMA RiskMAP

This and any additional data can be viewed on the ArcGIS online hazard map called the King County Equity in Response and Planning Tool.

4.5 Jurisdiction-Specific Risk Assessments

In addition to this countywide risk assessment, each participating jurisdiction completed a risk assessment focusing on the priority hazards, vulnerabilities, and consequences. These assessments are contained in each planning partner annex. These assessments will have much more detail about

individual jurisdiction risks and should supplement the wider lens of the risk profiles contained in the base plan.

To complete their assessments, jurisdictions were provided with GIS data and an ArcGIS online map containing relevant data on hazards and impacts. The data is the same as that used in the base plan risk assessments, but jurisdictions were asked to focus on impacts specific to their assets and boundaries. Jurisdictions assessed risk in two ways.

- First, jurisdictions looked at hazards that could impact them, how susceptible/vulnerable they are to those hazards, and the consequences/impacts of a hazard event. The task was to develop “risk elevator pitches” that summarize the key elements of hazard risk in a way accessible to elected officials and the public.
- Second, jurisdictions were asked to consider an asset-based approach, looking at their priority assets, the hazards that threaten those assets, and the consequences of losing the asset. All jurisdictions were encouraged to complete this process, but only special purpose districts were required to complete it. The goal of this approach was to identify assets that needed mitigation.

In developing their risk assessments, jurisdictions held internal meetings to select the list of hazards that would be included and to assess the relative risk of each hazard. Most used a high-medium-low approach for impact, where high impact is a debilitating event, and moderate impacts are serious events that disrupt operations for multiple days. For those that also considered probability separately from the base plan, a high probability event is likely to occur on an annual basis. These jurisdiction-specific risk assessments are not designed to be exhaustive but should give a much clearer picture of risk and vulnerability than is normally available from countywide assessments.

Chapter 5

Avalanche

Risk Assessment Scoring		
1	Location	Hazard
2	Probability	
2	Magnitude	
1	Public	Impact
1	Responders	
1	COP	
1	PFI	
1	Environment	
1	Economy	
1	PCG	
1	People	Vulnerability
1	Property	
1	Environment	
1	Operations	
1	People	Risk
1	Property	
1	Environment	
1	Operations	
Low	**Overall Risk**	

PC: WADOT

Chapter 5 Avalanche

5.1 Hazard Description

Avalanche hazards in the Pacific Northwest are most common during the winter and spring in the Cascade and Olympic Mountain Ranges. They occur when a mass of snow slides, flows, or tumbles down a slope. The slopes range between 30 to 45 degrees and have enough snow depth to cover anchors such as rocks and small trees. Avalanches may also release on slopes steeper than 45 degrees, where snow may accumulate, and occasionally on low-angle slopes under ideal wet snow conditions. Avalanche forecasters use nine categories to describe the current avalanche problem. These include two primary types of avalanches:

- **Loose snow avalanche:** an avalanche that releases from a single point and entrains cohesionless snow as it fans downhill.
- **Slab avalanche:** a cohesive layer of snow that avalanches. Slab avalanches account for the large majority of avalanche accidents because their failures propagate across the slope and around the victim, making them harder to escape than a point-release avalanche. Slabs form as snow settles and becomes denser or winds load or add cohesion to snow.
- **Roof avalanche:** an avalanche that falls from the roof of a man-made structure. Roof avalanches commonly slide on the roof's surface, thus involving the entire existing snowpack. Roof avalanches most commonly occur during warming periods after substantial snow has accumulated. Accidents involve unsuspecting residents, or snow removal and maintenance workers.

Additional categories include qualification to the age and depth of the snowpack's weak layer, the formation type, and a few specific types, such as cornices.

Common factors that contribute to avalanche danger include old snow depth, old snow surface, new snow depth, new snow type, snow density, snow fall intensity, precipitation intensity, settlement, wind direction and wind speed, temperature, subsurface snow crystal structure, and tidal effect.[1] Research done at Snoqualmie Pass indicates that most natural avalanches occur within one hour after the onset of rain over a weakened snow pack. Large amounts of new snow accumulation also increases avalanche risk, especially when coupled with wide temperature swings. These events, whether natural or human-triggered, pose risks to recreationalists, ski area operations, and travelers on highways.

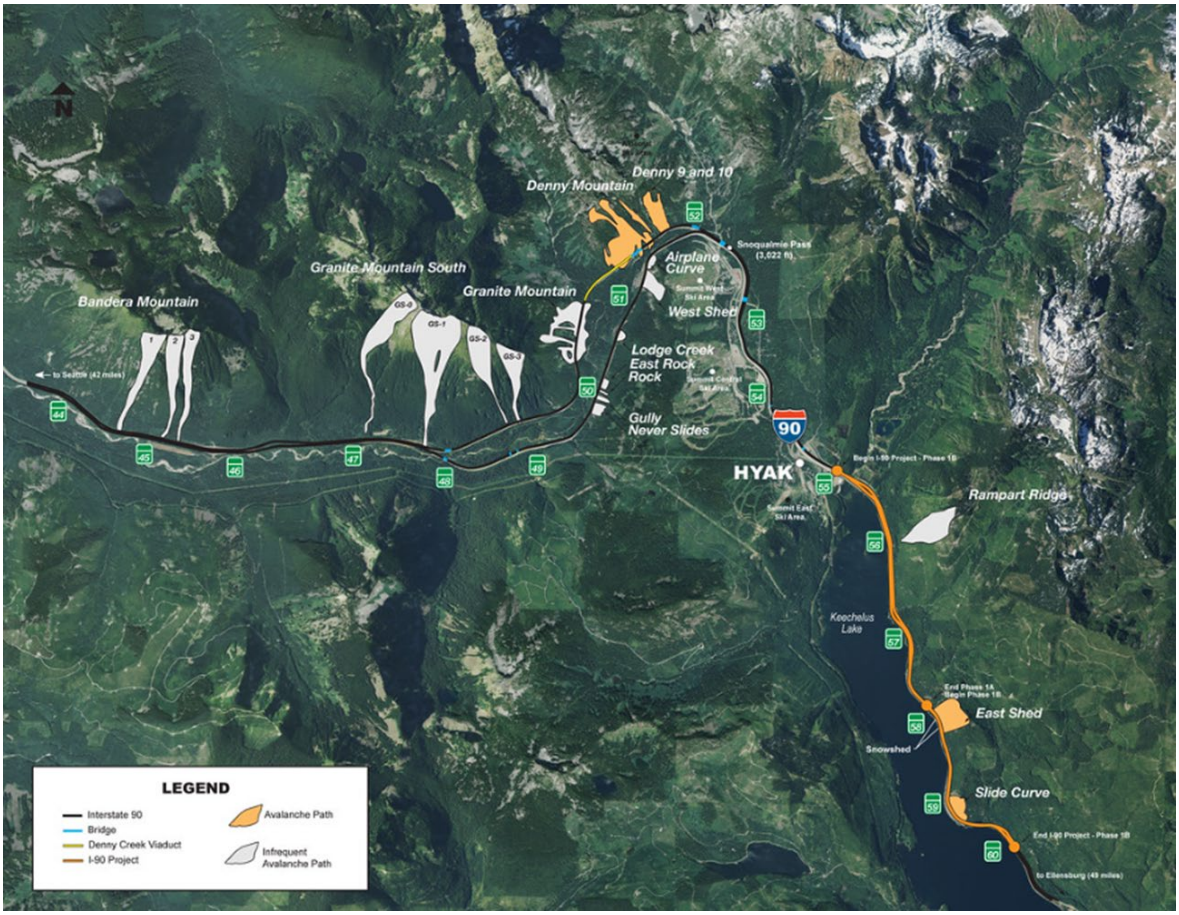
[1] Scott M Kruse, "Avalanche Evaluation Check List" *Avalanche Review* vol. 8, No 4 (February 1990)

5.2 Location

Avalanche events occur at two mountainous locations in King County: Stevens Pass in the northeast along US Highway 2 and Snoqualmie Pass on the county's central-eastern boarder along Interstate 90. Snoqualmie and Stevens Pass are significant transportation routes, particularly for commercial traffic connecting the Ports of Tacoma and Seattle to Eastern Washington and the northern tier of the US. They are also the closest ski areas and snow parks to the greater Seattle area.

Snoqualmie Pass spans 3,022 feet of the I-90 roadway and receives an average annual snowfall of 294 inches. The typical daily traffic volume on I-90 is around 28,000 vehicles, with approximately 5,600 of those being freight.[2] In the event of an avalanche, significant disruptions to east-west travel are anticipated. Figure 5-1 shows in orange common avalanche paths, and in grey infrequent avalanche paths. It also highlights projects, bridges, and viaducts that could be disrupted.

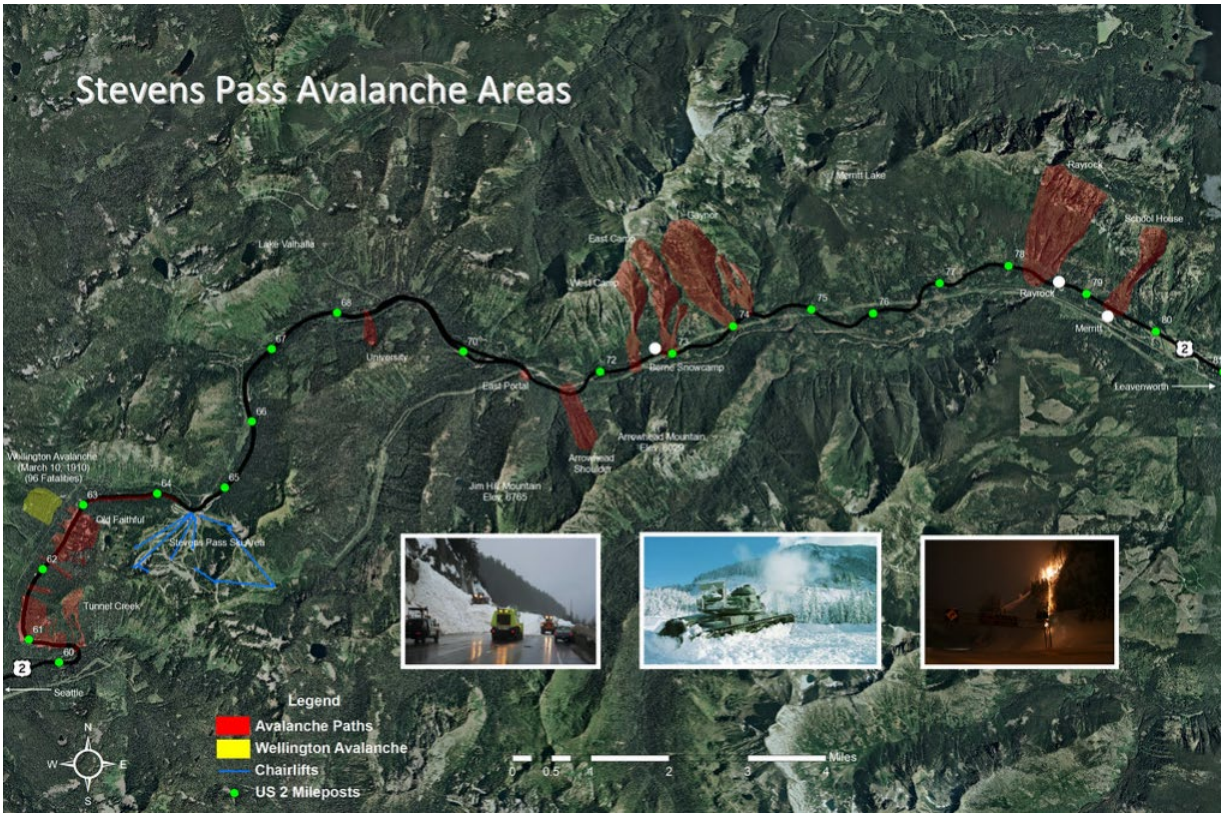
Figure 5-1 Snoqualmie Pass



[2] WSDOT, "Avalanche control" WSDOT Operations & Services (n.a.): https://wsdot.wa.gov/travel/operations-services/avalanche-control

Stevens Pass spans 4,061 feet of the highway and receives an average annual snowfall of 338 inches. The typical daily traffic volume over Stevens Pass is approximately 4,500 vehicles, with about 450 of those being freight. Figure 5-2 highlights the avalanche paths in red, with the Wellington Avalanche, marked in yellow, which remains the deadliest avalanche in U.S. history. This tragic event occurred in 1910, claiming the lives of 96 people.

Figure 5-2 Stevens Pass



Both maps indicate that most avalanches occur in remote areas away from the ski resorts. The primary risks are posed to backcountry recreationalists and travelers along the transportation corridors.

The popular backcountry areas around Stevens and Snoqualmie passes involve complex terrain where avalanche fatalities occur with relative frequency. These areas draw in snowshoeing, alpine and cross-country skiing, snowmobiles, and winter hikers and campers. While many people who engaged in snow sports in these areas are highly experienced enthusiasts; even with safety equipment, they may trigger or fall victim to avalanches. The Snoqualmie Pass backcountry area has more complex terrain with more elevation difference between top and bottom of surrounding mountains than Stevens Pass. Based on the terrain, Snoqualmie Pass backcountry has larger avalanche paths capable of producing larger and more destructive avalanches than Stevens Pass.

Several stretches of Interstate 90 and Highway 2 in King County are vulnerable to avalanches between October and April each year, depending on snowpacks and weather conditions. In the event that these transportation corridors are closed down due to an avalanche, I-84 in Oregon or air travel are the only practical ways to travel between Spokane and Seattle. These closures can have a significant economic impact, particularly due to delays in freight transportation. To address these risks, the Washington State Department of Transportation (WSDOT) has established specialized avalanche crews that play a vital role in monitoring and mitigating avalanche hazards, ensuring the safety and efficiency of travel.

5.3 Magnitude

Each year, avalanches in Washington State cause an average of one to three fatalities. Thousands of avalanches occur in the Cascades during the winter season, though most are triggered naturally and have no human impact. In King County, the primary avalanche risk arises from severe winter storms between October and May, when Pacific storms frequently affect the region.

Figure 5-3 North American Public Avalanche Danger Scale

North American Public Avalanche Danger Scale

Avalanche danger is determined by the likelihood, size, and distribution of avalanches.
Safe backcountry travel requires training and experience. You control your risk by choosing when, where, and how you travel.

Danger Level	Travel Advice	Likelihood	Size and Distribution
5 - Extreme	**Extraordinarily dangerous avalanche conditions.** Avoid all avalanche terrain.	Natural and human-triggered avalanches certain.	Very large avalanches in many areas.
4 - High	**Very dangerous avalanche conditions.** Travel in avalanche terrain not recommended.	Natural avalanches likely; human-triggered avalanches very likely.	Large avalanches in many areas; or very large avalanches in specific areas.
3 - Considerable	**Dangerous avalanche conditions.** Careful snowpack evaluation, cautious route-finding, and conservative decision-making essential.	Natural avalanches possible; human-triggered avalanches likely.	Small avalanches in many areas; or large avalanches in specific areas; or very large avalanches in isolated areas.
2 - Moderate	**Heightened avalanche conditions on specific terrain features.** Evaluate snow and terrain carefully; identify features of concern.	Natural avalanches unlikely; human-triggered avalanches possible.	Small avalanches in specific areas; or large avalanches in isolated areas.
1 - Low	**Generally safe avalanche conditions.** Watch for unstable snow on isolated terrain features.	Natural and human-triggered avalanches unlikely.	Small avalanches in isolated areas or extreme terrain.

Avalanches are measured using the North American Public Avalanche Danger Scale, which measures the likelihood of both natural and human-triggered avalanches, as well as their size and distribution. Figure 5-3 shows the scale ranges from 1 (low danger) to 5 (extreme danger).

Both Stevens and Snoqualmie Pass areas experience all levels of avalanche danger as well as human-triggered and natural avalanches in their surrounding backcountry terrain. However, Snoqualmie Pass has more highway and parking capacity than Stevens Pass. There is no definitive source on backcountry use, however, known parking capacity, proximity to population centers, and the number of avalanche observations publicly submitted to Northwest Avalanche Center per zone suggest more backcountry users visit the Snoqualmie Pass corridor over the course of the season.

The most frequent impact from avalanches is from pass closures, especially along Snoqualmie Pass on I-90. In particularly severe events, Snoqualmie, Stevens, and White Passes may close for days, cutting the state in half. The other routes that cross the cascades, such as US 20, SR 410, and SR 14, are closed throughout the winter and are not suitable for large traffic volumes or commercial traffic. Impacts on transportation through mountain passes result in travel delays with local to regional economic effects. Avalanche risk reduction occurs on these corridors throughout the spring as WSDOT clears the road for summer operations.

In addition to the roadway risk, two of the state's three cross-state railways pass through the Cascades. These railroads travel along a route similar to the major highways and are similarly susceptible to avalanche danger. Significant snowfall and avalanche danger can disrupt rail freight traffic across the state, with substantial economic impacts.

5.4 Previous Occurrences

The Northwest Avalanche Center has reported on avalanche incidents that presented a risk of human injury or fatality, excluding those avalanches that occurred without resulting in significant impact. There was a total of 14 injuries and 13 fatalities across the region. Specifically, Stevens Pass experienced 3 injuries and 2 fatalities, while Snoqualmie reported 11 injuries and 11 fatalities. Regarding the reported danger levels for each event, 68% were classified as moderate risk, and 26% were classified as considerable. The number of reported avalanche incidents have also show to decline over this period.

While there is more frequent reporting of avalanche activity in Snoqualmie Pass, the avalanche terrain around Stevens Pass is more than capable of producing avalanches large enough to bury, injure or kill a person, and has over the years. In fact, the most significant avalanche event in Washington State, and the deadliest in US history, occurred in 1910 near Stevens Pass. Two trains carrying passengers were hit by an avalanche killing 96 people.

Table 5-1 Significant Avalanches in King County, 2001-2024[3]

Date	Pass	Size	Fatalities and Injuries
1910 (Historic Maximum)	Stevens Pass (railway)	n/a	96 Fatalities
April 9, 2010	Snoqualmie Pass	D2 - Moderate	2 Injuries
April 10, 2010	Snoqualmie Pass	D3 - Considerable	1 Injury
February 1, 2011	Snoqualmie Pass	D2 - Moderate	1 Fatality
March 23, 2011	Snoqualmie Pass	D1 - Low	None
March 27, 2011	Stevens Pass	n/a	1 Fatality
April 3, 2011	Stevens Pass	n/a	1 Injury
April 6, 2011	Snoqualmie Pass	D2 - Moderate	3 Injuries
January 1, 2012	Snoqualmie Pass	n/a	None
January 21, 2012	Snoqualmie Pass	n/a	None
February 19,2012	Snoqualmie Pass	D2 - Moderate	1 Fatality
February 19, 2012	Stevens Pass	n/a	1 Fatality
January 15, 2013	Snoqualmie Pass	n/a	1 Injury
April 13, 2013	Snoqualmie Pass (two locations)	n/a	2 Fatalities
April 13, 2013	Stevens Pass	n/a	None
January 4, 2014	Snoqualmie Pass	n/a	None
February 11, 2014	Stevens Pass	D3 - Considerable	2 Injuries
February 22, 2014	Snoqualmie Pass	n/a	None
March 22, 2014	Snoqualmie Pass	D3 - Considerable	1 Fatality

[3] NWAC "Northwest Avalanche Accident Summaries" *Northwest Avalanche Center* (December 2024) https://www.nwac.us/accidents/accident-reports/

April 27, 2014	Snoqualmie Pass	D2 - Moderate	1 Injury
December 6, 2015	Stevens Pass	D2 - Moderate	None
December 17, 2015	Snoqualmie Pass	D3 - Considerable	1 Injury
December 19, 2015	Snoqualmie Pass	D3 - Considerable	1 Fatality
December 31, 2015	Snoqualmie Pass	D1/D2 – Low/Moderate	1 Fatality
March 4, 2017	Snoqualmie Pass	D2 - Moderate	1 Injury
March 5, 2017	Stevens Pass	n/a	None
April 11, 2017	Snoqualmie Pass	D2 - Moderate	1 Fatality
February 18, 2018	Snoqualmie Pass	D2 - Moderate	None
February 25, 2018	Snoqualmie Pass (two locations)	D2 - Moderate	3 Fatalities
February 16, 2019	Stevens Pass	n/a	None
February 16, 2020	Stevens Pass	n/a	None
January 31, 2021	Snoqualmie Pass	D2 – Moderate	1 Injury
February 7, 2021	Stevens Pass	n/a	None
February 12, 2023	Stevens Pass	n/a	None
March 5 2024	Stevens Pass	D2 - Moderate	None

5.5 Probability of Future Occurrences

The overall frequency of avalanche events is likely to decrease due to the changing climate. As snow cover diminishes at lower elevations, the potential areas for avalanches to occur are reduced. However, at higher elevations where snowfall remains abundant, avalanche events may increase in intensity. Many factors contribute to avalanche formation and release, though the most significant involves the bond between snow layers and loading from new snow or rain. The Pacific Northwest has a maritime snow climate, and most avalanche activity is directly related to precipitation events,

either snow or rain. Rapid changes in temperature, especially at or near the freezing point, further contribute to avalanche release.

5.6 Climate Change Considerations

Research pertaining to climate change impact on avalanche activity in this region is currectly limited. However, climate change is expected to lead to a significant decrease in snowpack in Washington, with projections indicating a reduction of up to 70% by 2080 compared to 2006 levels.[4]

Avalanche frequency and type relative to elevation and location will likely change over time due to the impacts of climate change. Initial research on the impacts of climate change and avalanches suggest we may see fewer lower elevation avalanches due to reduced snowpack. Depending on how the climate warms in our region, we may see fewer avalanches associated with colder weather (persistent slabs) and more wet snow avalanches.

5.7 Impact Assessment

Public	Avalanche conditions can cause closure of ski areas like: Alpental, Hyak (Summit East), Ski Acres (Summit Central), and Stevens Pass. The recreational skiers and the people who are seasonally employed can be impacted when these conditions close ski areas. People who ski "out of bounds" take exceptional risks in locations where avalanche control does not maintain safe conditions and search and rescue operations may be hampered. Pass closures may inconvenience people by causing them to either take commercial flights between eastern and western Washington or cause them to take wide routes around the mountain area through the Columbia Gorge between Washington and Oregon. There are no major populations in King County that are exposed to avalanche terrain. The King County community closest to avalanche country is Skykomish. It has not experienced an avalanche in recent memory.

[4] Washington Emergency Management Division (EMD), "Avalanche" *Washington State Enhanced Hazard Mitigation Plan* (2023): p. 28, https://mil.wa.gov/asset/651ec296d76a9/2023_WA_SEHMP_final_20231004.pdf

Responders	When avalanches bury or injure skiers and backcountry hikers, the King County Sheriff's Office Search and Rescue team(s) may be deployed along with trained volunteers and specially trained volunteer K-9 units like BARK (Backcountry Avalanche Rescue K-9). Most search missions occur in or around the off-trail perimeter of ski areas like Snoqualmie Acres, Hyak, Alpental, and Steven's Pass. Buried skiers are often severely injured or may be killed from their injuries or suffocation under large amounts of snow in areas difficult to reach.
Continuity of Operations	Avalanche areas are remote to most King County operations. Where avalanches may occur, King County Sheriff's Office Search and Rescue, Ski patrols, and volunteers may be involved. This may include BARK, a group that provides K-9 search capability for avalanche victims. Support may also be required from the aviation unit of the King County Sheriff's Office and from Emergency Medical Service units. Support personnel for avalanche control are provided by Washington State Department of Transportation.
Property, Facilities, and Infrastructure	**Property** Property exposed to avalanches include seasonal vacation homes and ski resort operations. **Facilities** There are no known healthcare facilities or systems exposed to avalanches. **Infrastructure** Critical infrastructure that may be impacted includes the BNSF railway (also used by Amtrak) and the east west highways, US 2 (Stevens Pass) and I-90 (Snoqualmie Pass). Chinook Pass usually closes from October through May.
Environment	Avalanches are natural events, but they can have significant environmental impacts, including the destruction of wildlife, trees, and the alteration of the landscape. These events can reshape terrain and disrupt ecosystems. To mitigate the effects of avalanches on both infrastructure and the environment, several upcoming infrastructure projects along I-90 in Snoqualmie Pass are being proposed including the installation of avalanche chutes. These chutes are designed to redirect

	snowfall away from the I-90 animal crossing overpass, which serves as a vital north-south habitat connector for wildlife.
Economy	Closure of ski areas from avalanche danger usually lasts only a short time. While revenue to one or more ski areas may be reduced, no long-term economic impacts can be expected from avalanche issues. Heavy snows and avalanche danger may close Stevens and/or Snoqualmie Pass for extended periods. These pass closures can impede transportation of goods between eastern/western Washington, impact the Port of Seattle and port/countries around the/Pacific Rim. Avalanche closure of King County passes may cause motorists and truckers to reroute through Interstate 84 in Portland. In 2024, WSDOT completed an "Estimated Road User Cost of Snoqualmie Pass Closure", using the volumes of traffic in the winter months to determine an average total hourly cost of delays based on weekday/weekend calculations. For weekdays, the average hourly cost of a delay is $52,743, while for a weekend, the average hourly cost of a delay is $67,576.[5]
Public Confidence in Governance	The public at risk has a good understanding of the risks from avalanche. Warnings are regularly posted and announced to skiers and back country hikers during the winter months.

5.8 Vulnerability Assessment

Vulnerable populations	Snowmobilers, hikers, and skiers in back-country and off-trail environments are at the highest risk from avalanche. Search and Rescue regularly travel on search missions for missing recreationists, putting them at risk from avalanche as well.
Property	Several homes in the Alpental Valley have been directly affected by avalanches. Snow fences installed in 1999 mitigate the hazard. Avalanche professionals' ongoing monitoring and evaluation contribute to the risk evaluation.

[5] WSDOT, *Snoqualmie Winter Operations Study* (December 2024): p. 6, https://wsdot.wa.gov/sites/default/files/2024-12/Snoqualmie-Winter-Operations-Study-December2024.pdf

Environment	Avalanches are a natural disturbance that can both harm and benefit ecosystems. Next to Snoqualmie Pass is the wildlife crossing overpass that provide a critical north-south connection for elk, deer, coyotes, and cougars.
Operations	I-90 and US-2 are the most vulnerable routes to avalanche. Disruptions to both are common during the winter, though most are for a short duration. A long-duration disruption could have significant economic consequences.

Chapter 6

Civil Disorder

Risk Assessment Scoring		
1	Location	Hazard
3	Probability	
2	Magnitude	
2	Public	Impact
3	Responders	
2	COP	
2	PFI	
1	Environment	
2	Economy	
3	PCG	
2	People	Vulnerability
3	Property	
1	Environment	
3	Operations	
2	People	Risk
2	Property	
2	Environment	
2	Operations	
Moderate	**Overall Risk**	

PC: Dean Rutz

Chapter 6: Civil Disorder

6.1 Hazard Description

The United State Constitution, in accordance with the stipulations of ratification from the Colonies, adopted the first 10 amendments collectively known as the Bill of Rights, laying out the initial protected rights under the Constitution guaranteed to all citizens of the United States. The First being the protected right to peacefully assemble. This right has been entrenched in the very fabric of the United States even before the country as we know it existed. However, as we evolved as a nation, complex social, political, and economic problems began to arise. Almost in tandem, the effectiveness of this right began to come into question with many movements, leveraging changing tactics and technology, finding other forms of assembly more effective at affecting change either for or against the status quo. With the evolution of the protest many social and political scientist began to identify the different forms of protests, collectively known as Civil Unrest, and laws were written to both protect public order and further define the right to protest under the 1st Amendment.

Table 6-1 Hierarchy of civil unrest

Name	Description
Peaceful Protests	Under the 1st Amendment, the right to "protest" is defined as "the right of the people peaceably to assemble." However, laws have evolved that govern this right clarifying that assemblies which are not peaceful are generally not protected under the law. The laws that deal with disruptive conduct are generally grouped into offenses that disturb the public peace. They range from misdemeanors, such as blocking sidewalks or challenging another to fight, to felonies, such as looting and rioting. [1]
Civil Disobedience	Promoted by nationalist movements in Africa and India, the Civil Rights movement in the U.S., and labor and anti-war movements in many countries, Civil Disobedience is typically equated with protests or non-violent resistance. Civil Disobedience, in contrast, is a "public, nonviolent, conscientious yet political act contrary to law, usually aimed at bringing about a change of the law or government policy; limited to instances of substantial and clear injustice and must occur only after the legal means of redress have proved futile."[2]

[1] Revised Code of Washington Title 9A.
[2] US Department of Justice, "Theory of Civil Disobedience" *NCJRS Virtual Library* (1989): https://www.ojp.gov/ncjrs/virtual-library/abstracts/theory-civil-disobedience-civil-disobedience-p-125-149-1989-paul

Civil Disorder	Defined under Title 18 of the United States Code § 232 (1) Civil Disorder is "any public disturbance involving acts of violence by assemblages of three or more persons, which causes an immediate danger of or results in damage or injury to the property or person of any other individual." 18 U.S. Code § 231 outlines what is considered "disorder," including the use, application or making of any firearm, or explosive or incendiary device, or technique capable of causing injury or death to persons; transports or manufactures for transportation in commerce any firearm, or explosive or incendiary device, knowing or having reason to know or intending that the same will be used unlawfully in furtherance of a civil disorder; commit any act to obstruct, impede, or interfere with any fireman or law enforcement officer lawfully engaged in the lawful performance of official duties incident to and during the commission of a civil disorder. In this context, any disobedience in which participants turn violent and antagonistic toward public safety and civil authority is illegal.[3] Similarly, Washington state law defines civil disorder as "any public disturbance involving acts of violence that is intended to cause an immediate danger of, or to result in, significant injury to property or the person of any other individual." Further, under the Revised Code of Washington 9A.48.120, a person is guilty of civil disorder training if "he or she teaches or demonstrates to any other person the use, application, or making of any device or technique capable of causing significant bodily injury or death to persons, knowing, or having reason to know or intending that same will be unlawfully employed for use in, or in furtherance of, a civil disorder."

Causation

Civil disorder can arise from a variety of circumstances and encompasses a wide range of civil actions, from peaceful demonstrations to more disruptive or violent forms of unrest. The intensity of these disturbances often correlates with the level of public dissatisfaction or protest.

Examples of civil disorder include, but are not limited to, violent protests, roadblocks, riots, acts of sabotage, and various forms of criminal behavior. Such disturbances can pose serious risks, becoming increasingly chaotic and difficult to control.

[3] Office of the Law Revision Council. "Ch. 12: Civil Disorders" *18 USC* (1968): https://uscode.house.gov/view.xhtml?path=/prelim@title18/part1/chapter12&edition=prelim.

One group often associated with civil disorder is the "Black Bloc." This tactic, employed by certain anarchist factions, involves a group of individuals dressing uniformly in black clothing to create the illusion of a cohesive and unified force, which is meant to promote solidarity for a particular cause. This strategy is especially challenging for law enforcement, as it makes it nearly impossible to distinguish one participant from another, providing anonymity while facilitating coordinated criminal acts.

Additionally, the presence of law enforcement often escalates tensions during these events. Rather than deterring violence, their intervention can sometimes heighten aggression and provoke further unrest.

The political climate surrounding civil disorder is constantly shifting, with changes in leadership, policies, and public sentiment contributing to the volatile nature of these disturbances.

6.2 Location

While demonstrations and protests can occur throughout King County, civil disorder is more likely to occur in specific areas, particularly in Seattle, which serves as the county's political and cultural hub. These civil actions often involve free speech rights in public places and do not evolve into chaos and violence. Civil disorder is often seen at government buildings, military bases, schools, universities, city council meetings, as they represent centers of power and decision-making. Additionally, areas like state and city parks, as well as the downtown core, are prime locations for civil unrest due to their visibility and accessibility to large groups.

Sites that are attractive for political rallies should be viewed as potential locations for the epicenter of civil disorder events. Disruption of critical infrastructure may occur during very severe civil disorder events. Public services such as water, power, communication, and transportation may be temporarily unavailable.

6.3 Magnitude

In King County, civil disorder can emerge from a series of escalating events, each building upon the next. It often begins as peaceful protest or civil disobedience, where individuals express their grievances within the bounds of the law. However, when external factors—such as the presence of anarchists, police violence, or broader social unrest—intervene, these peaceful demonstrations can transform into civil disturbances and, in extreme cases, civil disorder. The impact of such events can be far-reaching, affecting not only the immediate community but also the larger social and political landscape. Understanding the escalation of civil disturbances into full-scale civil disorder requires a look at the different phases and levels of conflict—from peaceful protesting to violence and property damage.

Phases of Protest and Escalation

Protests typically start as peaceful demonstrations, where individuals or groups gather to voice their concerns on a particular issue. In King County, these types of events are often seen as essential elements of civic expression. People may gather in public spaces to peacefully advocate for causes such as racial justice, environmental protection, or workers' rights. The aim is to engage in civil disobedience, challenging laws or actions perceived as unjust, without resorting to violence or property destruction.

However, not all protests remain peaceful. As tensions rise, peaceful demonstrations can escalate into civil disturbances. Civil disturbances often involve acts of resistance that push the boundaries of legal protest. This might include blocking roads, disrupting business operations, or engaging in minor property damage. While these actions may be disruptive, they are usually aimed at drawing attention to the issue at hand without the intent to incite widespread violence. In this phase, there may still be some level of public support or sympathy, as the demonstration is seen as a legitimate expression of discontent, albeit one that has exceeded acceptable behavior.

In the worst-case scenario, civil disturbances can escalate into civil disorder. Civil disorder represents the highest level of escalation, where protests turn violent and cause significant disruption to public order. This stage can be triggered by a variety of factors, including the actions of provocateurs or groups seeking to exploit the unrest for their own agendas[4]. The presence of anarchists, especially those utilizing tactics like the "Black Bloc," can turn an otherwise peaceful protest into a violent event. The Black Bloc strategy involves groups of anarchists dressing in all black, often with masks, to conceal their identities and present a unified front. This anonymity allows them to engage in criminal activities, such as vandalism, arson, or violent confrontations with law enforcement, without immediate identification or accountability.

The 1999 World Trade Organization (WTO) protests in Seattle serve as a clear example of civil disorder. Initially organized as a peaceful demonstration against the WTO's policies, the protests quickly escalated into violent confrontations. Anarchists, employing Black Bloc tactics, vandalized businesses, looted stores, and engaged in violent clashes with police. The event led to over 600 arrests, widespread property damage, and millions of dollars in losses for local businesses.[5] The city's cost of managing the situation ballooned, with emergency services, repairs, and security efforts costing far more than anticipated. This event marked a significant turning point in the way law enforcement responded to large-scale protests, with authorities becoming more adept at identifying the potential for escalation and monitoring certain groups for signs of trouble.

[4] Kory Flowers, "Understanding the Black Block" *Police: The Law Enforcement Magazine.* (January 30, 2015): https://www.policemag.com/341767/understanding-the-black-bloc.
[5] Sean Rossman, "G-20 summit protests: What is a Black Bloc?" *USA Today.* (February 2, 2017): https://www.usatoday.com/story/news/nation-now/2017/02/02/what-black-bloc/97393870/.

Triggers and Tensions

Civil disorder can be triggered by a variety of factors, often stemming from a combination of social, political, and economic issues. Police violence is a common catalyst for such events. For example, the 2009 police shooting of Oscar Grant in Oakland, California, led to widespread unrest, which echoed in cities across the country, including Seattle.[6] Similarly, in King County, the 2008 video of a King County deputy assaulting a teenage girl in a holding cell became a flashpoint for public outrage. In 2010, activists in Seattle organized a "March Against Police Brutality," drawing attention to systemic violence and misconduct. Protests like these can lead to cycles of unrest, where each new demonstration builds upon the emotional intensity of previous events.[7]

Protests often create a feedback loop, where the actions and outcomes of one protest can inspire and fuel subsequent protests. This cycle occurs because protests are not just reactions to immediate events but are deeply rooted in emotional and social responses to perceived injustice or systemic problems. When one protest takes place, it sets off a chain reaction that can influence the actions and emotional environment of future demonstrations.

When protests escalate into civil disorder, the presence of anarchist groups like Black Bloc often plays a pivotal role. These groups operate as accelerants, transforming protests into more violent confrontations. Law enforcement now carefully monitors these groups during peaceful protests, noting any signs of aggression or unlawful behavior. As soon as such elements appear, the situation can rapidly deteriorate, creating a volatile environment where clashes are inevitable. These heightened police presence can, in turn, provoke further unrest, exacerbating tensions and leading to a dangerous feedback loop.

The ultimate severity of any civil disorder event will depend on the magnitude of the event and its location. The more widespread an event is, the greater the likelihood of excessive injury, loss of life and property damage. Additional factors, such as the ability of law enforcement to contain the event, are also critical in minimizing damages.

[6] Associated Press, "Ex-BART Officer Johannes Mehserle Released From Jail" *KPIX CBS SF Bay Area.* (June 13, 2011) https://sanfrancisco.cbslocal.com/2011/06/13/ex-bart-officer-johannes-mehserle-released-from-prison/.
[7] J Seattle, "Protest against police brutality starts at Seattle Central" *Capitol Hill Seattle Blog.* (April 9, 2010) https://www.capitolhillseattle.com/2010/04/protest-against-police-brutality-starts-at-seattle-central/.

6.4 Previous Occurrences

Date	Location	Cause	Description
Nov 1999	Seattle, WA – World Trade Organization	Anti-globalization	An example of a worst-case scenario was the 1999 Seattle World Trade Organization rioting which significantly impacted the City and led to numerous injuries and arrests. The rioting raised Seattle's cost of handling the conference to $9 million from an earlier estimated city cost of $6 million surpassing worst-case projections. In addition, downtown Seattle businesses lost an estimated $20 million in property damage and lost sales during the WTO conference.[8]
Feb 27, 2001	Seattle, WA – Pioneer Square	Unknown	During a Mardi Gras celebrations, there were numerous random attacks including reports of widespread brawling, vandalism, and weapons being brandished. Damage to local businesses exceeded $100,000. About 70 people were reported injured. Several women were sexually assaulted. One man, Kris Kime, died of injuries sustained during an attempt to assist a woman being brutalized.[9]
May 2013	Seattle, WA	May Day	A 2013 May Day protest in downtown Seattle turned violent with police responding to demonstrators throwing rocks, bottles, metal pipes, fireworks -- and even a skateboard. The clashes left eight officers with injuries, and police reporting the arrests of 17 people on various offenses including property destruction and assault. During the clashes, police deployed flash-bang grenades and tackled unruly protesters to the ground.[10]
May 2016	Seattle, WA	May Day	In 2016 May Day protest in Seattle a peaceful march turned violent when protesters lit

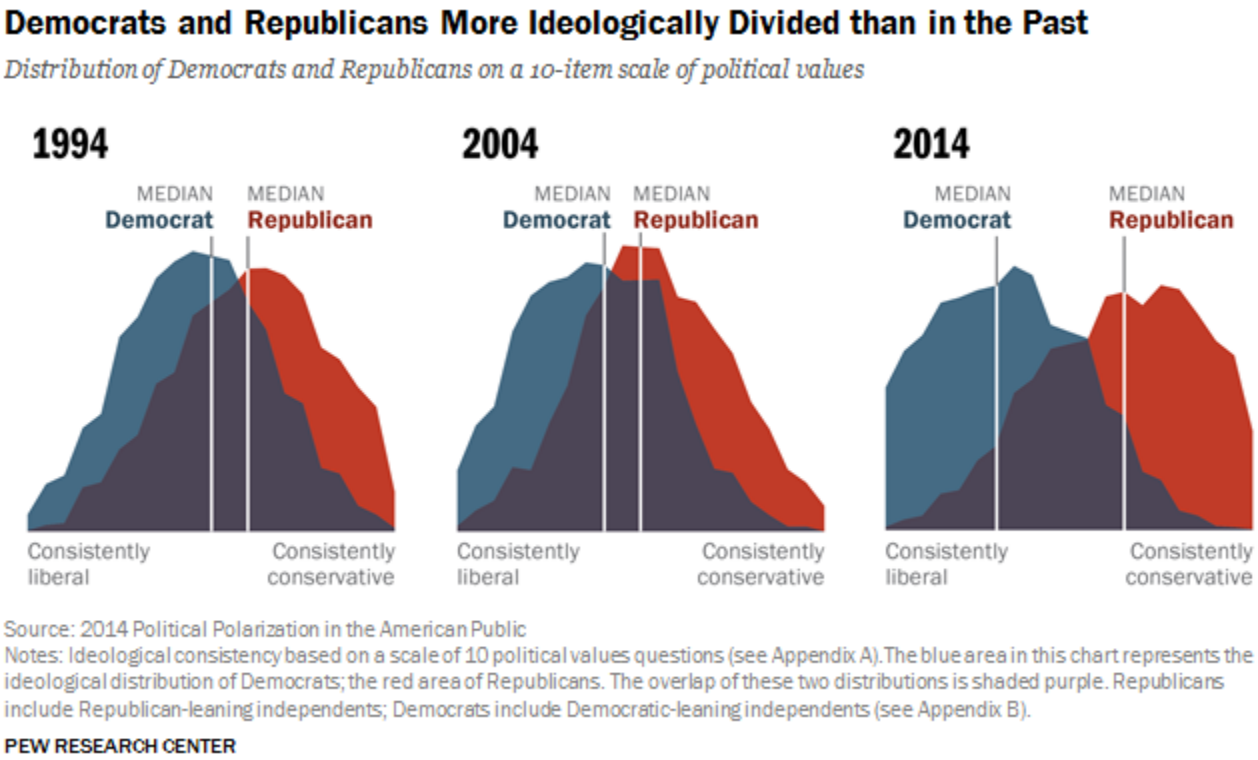
[8] CBC News," WTO protests hit Seattle in the pocketbook" (January 6, 2000): https://www.cbc.ca/news/world/wto-protests-hit-seattle-in-the-pocketbook-1.245428.
[9] Lynsi Burton, "Looking back: Mardi Gras riots of 2001" *The Seattle Times.* (February 16, 2015): https://www.seattlepi.com/seattlenews/article/Looking-back-Mardi-Gras-riots-of-2001-6084162.php.
[10] Amanda Watts, Lindy Royce-Bartlett. "17 arrested as Seattle May Day protests turn violent" *CNN.* (May 2, 2013) https://www.cnn.com/2013/05/01/us/seattle-may-day-protests/index.html.

			fireworks and threw rocks and Molotov cocktails at police. Nine people were arrested and five officers were injured in the clashes.
January 2017	Seattle, WA – University of Washington	Politics	In January 2017 at University of Washington, demonstrators and counter-demonstrators gathered as a politically conservative commentator was scheduled to speak. Violent protests took place on campus and a person was shot.
June 2020	Chaz/Chop Seattle Zone	Police Brutality	In the wake of George Floyd protests, some demonstrators took over a portion of the Capitol Hill neighborhood, establishing the CHOP/CHAZ (Capitol Hill Organized Protest/Capitol Hill Autonomous Zone). This area became a flashpoint for further clashes, with occasional violence, shootings, and confrontations between police and activists.

6.5 Probability of Future Occurrences

There is a significant likelihood of future civil disorder in King County. Like many urban centers across the U.S., King County is grappling with growing political discontent driven by ideological divides over social policies, economic priorities, and individual rights. These divisions are further intensified by a political realignment that has funneled differing viewpoints into two increasingly polarized parties. This polarization is compounded by longstanding tensions between certain communities, particularly communities of color, and local law enforcement, which continue to fuel distrust and demands for reform.

Figure 6-1 Political Polarization in the American Public[11]



Moreover, the rapid spread of information and organization via social media platforms, especially TikTok, amplifies these tensions. Social media enables quick mobilization and the viral dissemination of events, making it easier to organize protests and quickly escalate unrest. As these factors converge, the risk of civil disorder in King County is likely to increase.

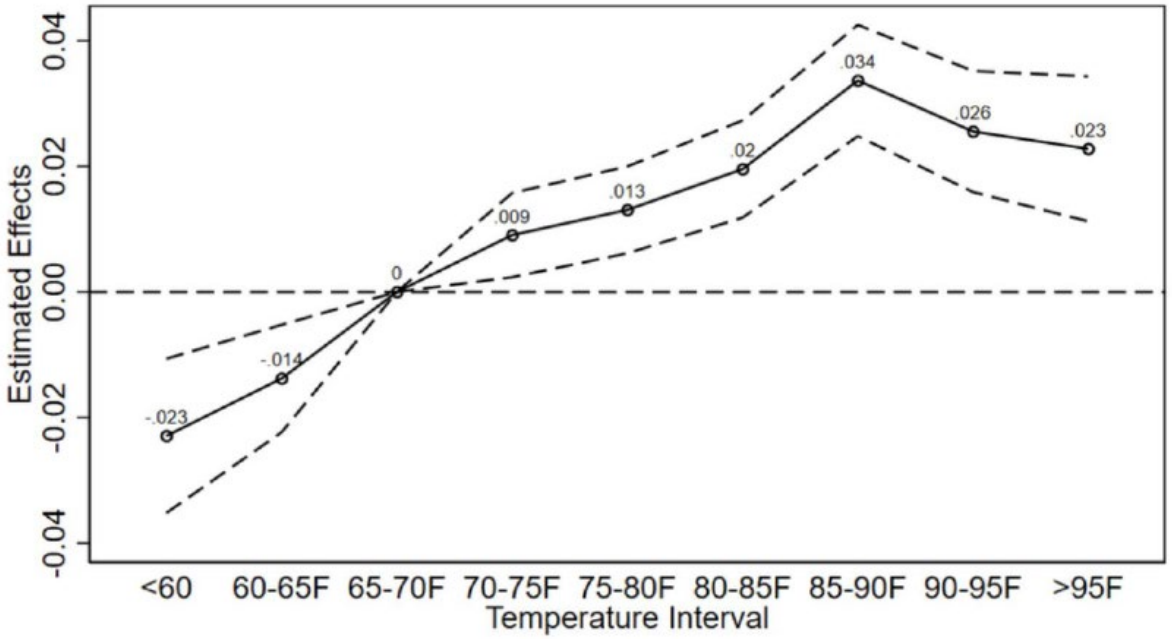
6.6 Climate Change Considerations

The effects of climate change have shown to amplify civil unrest by exacerbating existing economic, social, and political instabilities. Urban areas, particularly those with limited greenspaces that are susceptible to climate-related phenomena like the urban heat island effect, are more prone to increased communal frustration and conflicts. The intensifying effects of climate change, such as extreme weather events, resource scarcity, and rising costs of living, intersect with social inequalities, creating a volatile environment where vulnerable communities are disproportionately affected. This intersectionality between social issues and climate change heightens tensions, fueling civil unrest as people confront both environmental and systemic challenges simultaneously. Figure

[11] Michael Dimock, Carroll Doherty, Jocelyn Kiley, Russ Oates, "Political Polarization in the American Public" *Pew Research Center* (June 2014): p. 6, https://www.pewresearch.org/wp-content/uploads/sites/4/2014/06/6-12-2014-Political-Polarization-Release.pdf

6-2 takes the city of Los Angeles as a case study and plots the point estimates for the temperature-crime relationship. The assessment concluded that heat acts as a driver crime, namely that occurs within the same day.

Figure 6-2 Impact of Daily Temperature on Crime Rates in Los Angeles[12]



6.7 Impact Assessment

Public	All King County residents can be impacted, though those who live or work in downtown areas tend to be more exposed and impacted by civil disorder incidents.
Responders	Responders are often on the front line of events. Responders can be targeted, causing injury to personnel, damage to facilities, and the loss of equipment. Responders are often injured during major incidents and, even when events are brought under control, may be seen as an enemy of the community causing long-term trust issues.
Continuity of Operations	Major incidents can bring government services to a standstill. In King County, with both City of Seattle and King County offices are in the same area, along with

[12] Kilian Heilmann, Matthew Kahn, Cheng Keat Tang, "The urban crime and heat gradient in high and low poverty areas" *Journal of Public Economics* (May 2021): p. 17

	court facilities. A major incident in this area would prevent employees from getting to work or home. Furthermore, government buildings are often targeted and can be damaged or destroyed.
Property, Facilities, Infrastructure	**Property** Much of the impact from civil disorder is to property, secondary only to economic impacts. During the World Trade Organization protests in 2000, over $20 million in damage was recorded by businesses and $9 million in costs to the city. **Facilities** Health systems can be overwhelmed by civil disorder incidents, such as when large numbers of demonstrators are brought to the hospital due to exposure to tear gas or due to clashes with counter-demonstrators or with police. **Infrastructure** • Energy: Pipelines carrying oil are a potential target for demonstrators. Oil trains have been targeted frequently in Washington; however, these protests do not tend to turn violent. • Water/Wastewater: Water systems are rarely the primary target of a demonstration and may only be peripherally impacted. • Transportation: One of the largest impacts from a major incident is disruption to transportation. Transit facilities and assets like busses may be destroyed. Roads can be closed for hours or days. • Communications: Communication systems are redundant and are unlikely to be severely impacted by a civil disorder incident.
Environment	Civil Disorder will have a minimum impact on the environment; unless, hazard material facilities such as petroleum, chemical, and recycling are targeted in arson fires or vandalism. The impact on the environment in such cases could be significant.
Economy	Economic impacts caused by loss of business, destruction of businesses, and business interruption can exceed the property damage dollar figures by a factor of two or more. Lost sales and uninsured losses can permanently destroy many businesses. Areas can also become perceived as unsafe or unwelcoming for business, further hurting the economy.

Public Confidence in Governance	Major incidents can cause long-term damage to public confidence in the jurisdiction or, especially, public safety elements of jurisdiction governance. This can cause either alienation or, when response is proactive, help rebuild confidence and trust. To best preserve and grow confidence, a jurisdiction must respond quickly and effectively but without excessive force. The general public expects a quick restoration of order and protection of property while activists may demand accountability from officials and safety for peaceful demonstrators.

6.8 Vulnerability Assessment

Vulnerable populations	Certain population groups are more vulnerable during civil disorder event either because they are the target of civil discord, or because of social, economic, or physical circumstances. **Communities of color** People of color, particularly Black, Indigenous, and Latino communities, are historically targeted by civil disorder events. While rare in our region, the United States has a long history of racially-motivated riots that burn and destroy minority-owned businesses and homes. **Immigrant communities** Immigrant and refugee populations are often already marginalized and may face heightened vulnerability during civil disorder due to language barriers, lack of familiarity with local legal systems, or fear of interaction with law enforcement due to potential immigration status concerns. **People experiencing homelessness** In times of civil unrest, people experiencing homelessness are more likely to be exposed to violence, police crackdowns, or displacement from encampments, making it even harder to access basic necessities like food, shelter, or healthcare. Moreover, homeless individuals may have nowhere to go when public services, shelters, or transportation networks are disrupted.

	Woman and gender minorities Women may face increased risks of sexual violence, exploitation, or harassment in chaotic or unsafe environments, while gender minorities may face added discrimination, marginalization, or violence. **Essential workers** Workers in essential services, such as healthcare, public transportation, utilities, and law enforcement, are particularly vulnerable during civil disorder events due to their proximity to the unrest. These workers may face risks of violence or aggression, especially if they are seen as part of the system that protesters are targeting.
Property	Businesses in high traffic areas of Seattle would be vulnerable to property damage from civil disorder. Property that would be targeted in this situation includes banks, financial institutions, government buildings, retail chains, and monuments.
Environment	During civil disorder events, acts of arson and the destruction of properties—such as vehicles, buildings, and businesses—can result in the release of harmful pollutants into the air. Fires release smoke, soot, and toxic chemicals like carbon monoxide, particulate matter, and volatile organic compounds (VOCs) that can severely impact air quality and public health. In urban areas, these pollutants may be concentrated, exacerbating pollution levels in already affected regions.
Operations	**Government Facilities** Civil disorder incidents often target government organizations or visible images of the government such as police vehicles, city halls, or court facilities. **Businesses** Businesses such as banks, businesses in downtown areas or along transportation routes, and other commercial establishments are often targeted during looting or may be targeted for political or racist reasons such as ownership by an immigrant group in the case of anti-immigration riots or because they are associated with an industry being targeted by the manifestation (banks, abortion clinics, oil company offices, etc.).

Chapter 7

Cyber Incidents

Risk Assessment Scoring		
3	Location	Hazard
4	Probability	
3	Magnitude	
1	Public	Impact
2	Responders	
3	COP	
2	PFI	
1	Environment	
3	Economy	
4	PCG	
2	People	Vulnerability
2	Property	
2	Environment	
3	Operations	
3	People	Risk
3	Property	
3	Environment	
3	Operations	
High	**Overall Risk**	

Chapter 7: Cyber Incidents

7.1 Hazard Description

Information technology has become deeply integrated into how we conduct everyday life. In the context of government, technology plays a crucial role in delivering essential public services, such as healthcare, public transportation, law enforcement, citizen engagement, public utilities, and managing tax and ratepayer systems. A cyber incident can have a profound and disruptive effect on these technologies, jeopardizing local governments' ability to provide critical services and maintain daily operations.

A **cyber incident** is defined by the Department of Homeland Security (DHS) in the 2024 National Cyber Incident Response Plan as "an event occurring on or conducted through a computer network that actually or imminently jeopardizes the confidentiality, integrity or availability of computers, information on communication systems or networks, physical or virtual infrastructure controlled by computers or information systems, or information resident thereon. A cyber incident may include a vulnerability in an information system, system security procedures, internal controls, or implementation that could be exploited by a threat source."[1] This definition is further elaborated in U.S. Code, Title 44, Section 3542.

Figure 7-1 CIA triad model[2]



Confidentiality: preserving authorized restrictions on information access and disclosure, including means for protecting personal privacy and proprietary information.
Integrity: guarding against improper information modification or destruction and ensuring information non-repudiation and authenticity.

- **Data Integrity (DI)**: The property that data has not been altered in an unauthorized manner. DI covers data in storage, during processing, and while in transit.
- **System Integrity (SI)**: The quality that a system has when it performs its intended function in an unimpaired manner, free from unauthorized manipulation of the system, whether intentional or accidental.

Availability: Ensuring timely and reliable access to and use of information.

[1] Department of Homeland Security, *National Cyber Incident Response Plan Draft*, (December 2024): p. 5, https://www.cisa.gov/sites/default/files/2024-12/NCIRP%20Update%20Public%20Comment%20Draft%20508c.pdf
[2] Debbie Walkowski, "What is the CIA Triad?" *F5 Labs* (2019): https://www.f5.com/labs/learning-center/what-is-the-cia-triad

Cyber incidents can be categorized as (1) malicious attacks, (2) human errors and system glitches, or (3) environmental hazards.

Malicious attacks

Cyber incidents based on actors with malicious intent can be driven by criminal motives for profit, extortion, and theft or to damage, destroy or interfere with infrastructure systems. Organizations worldwide experience malicious attacks on a daily basis. Most of the attacks are unstructured with little to no organization behind them such as a phishing attack or malware hidden in a downloaded file. Attacks are carried out with tools aiming to take advantage of well-known flaws and are often detected by security tools such as antivirus programs before they cause harm. However, an undetected attack can cause significant harm to an organization before it's detected and fully contained. More sophisticated attacks with a specific target are less common, harder to detect and take longer to contain. These attacks are more likely to have a catastrophic impact on an organization causing disruptions over some or all of the network. Over the last few years attackers have been targeting organizations using sophisticated ransomware, which encrypts the organizations' data and demands a ransom to decrypt it. Other attacks include cyber terrorism(aiming to cause sufficient destruction or disruption) to generate fear or undermine entities such as an organization, a region, a sector or a country.

Human error and system glitches

Cyber incidents due to human errors and system glitches can occur because of negligence, lack of implemented policies and/or process, unclear roles and responsibilities, insufficient training, misconfigurations etc. Such incidents are often identified and contained faster than disruptions caused by malicious actors. Human errors and system glitches can expose confidential data, decrease availability and put data integrity at risk.

Environmental hazards

Data centers, physical IT infrastructure and hardware are vulnerable to other hazards such as earthquakes, flooding, fires, and extreme weather that result in long lasting power outages. In the event of such hazards it is likely that the disruption to information technology will slow down the recovery time of critical communication systems, essential services and hardware. This can cause a variety of cyber incidents including loss of data and system availability and communications.

Unshielded electronic and electrical equipment is sensitive to electromagnetic pulses (EMP) and geomagnetic disturbances (GMD). An EMP is an intense burst of electromagnetic energy resulting nuclear explosion in the atmosphere whereas a GMD is a temporary disturbance of the Earth's magnetosphere caused by a solar wind shock or cloud of magnetic field that interacts with Earth's

magnetic field.[3] Whether caused by man or nature, EMP and GMD events can temporarily affect or permanently damage electronic equipment. Solar storms that affect electronic equipment are rare but have occurred in the past, impacting GPS satellite systems and signals sent to ground-based receivers.

7.2 Location

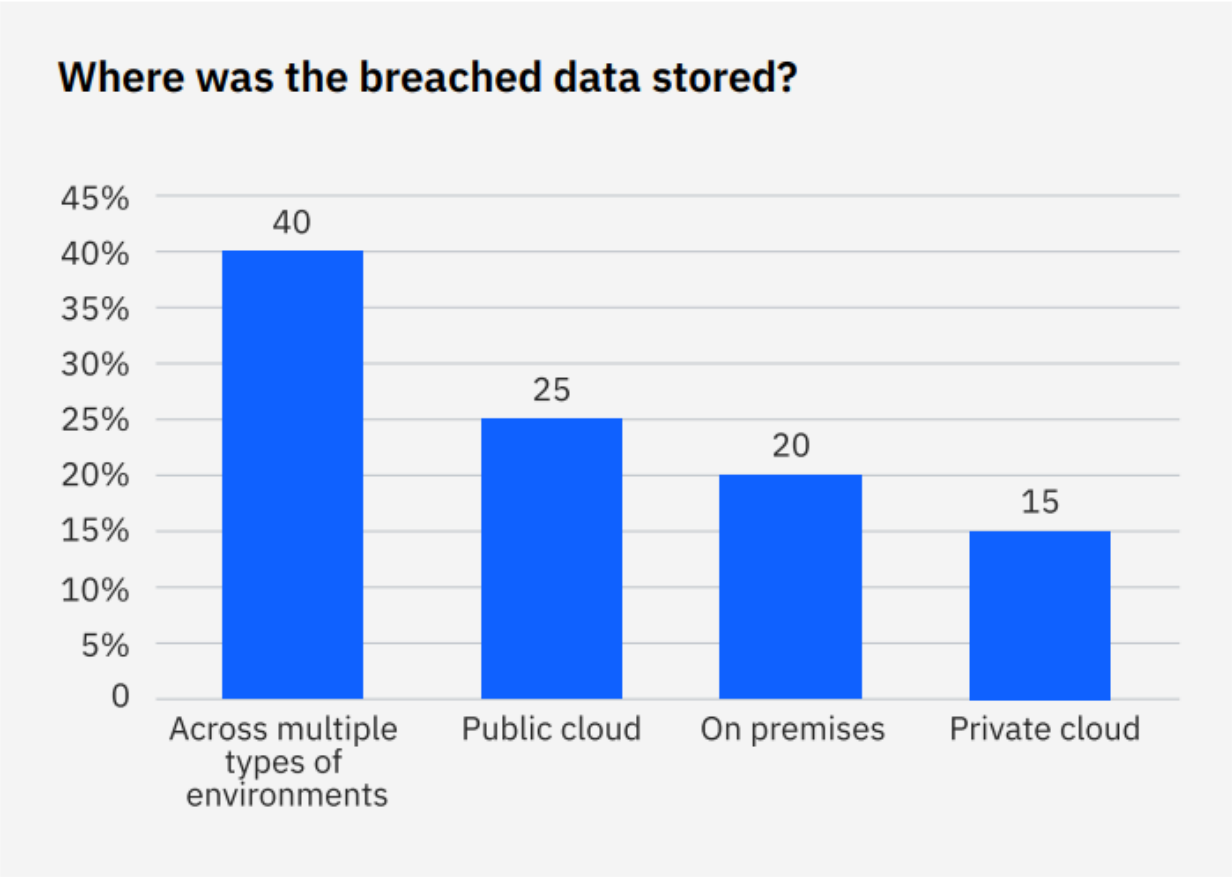
The cyber threat "landscape" is constantly evolving due to advances in technology, the growing motivation of attackers, and the expansion of attack "surfaces" across digital ecosystems. Wherever information technologies exist and are used, cyber incidents can occur. The nature of a cyber-incident differs from other types of hazards because it is inherently driven by online actions and targets digital systems, but it can also result in significant physical impacts. For instance, cyberattacks can disrupt critical infrastructure, manufacturing processes, or even cause breaches in physical security. As the digital landscape expands and technology becomes more integrated into daily operations, cyber incidents increasingly have the potential to affect both virtual and physical environments. The primary avenues of attack, or virtual locations of threat, include cloud-based, phishing, third party breaches, ransomware, and insider threats.

Cloud-Based

Regardless of where data is stored, it is always susceptible to breaches. However, some storage environments are more vulnerable and costly to breach than others. A significant number of breaches involve data that is distributed across multiple environments, including public clouds, private clouds, and on-premises systems. As organizations continuously evolve their data management strategies, they often fail to account for shadow data —data that's unmanaged and likely invisible to the IT department. This shadow data typically arises when employees use unauthorized applications or upload files to unsanctioned cloud storage locations without the organization's knowledge. In fact, approximately 40% of all data breaches are linked to data spread across multiple environments, highlighting the complexity of managing data security in hybrid and multi-cloud architectures.

[3] Department of Homeland Security, *Electromagnetic Pulse (EMP)/Geomagnetic Disturbance (GMD)* (December 2023): https://www.dhs.gov/science-and-technology/electromagnetic-pulse-empgeomagnetic-disturbance

Figure 7-2 IBM data storage type for reported data breaches, 2024



Phishing

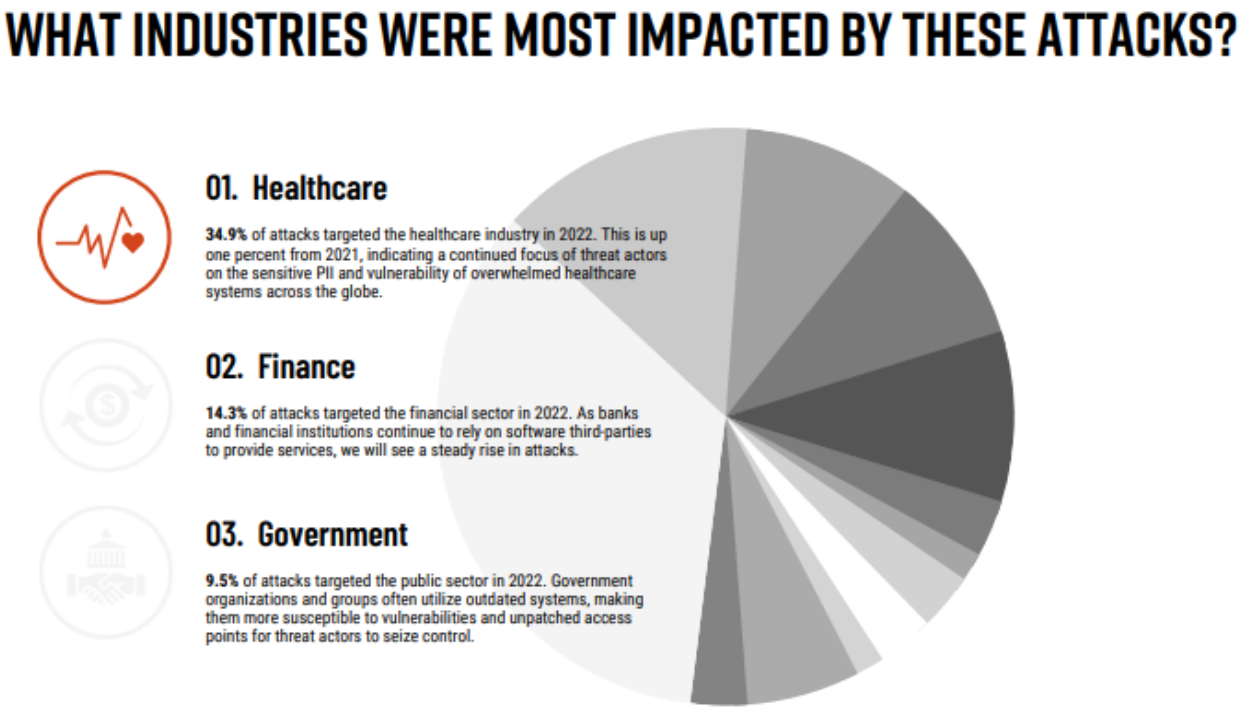
Phishing is a social engineering tactic that is used to persuade individuals to provide sensitive information and/or take action through seemingly trustworthy communications, such as through impersonations of financial institutions, IT departments, or government agencies. Phishing attacks are usually untargeted and come in the form of an email. According to the IBM, employee training continues to be an essential element in cyber defense strategies, specifically for detecting and stopping phishing attacks.[4]

Third Party Breaches

Technology vendors that provide technical, software, and healthcare services are particularly vulnerable to third-party breaches.[5] Hackers frequently exploit weaknesses in software or

[4] IBM, *Cost of a Data Breach Report* (2024): p. 23
[5] Black Kite, *Third Party Breach Report* (2023): p. 7, https://blackkite.com/wp-content/uploads/2023/01/third-party-breach-report-2023.pdf

manipulate code to gain unauthorized access. However, many organizations place undue trust in the security of the software and services they rely on, often neglecting to conduct thorough checks for vulnerabilities within their digital supply chain. In 2022, industries such as healthcare, finance, and government, which are heavily reliant on technology vendors, were particularly impacted by these kinds of attacks.



This type of breach occurred in 2020 for the Washington State Employment Service Department (ESD). The breach was traced back to Accellion, a technology provider that facilitated file transfers. At the time, many individuals were applying for unemployment benefits due to the COVID-19 pandemic, increasing the volume of sensitive data being processed. As a result, personal information of approximately 1.6 million individuals was compromised, and the ESD faced a staggering loss of $600 million due to fraudulent unemployment claims.[6]

Ransomware

Ransomware is a type of malicious software (malware) designed to deny access to a computer system or data until the victim pays a ransom. Ransomware attacks saw a significant resurgence in early 2023, with high-profile incidents affecting organizations worldwide. The United States was the most targeted country, accounting for 43% of all attacks, followed by the UK (5.7%) and Germany

[6] Kurt Schlosser, "Data breach exposes 1.6 million Washington state residents who filed unemployment claims in 2020" *Geekwire* February 2021): https://www.geekwire.com/2021/data-breach-exposes-1-6-million-washington-state-residents-filed-unemployment-claims-2020/

(4.4%). Among industries, manufacturing (19.5%), professional, scientific, and technical services (15.3%), and educational services (6.1%) were the most frequently targeted.

Manufacturing and professional service companies are often prime targets due to the valuable intellectual property and sensitive data they store, making them attractive to cybercriminals looking for high-value ransoms. Educational institutions, on the other hand, tend to hold large volumes of personal data, including information on students, staff, and research, which makes them lucrative targets for ransomware groups.

Insider Threats

While external threats often dominate discussions, insider threats, whether malicious or inadvertent, pose significant risks. Insiders could include employees, contractors, or partners/collaborators who have access to critical systems. While malicious insider attacks make up only 7% of breaches, they are often the highest cost for response and recovery averaging 4.99 million dollars.

Others

While cloud-based attacks, phishing, third-party vulnerabilities, ransomware, and insider threats are some of the most common avenues for cyberattacks, they are not the only vectors that entities should consider when planning their defenses. Table 7-1 offers a comprehensive list of various cyber threat vectors and their subtypes, including different types of malware, network and database interception, password and access control breaches, social engineering tactics, and physical/infrastructure-related threats.

Table 7-1 Cyber threat vectors used for malicious attacks

Cyber Threat Vector	Definition
Malware Types	
Advanced Persistent Threat (APT)	An attack in which the attacker gains access to a network and remains undetected. APT attacks are designed to steal data instead of cause damage.
Backdoor	An undocumented way of gaining access to a computer system. This is a security risk.
Drive-by Downloads	Malware is downloaded unknowingly by the victims when they visit an infected site.
Malware	Software or firmware intended to perform an unauthorized process that will have an adverse impact on the confidentiality, integrity, or availability of an information system. Examples include:

	• **Adware:** A form of software that displays advertising content in a manner that is potentially unexpected and unwanted by users, which may also include various user-tracking functions (similar to spyware). • **Malvertising:** Malware downloaded when the victim clicks on an affected ad. • **Ransomware:** Malware that locks a person's keyboard or computer to prevent them from accessing data until a ransom is paid, usually in Bitcoin. A popular variation of this is ransom crypto ware, which corrupts files using a private key that only the attacker possesses. • **Spyware:** Software that allows others to gain private information about a user, without that person's knowledge or consent, such as passwords, credit card numbers, social security numbers, or account information. • **Trojan horses:** A computer program that appears to have a useful function, but also has a hidden and potentially malicious function that evades security mechanisms. • **Virus:** A program or code that attaches itself to a legitimate, executable program, and then reproduces itself when that program is run. • **Worms:** A self-contained program (or set of programs) that is able to spread copies of itself to other computer systems, usually through network connections of email attachments.
Structured Query Language injection (SQLi)	Attackers use malicious SQL code for backend database manipulation to access information that was not intended to be displayed.
Zero-day exploit	An attack which occurs the same day a vulnerability is discovered in the software. The vulnerability is exploited by the attacker before it can be fixed by a patch or a permanent solution.
Network and Data Interception	
Denial-of-Service Attack (DoS)	Attacks that focus on disrupting service to a network in which attackers send high volumes of data until the network becomes overloaded and can no longer function.
Man-in-the-Middle (MITM)	MITM attacks mirror victims and endpoints for online information exchange. In this type of attack, the MITM communicates with the victim who believes they are interacting with the legitimate endpoint website. The MITM is also communicating with the actual endpoint website by impersonating the victim. As the process goes through, the MITM obtains entered and received information from both the victim and endpoint
Pharming	Arranging for a website's traffic to be redirected to a different, fraudulent site, either through a vulnerability in an agency's server

	software or through the use of malware on a user's computer system.
Password and Access Control	
Password Attacks	Third party attempts to crack a user's password and subsequently gain access to a system. Password attacks do not typically require malware, but rather stem from software applications on the attacker's system. These applications may use a variety of methods to gain access, including generating large numbers of generated guesses, or dictionary attacks, in which passwords are systematically tested against all of the words in a dictionary. Due to users reusing the same password for different systems a password attack targeting an unrelated system can give the attacker access to a more sought-after system.
Spoofing	Attempting to gain access to a system by posing as an authorized user, synonymous with impersonating, masquerading, or mimicking. Attempting to fool a network user into believing that a particular site was reached, when actually the user has been led to a false site that has been designed to appear authentic, usually for the purpose of gaining valuable information, tricking the user into downloading harmful software, or providing funds to the threat actors.
Social Engineering	
Social Engineering	In the context of cyber-security, this refers to an effort to psychologically manipulate a person, especially through misrepresentation or deception, to gain access to information. Methods of social engineering include: • **Phishing:** Malicious email messages that ask users to click a link or download a program. Phishing attacks may appear as legitimate emails from trusted third parties. • **Spear Phishing:** A form of phishing that targets a specific individual, company, or agency, usually relying on an accumulation of information to make subsequent ruses more effective when further probing the target, until a successful security breach finally becomes possible.
Physical and Infrastructure	
Physical damage	Intentional or unintentional damage to physical infrastructure such as data centers, hardware, or power grids.

7.3 Magnitude

Cyber incidents put both financial resources and sensitive information at risk. The financial impact includes costs related to downtime, remediation efforts to repair damaged systems, expert consultations, and potential ransom payments. Data loss or compromise also poses a significant threat, particularly for entities handling sensitive information such as Personally Identifiable Information (PII) or Personal Health Information (PHI). The County, for example, manages a wide range of public, sensitive, and confidential data, some of which is regulated by federal law, the Revised Code of Washington, and global compliance standards. Unauthorized, unintentional, or unanticipated disclosure of confidential data could lead to identity theft, financial loss for individuals, operational disruptions for businesses, legal action, and reputational damage for the County.

The magnitude of a cyber incident is further influenced by the duration of the event and the ability to detect and respond to it in a timely manner. Having the ability to preempt the incident and activate a well-known and effective incident response plan is also critical in reducing the duration of the event. It could take weeks, months, or even years to fully recover from a cyberattack. According to IBM's 2024 Cost of a Data Breach Report, the average time it takes a business to identify a data breach is 194 days. The average time it takes to fully contain a breach, after it has been identified, is 64 days.[7]

Scenarios

Smaller cyber incidents may have minimal impact, such as a minor configuration error discovered early, or a stolen encrypted laptop without sensitive data. These types of incidents, while disruptive, are often recoverable without significant consequences for the County's operations. On the other hand, a large-scale cyber incident, such as a ransomware attack that encrypts all or most of the County's data, can have catastrophic effects. This could lead to the loss of critical operational capabilities, economic damage, reputational harm, and even health and safety risks for the individuals living, working, or visiting the region. The County's essential services, which are crucial for public health, safety, and legal compliance, can be severely disrupted if they are unavailable for 0-72 hours after the initial attack.

A prolonged disruption to these essential services can have devastating consequences for the region. The County's essential functions, which are critical to supporting life, health, and safety, include services that must meet specific legal requirements. The loss of critical system availability, functionality, and operational effectiveness can hinder productivity and impact the performance of individuals supporting County operations. In cases where hardware, networks, servers, or backup systems are damaged by other hazards or malicious actions, recovery delays can be further

[7] IBM, *Cost of a Data Breach Report* (2024): p. 10

compounded. Moreover, if unauthorized changes are made to IT systems or data—either intentionally or accidentally—system and data integrity may be compromised. If such integrity issues are not addressed, continued use of contaminated systems or corrupted data can lead to inaccurate decisions, fraud, or further operational risks.

Vendors

The County also relies on SCADA (Supervisory Control and Data Acquisition) systems, which are used to control infrastructure and facility processes, including wastewater treatment and airport operations. Cyber incidents targeting these critical systems could have severe consequences, including environmental, health, safety, and financial risks for the region.

Not all IT systems utilized by the County are managed internally; the County also relies on third-party vendors and partners who may be exposed to cyber threats. Disruptions within these external organizations can also affect the County's operations, underscoring the importance of securing the entire ecosystem of stakeholders to minimize cyber risk.

Cyber Resiliency

As cyber threats evolve, entities must continually update their security posture. Due to the complexity of the cyber threat landscape, a comprehensive, multi-layered approach to defense is essential. Cyber defense can be broken down into five phases: (1) identification, (2) protection, (3) detection, (4) response, and (5) recovery strategies. To mitigate the risk of cyber incidents, it is crucial to manage threats and vulnerabilities by investing in network protection and malware detection, developing incident response plans and exercises, providing employee training, and establishing backup systems.

The Cybersecurity and Infrastructure Security Agency (CISA) is the Nation's risk advisor, partnering with industry and government to understand and manage risk to our Nation's critical infrastructure. They coordinate security and resilience efforts using trusted partnerships across the private and public sections and deliver technical assistance and assessments to federal stakeholder as well as to infrastructure owners and operators nationwide. Their CISA Resource Hub offers a range of cybersecurity assessments that evaluate operational resilience, cyber security practices, organizational management of external dependencies, and other key elements of a robust and resilient cyber framework.

7.4 Previous Occurrences

Cyber incidents occur daily across the globe. The quantity of information being stolen by malicious attackers, destroyed or exposed as a result of a human error, or made unavailable due to a system glitch is growing each year. King County is the recipient of a constant variety of attacks ranging from scans for weaknesses in our defenses, malware, phishing, and internet-based attacks, as well as

insider threats. In recent years, we have seen a rise ransomware. Table 7-2 comprises local, state, national, and international events and exemplifies consequences of cyber-incidents.

Table 7-2 Notable cyber-attack events, 2014 – 2024

Year	Location/Affiliation	Vector	Description
2014	Washington State	Human error	Washington State experienced a six hour long 911 system outage due to human error.
2014	United States	Malicious insider threat	280,000 AT&T accounts were breached by insiders who accessed user information with malicious intent.
2015	United States	Third-party breach	The Office of Personnel Management (OPM) experienced a malicious attack resulting in over 20 million compromised personnel records.
2016	United States	Third-party breach	The US Special Counsel Robert S. Mueller, III investigated Russia's interference in the 2016 presidential election. Known as the Mueller Report, the investigation states Russians hacked into the Democratic National Committee and released documentation through the media organization WikiLeaks.[8]
2017	Global	Hazard	A geomagnetic storm affected power grids and radios.
2017	University of Washington	Human error	The University of Washington suffered a HIPAA data breach exposing the information of nearly 1 million patients due to human error.
2019	Washington State	Ransomware	The City of Sammamish was targeted by a ransomware attack that shut down many of the city's online services, requiring the city manager to declare an emergency and request support from law enforcement and King County IT, as well as hire a tech company to help resolve the crisis.

[8] Special Council Robert S. Muller III, *Report On The Investigation Into Russian Interference In The 2016 Presidential Election,* v. I of II (March 2019): p. 1, https://www.justice.gov/archives/sco/file/1373816/dl?inline=

2020	WA Employment Security Department (ESD)	Third-party breach	Personal information of more than 1.6 million people who filed for unemployment claims through ESD was compromised in 2020. The Office of the Washington State Auditor attributed the breach on a third-party software provider named Accellion, whose services are used to transmit computer files. The state Employment Security Department (ESD) lost $600 million to fraudulent unemployment claims.[9]
2023	Pierce College District	Human error	Personal data belonging to more than 155,000 former Pierce College students and staff was leaked on the dark web after a cyber attack. It was the third-largest data breach in Washington state that year.[10]
2024	City of Newcastle, WA	Ransomware	The City of Newcastle had fallen victim to a ransomware attack orchestrated by the cybercriminal group RansomHub. The attackers have claimed possession of the city's confidential data and threatened to publish or sell the stolen data if the city did not respond to their demands.[11]
2024	Port of Seattle	Ransomware	The Port of Seattle isolated its critical systems after the port identified system outages consistent with a cyberattack. The investigation determined that the unauthorized actor was able to gain access to certain parts of its computer systems and was able to encrypt access to some data. As the port refused to pay the ransom, it is feared that the attacker may post allegedly stolen data on the dark web.[12]

[9] Kurt Schlosser, "Data breach exposes 1.6 million Washington state residents who filed unemployment claims in 2020" *Geekwire* February 2021): https://www.geekwire.com/2021/data-breach-exposes-1-6-million-washington-state-residents-filed-unemployment-claims-2020/

[10] Shea Johnson, "Pierce College cyberattack exposed 155,000 people's data. Is the district at fault?" *The News Tribune* (November 2023): https://www.thenewstribune.com/news/local/article281698368.html

[11] Halcyon, *RansomHub Ransomware Attack Threatens City of Newcastle, Washington's Data Security* (July 2024) https://www.halcyon.ai/attacks/ransomhub-ransomware-attack-threatens-city-of-newcastle-washingtons-data-security

[12] Syed Rakin Rahman, "Port of Seattle shares details of a cyberattack" *Port Technology International* (September 2024): https://www.porttechnology.org/news/port-of-seattle-shares-details-of-a-cyberattack/

2024	Seattle Public Library	Ransomware	The Seattle Public Library's experienced a ransomware attack that took down their systems, internet, public computers, and library catalog at all 27 locations throughout the city.[13]
2024	Highline School District	Ransomware	School district within Seattle, WA identified a form of ransomware on their network which shutdown their systems. A third-party cybersecurity forensic specialist and launched an investigation which is ongoing.[14]

7.5 Probability of Future Occurrences

Unlike natural hazards, cyber threats cannot be predicted at regular intervals. However, as our digital reliance increases so will vulnerabilities that can be exploited by threat actors. In mitigating these vulnerabilities, organizations are faced with choices regarding response to ransomware threats. Best practices dictate not paying ransomware attackers the sums of money they request. This is thought to decrease the risk of future occurrences by potentially removing financial gain as a viable option for the target.

With increased digital reliance comes increased and evolving technological advancements. Artificial Intelligence makes its way into daily operations for many organizations. While AI can decrease the gap of necessary skilled professionals in cybersecurity and increase efficiency in the detection and response process, it can also decrease the barrier to entry for attackers. Language models make producing phishing messages simple for threat actors.[15] Inputting sensitive data into AI models can also pose a risk to organizations as how this data is used and reused by AI models is not well accounted for. Due diligence is needed to ensure companies providing AI services have adequate protection for the data inputted into their models. This may contribute to frequency of cyber threat occurrences in the future.

[13] Keely Quinlan, "Seattle Public Library ransomware attack to cost $1M, officials say" *Statescoop* (September 2024): https://statescoop.com/ransomware-attack-seattle-public-library-2024/
[14] Highline Public Schools, "Incident FAQS" *Departments/Communications* (2024): https://www.highlineschools.org/departments/communications/incident-faqs
[15] IBM, *Cost of a Data Breach Report* (2024): p. 6

7.6 Climate Change Considerations

Artificial Intelligence impacts to carbon emissions and water usage make it a contributor to climate change. As natural disasters, storms, and hazards increase in frequency, vulnerabilities in critical infrastructure impacted by these hazards also increase.

7.7 Impact Assessment

Public	Anyone who is present in King County during a cyber-incident can be impacted. Impact on residents may include: delayed services such as transportation, impaired or cancelled healthcare services, decreased or no availability of public services, information, and financial loss and exposed or lost information.
Responders	Emergency responders may not be able to access their mission critical system, and therefore experience delays or performance issues. If data confidentiality is lost the public may lose their trust in the response organization and system. If data integrity is lost it may put patients and first responders at risk. King County may experience a prolonged incident response if the disruption is long lasting, complex and exhausting internal resources.
Continuity of Operations	Minor cyber incidents which are identified early and are recoverable may have some impact on daily operations before being fully contained but won't lead to significant loss of operations. A significant incident impacting one or more functions and businesses can severely affect the County's capability to perform critical operations. However, not all daily operations are critical. The County has defined its essential services, which need to become operational within 0-72 hours after disruption to ensure the organizations capability to maintain critical healthcare, safety, legal and regulatory needs. **In the event of a cyber-incident which render a non-critical service unavailable the County may lose revenue, experience loss of productivity and risks losing data over time.**
Property, Facilities, and Infrastructure	**Property** Cyber incidents can cause physical damage if property such as facilities, devices, infrastructure, or end consumers are affected by the disruption. An incident including utilities, life support devices, transportation or telecommunications may lead to extensive property damages.

Facilities

Last years' cyber incidents including ransomware attacks, distributed denial of service attacks, system glitches and human error in healthcare systems all demonstrate that cyber incidents are capable of triggering emergencies that impact patient care and public health. If an agency cannot access its own EHR, patient care could be delayed or hindered. Furthermore, if other critical healthcare related systems and devices can't be accessed or data integrity can't be guaranteed, patient safety will be at risk.

Infrastructure

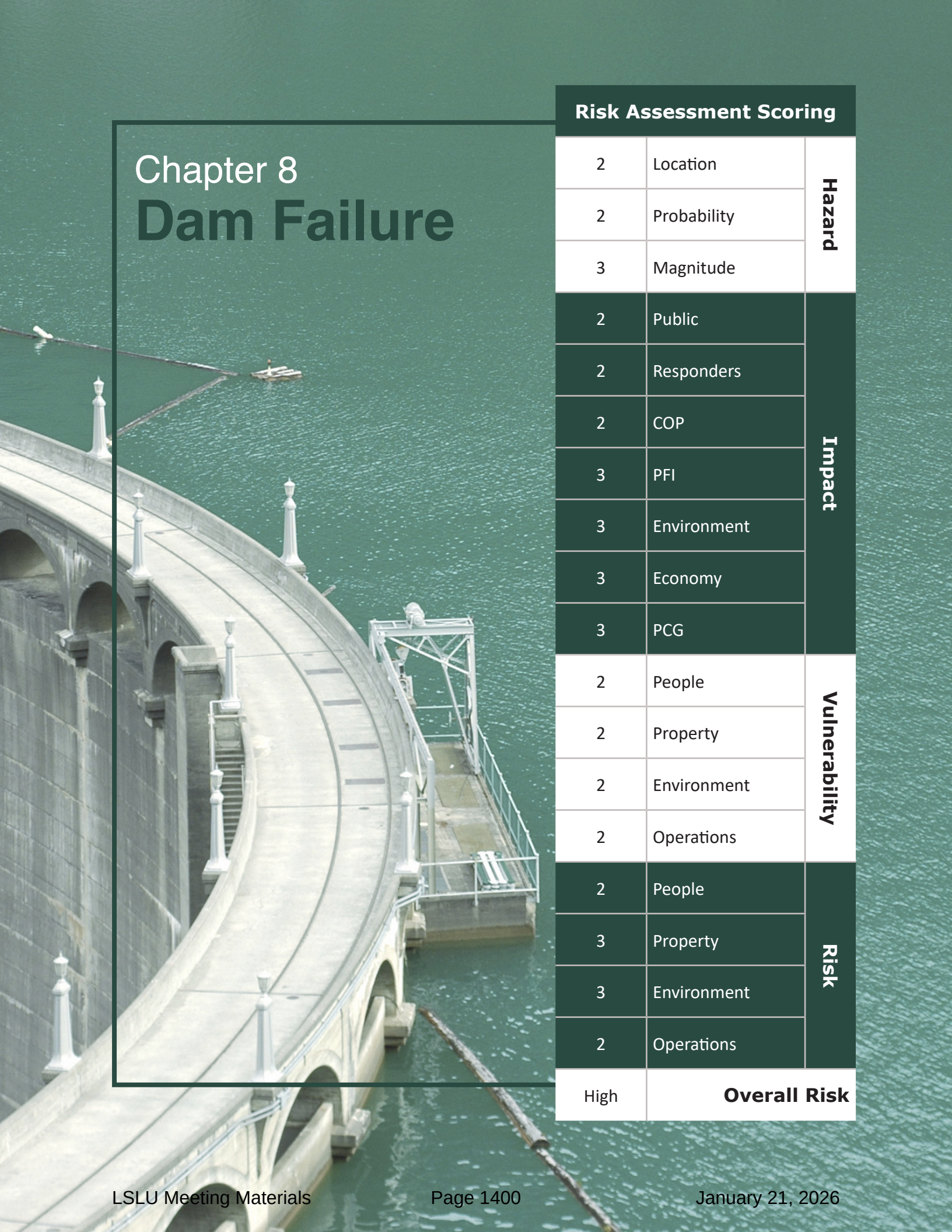
- Energy – Information technology has a direct dependency to energy. A hazard impacting the power system can therefore have a secondary effect on the County and lead to a cyber-incident due to loss of power to devices rendering systems and data unavailable, loss of power to cooling systems which can cause overheating and fires in server rooms and data centers. Critical infrastructure has backup generators. Ensuring fuel delivery during long lasting power outages for the generators is critical.
  A cyber incident impacting King County and no other organization should not have an effect on the energy system.
- Water/Wastewater – Both water and wastewater facilities and infrastructure are vulnerable to cyber incidents on their SCADA systems, which can result in the release of hazardous material and system malfunctions. Such scenarios can result in environmental impact and create health and safety risks in the region.
- Transportation – Transportation systems are vulnerable to attacks on their SCADA systems, which may result in trains and vehicles not operating as planned, airport functionality issues, delays, and cancellations which can result in a secondary economic impact in the region due to loss of productive if people can't access public transportation to and from work.
- Communications – The County relies on different types of technology-based communications methods such as its website, VOIP and email to conduct its daily operations. A cyber incident impacting the VOIP or email system would quickly result in a loss of productivity, a negative consumer experience and could potentially halter or delay some of the County's operations.

Environment	The loss of control or availability of the County's SCADA systems could potentially impact the environment in the region if, for example, it causes the release of hazardous materials or improper disposal of wastewater.

Economy	The financial impact of a cyber-incident ranges from little or minimal to significant depending upon duration, scale, affected systems, devices and users. A significant, extended cyber incident affecting most or all of the County's operations would likely impact the local and possibly regional economy for some time. An incident of that magnitude would likely create significant, potentially long-term or ongoing challenges to the County's ability to fund essential services and activities related to Executive priorities. Organizations who experience cyber incidents which leads to data breaches of sensitive or confidential information can be subjects to legal fines and financial penalties if, for example, Personal Healthcare Information (PHI) is lost or exposed or personal identifiable information including social security numbers, credit card information or driver's license information is breached. Organizations who fail to meet regulatory and contractual obligations due to a cyber-incident may have significant cost for legal fees, settlements, and fines.
Public Confidence in Governance	Recent cyber-incidents involving government agencies such as the ransomware attack on the City of Atlanta shows that such large-scale disruption generate National media interest; third party actions; jeopardizes perceptions of effective operations, Executive priorities, and public confidence.

7.8 Vulnerability Assessment

Vulnerable Populations	Individuals who have a direct dependency on King County for health and safety reasons are vulnerable to cyber incidents impacting their needed services. Other vulnerable populations include individuals and organizations who depend on an income from the County if payments can't be processed, who are dependent on critical public services or County provided transportation.
Property	**Critical SCADA Systems** Industrial control systems which are used to control infrastructure and facility-based processes such as wastewater treatment and airports.
Environment	If SCADA systems were to become compromised, ecosystems could become vulnerable to the release of hazardous material. This impacts waterways, soil, and vegetation.
Operations	Facilities such as data centers and incident response facilities. The County has identified a number of essential services which are critical to support life, health, safety and legal requirements in the region. Although separate communication systems can be utilized in the event of a severe incident the County still relies on its communications systems for daily operations.



Chapter 8
Dam Failure

Risk Assessment Scoring		
2	Location	Hazard
2	Probability	
3	Magnitude	
2	Public	Impact
2	Responders	
2	COP	
3	PFI	
3	Environment	
3	Economy	
3	PCG	
2	People	Vulnerability
2	Property	
2	Environment	
2	Operations	
2	People	Risk
3	Property	
3	Environment	
2	Operations	
High	**Overall Risk**	

Chapter 8: Dam Failure

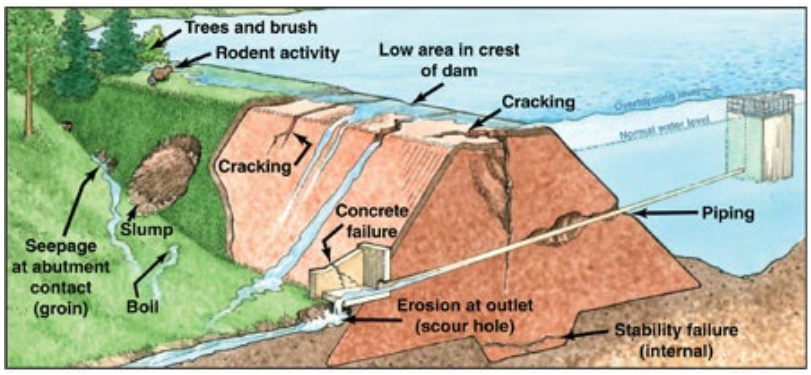
8.1 Hazard Description

Dam failure is an uncontrolled, often times, rapid release of water from an impoundment.[1] The impact of failure varies on factors such as impoundment size, steepness, land use downstream of the dam, and speed of failure. For larger dams, failure is characterized by a flood wave with high velocities. Smaller dams may only raise water levels slightly and slowly. The result of a dam failure can result in loss of life, property, infrastructure damage, public health impacts, safe drinking water, and environmental degradation within the inundation zone, but may have secondary effects on populations outside of the flooded area.

King County has 127 dams that serve in a variety of ways, agriculture, hydroelectric power generation, flood control, and recreation. All but eleven of these dams are embankment-type dams. Contrary to the popular images of dams like the Hoover dam, these dams are smaller and are typically made of a mixture of compacted materials such as soil, clay, and rock. A semi-pervious outer covering with a dense impervious core gives embankment dams their ability to resist seepage and water pressure. The other dams are made of concrete.

Dams fail for a variety of reasons, but the four most common are:[2]

- **Overtopping,** 34% - caused by the reservoir reaching capacity and water spilling over the top of a dam.
- **Foundation defects,** 30% - caused by settlement and slope instability.
- **Piping and seepage**, 20% - when water travels through the dam and causes internal erosion.
- **Conduits and valves,** 10% - Piping of embankment material into the conduit through joints or cracks.



[3]

[1] Tetra Tech. 2017. King County Dam Safety Emergency Planning Gap Analysis Report. Page 10.
[2] Washington State Department of Ecology – Water Resource Program – Dam Safety Office. Accessed 8/28/2019. https://ecology.wa.gov/Water-Shorelines/Water-supply/Dams/Emergency-planning-response/Incidents-failures.
[3] Washington State Department of Ecology – Water Resource Program – Dam Safety Office. 2018. Status of High and Significant Hazard Dams. Page 6.

Causation

Dam failure events are infrequent and may coincide with other events, such as earthquakes, landslides, excessive rainfall, wildfires, lahars and snowmelt. The average age of dams in King County is 47. As infrastructure ages, increased spending is needed to maintain its integrity. Following is a selection of events that may cause a dam to fail.

Table 8-1 Causation of dam failure by hazard events

Causation	Description
Earthquake[4]	Earthquakes can result in damage or failure of a dam. Earthquake effects on dams mainly depend on dam types. For example, the 2011 Tohoku Earthquake damaged 48 dams, causing one embankment type dam to fail[5]. Safety concerns for embankment dams subjected to earthquakes involve either the loss of stability due to a loss of strength of the embankment and foundation materials or deformations such as slumping, settlement, cracking and planer or rotational slope failures. Dams are engineered to withstand the Maximum Considered Earthquake, but older dams may have been engineered before we fully understood the earthquake risk in the region.
Climate Change[6]	While dam failure probabilities are low. The chance of flooding associated with changes of dam operation in response to weather patterns is higher. Dam designs and operations are developed in part from hydrographs and historical records. If weather patterns experience significant changes over time due to the impacts of climate change, the dam design and operations may no longer be valid for the changed condition. Release rates and impound thresholds may have to be changed. This would result in increased discharges downstream, thus increasing the probability and severity of flooding.
Landslides[7]	The integrity of a dam or reservoir can be affected by a landslide if they fail or move. Landslides can be triggered by heavy rainfall, snowmelt, reservoir drawdown, or earthquakes. Landslides can occur upstream in the reservoir, in a canyon downstream of a dam, or within the abutment of a dam. A landslide into the reservoir can generate a wave large enough to overtop a dam. Sloshing back and forth in the reservoir can

[4] KUOW. Seattle's Faults: Maps that Highlight Our Shaky Ground. Accessed 8/29/19. http://archive.kuow.org/post/seattles-faults-maps-highlight-our-shaky-ground
[5] International Commission on Large Dams. 2013. The 2011 Tohoku Earthquake and Dams. Page 9.
[6] Climate Impacts Group - University of Washington. 2018. New Projections of Changing Heavy Precipitation in King County. Page 40.
[7] Washington State Department of Natural Resources. Geological Portal Information. Accessed 8/28/2019. https://geologyportal.dnr.wa.gov/#natural_hazards

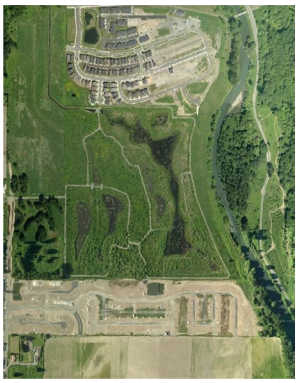
	result in multiple waves overtopping the dam. If the waves are large enough, there could be downstream consequences just from a wave overtopping the dam even if it doesn't fail. If enough large waves overtop an embankment dam or a concrete dam with erodible abutments, a failure could potentially result[8]. Some dams in the County have been built abutting a landslide. Often, these are ancient landslides that have stopped moving or are moving very slowly. However, if a landslide moves far enough, it can crack the core of an embankment dam, resulting in pathways for internal erosion to initiate, or disrupting the abutment support of a dam, resulting in failure.[9]
Wildfires[10]	Many of the County's highest hazard dams lie within wildfire-prone areas. Wildfires can damage dams, such as Eightmile dam near Leavenworth, directly by burning the surface of the dam or spillway and damaging other facilities at the dam. But the main threat from wildfires is how the surrounding watershed behaves. Heavy rains in a burned area can create: • More and faster runoff from rainfall events, especially high-intensity storms. • Large amounts of sediment, which may reduce storage capacity in a reservoir. • Debris flows (mudslides) or downed timber, which may obstruct access to the dam. • Debris flows from hill slopes near spillways, which may obstruct spillways. • More floating debris (dead trees, branches, sticks) in a reservoir, which may obstruct spillways[11]

[8] U.S Department of the Interior: Bureau of Reclamation. 2015. Risk Management: H-2 Landslide Risks. Page 1.
[9] Quartz. 2015. The World's Biggest Hydro Power Project May Be Causing Giant Landslides in China. https://qz.com/436880/the-worlds-biggest-hydropower-project-may-be-causing-giant-landslides-in-china/
[10] NW News Network. 2019. Eightmile Dam Near Leavenworth Has New Spillway, Is Being Monitored. https://www.nwnewsnetwork.org/post/eightmile-dam-near-leavenworth-has-new-spillway-being-monitored
[11] Washington State Department of Ecology - Water Resources Program - Dam Safety Office. 2015. Focus on Dams and Wildfires. Page 1.

Additionally, new development, outside of the 100-year flood plain, continues in dam inundation zones, meaning the population-at-risk from dam failure will continue to rise. Below shows development outside of the floodplain, but within a dam failure inundation area.



Green River 2009



Green River 2012

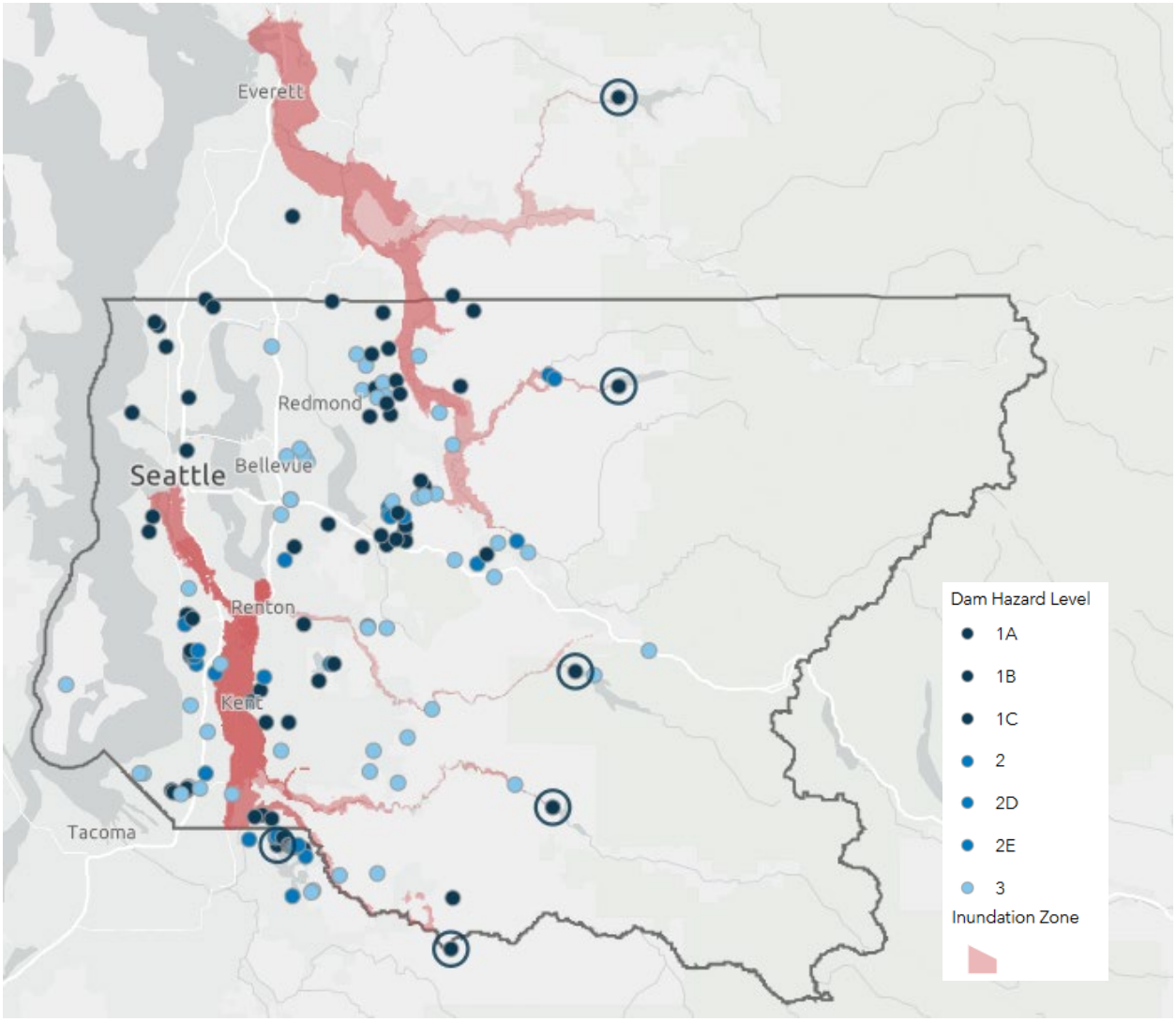


100-Year Floodplain

8.2 Location

There are a total of 127 dams located within King County, with an additional 20 dams situated outside, though their inundation zones extend into the county. Figure 1-1 illustrates all identified dams in the county, color-coded from dark blue to light blue. The darker blue shades represent higher hazard classifications, while the lighter blue indicates lower hazard classifications. The six dams marked with circles are classified as "Significant Dams" due to their potential impact, if they were to fail.

Figure 8-2 Dams in King County



Howard A Hanson

Howard Hanson, constructed in 1961, is a federally owned and operated dam by the United States Army Corps of Engineers. Its primary purpose is to provide flood control in the winter and fish enhancement in the summer. It dramatically reduced the amount of flooding that the Green River Valley experienced before its construction.

The right abutment of the dam is the toe of a large landslide. Seepage problems can occur for dams built into landslides. As mentioned previously, landslide activity can pose a serious risk to dams. Many mitigation actions have been taken to reduce risk at the dam, such as a gravel blanket and additional vertical and horizontal drains in the drainage tunnel have all drastically improved the safety of the dam. If preventative actions are not taken, internal erosion could fail the dam.

South Fork Tolt Dam

The South Fork Tolt Dam is owned and operated by the City of Seattle. It is a hydroelectric dam that also provides drinking water for 30% of 1.3 million people across the greater Seattle area. South Fork Tolt Dam is a large embankment type dam, equipped with a morning glory spillway.

The Tolt dam has known landslide hazards below the dam, and above the reservoir. If a slide were to occur below the dam, the slide may create a dam of its own. Engineers would need to evaluate what action should be taken. The Tolt Dam would have to lower the amount of flow downstream why the risk is being assessed. Additionally, if a slide were to occur in the reservoir, an overtopping wave may be generated that could cause the dam to fail or send a flood wave downstream.

Mud Mountain Dam

Mud Mountain Dam is a United States Army Corps of Engineer owned and operated dam on the White River. Its primary purpose is to provide flood control for nearly 400,000 residents in King and Pierce Counties. Typically, there isn't a reservoir being impounded by the dam. During heavy rains or times of snowmelt, engineers will impound the water and slowly release it downstream to avoid flooding residents.

The White River is a glacial river fed by Mt. Rainier. This leaves the possibility that a lahar, triggered by an earthquake, volcanic activity, or heavy rains could cause a debris flow that would block the intake structure on the dam. Such an event would decrease the storage capacity of the reservoir and cause flows to travel over the spillway. The loss in flood control capabilities on the White River would leave the Green, White, and Puyallup River Valleys susceptible to flooding.

Culmback Dam

Situated in Snohomish County, but inundating a portion of the King County's Lower Snoqualmie Valley, the Culmback Dam is owned and operated by Snohomish Public Utility District One. Culmback offers hydroelectric power generation, flood control, drinking water, and recreational benefits to the region.

Culmback Dam's morning glory spillway is designed to maintain adequate levels of freeboard in maximum probable flood events. Changes in hydrology affect the amount of water a dam would need to convey downstream to keep it from failing. Culmback Dam's watershed lies within a densely forested area that slows the speed in which water enters the reservoir, prevents sediment from entering the reservoir, and prevents debris flows. A wildfire around the dam would increase the hydrologic strain on the dam. An increased flow could be compensated with larger releases from the dam but would result in flooding of the Town of Sultan. If not, enough water could be discharged, an overtopping scenario at the dam would prove very dangerous.

Lake Tapps

Lake Tapps is a reservoir that sits in Pierce County made up of a system of dikes. If particular dikes were to fail, they would inundate Auburn and portions of the Green and White River Valley. Lake Tapps was built by Puget Sound Energy in 1911 and ran a hydroelectric program until 2004. Lake Tapps was purchased by Cascade Water Alliance in 2009 who currently owns and operates the reservoir. Its primary function is to provide drinking water to a group of contracting King County cities and water districts.

In addition to providing drinking water, Lake Tapps is also a residential community, many of whom use the Lake for recreational purposes. While residents are instructed to stay off the dikes, there is no physical security to keep individuals from accessing the structure. Many dikes have publicly accessible roads. Acts of terrorism or sabotage could pose a serious threat to the integrity of the levees.

Madsen Creek Flow and Water Control Pond

Madsen Creek Pond is a King County-owned dam. Constructed in 2008, its primary purpose is to provide flood control in extreme rainfall events. There is oftentimes no impoundment behind the dam in Summer months when there isn't consistent rainfall.

Madsen Creek Pond is designed to store runoff from a 100-year 24-hour storm and still maintain freeboard necessary to prevent flooding downstream. While the dam is comparatively very young as climate patterns become more unpredictable, Madsen Creek Pond and other dams may need to be retrofitted to accommodate the change in probable maximum precipitation. If actions were not taken to adjust to the new hydrology, chances of failure from an overtopping situation or an uncontrolled release would become higher.

Cedar Falls Project Masonry Dam

While there have been fewer failures of concrete dams than earthen dams in general[12], this doesn't mean that failure is unrealistic. The Masonry dam sits near the Rattlesnake Mountain Fault. While concrete dams have escaped failure in earthquake scenarios, minor damage has been observed. The Masonry Dam would need to be assessed for damage after an earthquake for cracking or other deficiencies in the structure or supporting structures. If deficiencies are noted, action must be taken to ensure that the dam doesn't fail. Earthquakes can also trigger landslides around the dam. Finally, large earthquakes can devastate communities, created a resource-scarce environment, potentially making it more difficult to find resources.

[12] Association of State Dam Safety Officials. 1989. Failure of Concrete Dams. Page 4.

8.3 Magnitude

The impact of a dam failure depends on factors such as the size of the impoundment, the steepness of the terrain, downstream land use, and the speed of failure. For larger dams, failure typically results in a fast-moving flood wave with high velocities. In contrast, smaller dams may only cause a gradual rise in water levels. The consequences of a dam failure can include loss of life, property damage, destruction of infrastructure, public health risks, contamination of drinking water, and environmental harm within the inundation zone. Additionally, there may be secondary effects on communities and ecosystems outside the flooded area.

While there are 127 dams in King County, there are 21 other dams situated in neighboring counties that impact the County if they were to fail. Out of the 147 total dams, 94 threaten human life.

Table 8-2 Dam hazard classification

Hazard Class	Number
1A = High – Greater than 300 lives at risk	10
1B = High – 31 to 300 lives at risk	18
1C = High – 7 to 30 lives at risk	42
2* = Significant – 1 to 6 lives at risk	17
2D = Significant – 1 to 6 lives at risk	7
2E = Significant – Environmental or economic impact	3
3 = Low – No lives at risk	50

* Legacy classification, parsing all 2's into 2D's and 2E's [13]

the KCOEM Dam Safety program consists of creating response plans for high hazard dams in the community, educating at-risk populations of the threat of dam failure, and connecting poor condition dams to resources that are available for repair or removal of the dam. The King County Emergency Management Dam Safety Officer works closely with Washington State Department of Ecology's Dam and Wells Manager to share information and create a regional effort to heighten dam safety in the County. The information on dams in the hazard profile are from the State Department of Ecology's Inventory of Dams. The Washington State Department of Ecology Dam Safety Office (DSO) is the regulating body over non-federal dams that impound at least 10-acre feet of water in the State of Washington. The DSO permits all new dam construction, inspects all high and significant hazard dams every 5 years, and requires that all deficiencies be remedied.

8.4 Previous Occurrences

King County has high hazard 1A dams that sit on the Green, White, Cedar, and Tolt Rivers. Additionally, Culmback dam in Snohomish County would flood parts of the Lower Snoqualmie

[13] Washington State Department of Ecology - Water Resources Program - Dam Safety Office. 2019. Inventory of Dams Report.

Valley. The Green, White and Lower Snoqualmie Valleys are the areas of greatest concern for dam failure. Smaller privately owned and government dams are also a concern, as they may not have access to funding streams that other larger municipal governments do.

Four dam failure incidents have occurred in King County; they account for all lives lost due to dam failure in Washington State:[14]

Table 8-3 Previous dam failure events

Date	Dam Name	Description
December 1918	Masonry Dam	Located near North Bend, Masonry Dam had excessive seepage, which caused a mudflow, destroyed a railroad line and damaged the village of Eastwick; no lives lost. Now referred to as the "Boxley Burst".
February 1932	Eastwick RR Fill	The failure was caused by a blockage in the culvert. Resulting in the destruction of the town of Eastwick and the loss of 7 lives.
January 1997	N. Boeing Creek Dam	Failure from damage caused by seepage resulted in water running into an intersection and detention pond.
January 2009	Howard Hanson Dam	Two depressions were discovered in the right abutment of the United States Army Corps of Engineers' Howard Hanson Dam. While repairs were being conducted, there was a 1 in 3 chance of a 25,000 cfs release down the Green River which would have caused significant flooding. The USACE was able to fully fix the dam by 2011 before a substantial flood ensued. King County and local jurisdictions spent $30 million on flood protection that wasn't reimbursed by FEMA.[15]
January 2009	Mud Mountain Dam	Mud Mountain Dam, owned and operated by the USACE, released a higher than usual flow down the White River during a heavy rain event. As a result, 100 homes were flooded. Since then, King County Flood Control District, Washington State, and Pierce County jointly funded a levee setback to reduce the risk of flooding and increase habitat restoration[16].

[14] Washington State Department of Ecology - Water Resources Program - Dam Safety Office. 2019. Washington State Notable Dam Failures and Incidents.
[15] Seattle Times. 2011. FEMA won't pick up $30 million tab to prepare for flooding. https://www.seattletimes.com/seattle-news/fema-wont-pick-up-30-million-tab-to-prepare-for-flooding/
[16] King County Department of Natural Resources and Parks – Water and Land Resource Division. 2018. Lower White River Countyline Levee Setback Project. https://www.kingcounty.gov/depts/dnrp/wlr/sections-programs/river-floodplain-section/capital-projects/lower-white-river-countyline-a-street.aspx

In King County, levees have a long history of damage and sediment problems resulting in costly repairs. Notable levee damage that has occurred since 2013 includes:

- Two flood events in November 2015 and December 2015 caused widespread impacts in King County, especially along the South Fork Skykomish River, Snoqualmie River, Tolt River, and Green River. These events resulted in the following levee damage:
    - South Fork Skykomish River – Levee armor eroded from Town of Skykomish Left Bank Levee.
    - North Fork Snoqualmie River – A total breach of the Shake Mill Left Bank Levee occurred, but no private property or infrastructure was damaged.
    - Middle Fork Snoqualmie River– Damage to the levee face of the Mason Thorson Extension Levee.
    - South Fork Snoqualmie River – Damage to the face of the Reif Road Levee.
    - Tolt River – Face rock was displaced from the Girl Scout Camp and Frew levees.
    - Green River – Scour and slumping along the Tukwila 205 Levee.

- A significant flood event in January – February 2020 damaged numerous flood protection facilities along the Cedar River, Green River, and Issaquah Creek, including:
    - Cedar River – Damage to the Belmondo Levee (which protects a regional fiber optic line, a regional trail, and a state highway) and erosion and scour at the Orchard Grove, Royal Arch, McDonald, Jan Road, and Getchman levees.
    - Green River – Erosion at the Fort Dent Levee, seepage and ponding at the Desimone and Briscoe School levees, and cracking in the crest of the McCoy Levee.

Issaquah Creek – Erosion at the State Route 18 Upstream and Downstream levees.

8.5 Probability of Future Occurrences

The likelihood of a dam failure in King County is very low. While the county's location near the Juan de Fuca Plate and Puget Sound Faults does lead to more frequent earthquakes than other parts of the U.S., the risk of dam failure from seismic activity is still minimal. Many of the dams in King County are relatively new, which reduces the chance of structural damage. Additionally, all large, high-hazard dams in the area are closely regulated by the Federal Energy Regulatory Commission (FERC) and other agencies. These organizations ensure that dams are properly maintained and that operators are prepared for potential emergencies, such as flooding.

8.6 Climate Change Considerations

Climate change introduces several factors that can increase the risk of dam failure. Wildfires, for example, can heighten the likelihood of landslides and sloughing, creating cascading hazards. Additionally, debris runoff from fires can lead to post-fire sedimentation and siltation in downstream dams. Warmer water temperatures, a direct result of climate change, can contribute

to soil saturation, increasing the risk of dam seepage. The earlier spring thaw and changing snowmelt patterns may also cause higher flow rates, placing additional stress on dams.

Heavy rainfall events can lead to erosion and scouring near dams, exacerbating runoff and increasing water pressure, while rising temperatures lead to faster evaporation, which may weaken dam structures over time. Both extreme heat and cold can further damage the structural integrity of dams. Finally, the increasing frequency and intensity of precipitation events elevate the risk of dam overtopping and complicate freeboard management, making it harder to ensure the dam's safety in extreme weather conditions.

8.7 Impact Assessment

With all the dams in the county, only a small amount of information can be shared here due to "For Official Use Only Designation". Another reason is that there is a lack of in-depth study done on dam failure impacts to King County. The best and most available estimates for dam failure damages/impacts are from the potential high release scenario at Howard Hanson Dam in 2009. Examples provided here relate to those studies.

Public	As the Green River Valley experience drastic differences in day time/night time population being an economic hub. The number of people that would need to be evacuated could drastically differ from the numbers identified in the hazard classification. An estimate in 2009 put a 25,000 cfs release from Howard Hanson triggering an evacuation on the scale of 200,000 to 300,000 people.[17]
Responders	Kent, Pacific, Seattle, Renton Regional Fire Authority, Valley Regional Fire Authority, and Eastside Fire and Rescue all have fires stations within dam inundation areas. Auburn, Algona, Pacific, Kent, Seattle, State Patrol Crime Lab, and King County Sherriff all have stations in dam failure inundations.
Continuity of Operations	Auburn, Kent, Tukwila, Carnation, Pacific, and Algona all have city halls within inundation areas. Courts, the County Elections office, King County Regional Justice Center in Kent where Superior Courts, Adult Detention, and other county agencies are located within dam failure inundation areas as well.

[17] Seattlepi. 2019. 300,000 might have to evacuate if Green River Floods. https://www.seattlepi.com/seattlenews/article/300-000-might-have-to-evacuate-if-Green-River-889468.php

Property, Facilities, Infrastructure

Dam Name	Residential Buildings Impacted in King County (Full Pool Failure)	Estimated Impacted in King County (Sunny Day Failure)*
Mud Mountain	9,992	829
Howard Hanson	8,508	2,545
South Fork Tolt	935	N/A
Lake Youngs	1,120	873
Culmback	59	N/A
Other Dams Combined (Estimate)	N/A	N/A

[18]

*Sunny day failure assumes a regular pool

2009 modelling of a high release from Howard Hanson.

Structures impacted	Lower Green	In 17,000 cfs impact area	In 25,000 cfs impact area
Residential	3,486	1,743	1,937
Commercial	16,798	12,245	13,667
Industrial	7,839	6,549	6,644

[19]

Facilities

[18] Tetra Tech. 2017. King County Dam Safety Emergency Planning Gap Analysis Report. Page 168.
[19] FEMA Region X. 2009. HAZUS Analysis for the Green River Valley. Page 166.

MultiCare Auburn Medical Center lies within a dam failure inundation area, but further study is needed to fully understand the impacts on health systems from dam failure.

Infrastructure

Infrastructure impacts vary dramatically based on the individual dam and type of failure.

- Energy- While there are dams that generate power in the County, they provide a relatively small amount of power. The Cedar, Snoqualmie, Twin Falls and, Tolt projects account for only 126 max MW output[20]. Power outages may be long term in areas where there has been a failure.
- Water/Wastewater – Drinking water availability would be drastically impacted by a failure of the Masonry, Lake Tapps, Lake Youngs, and Howard Hanson Dams. A failure of one of the many of the reservoirs around the County would also challenge water systems. The King County South Treatment Plant also lies within a dam failure inundation area.
- Transportation- Rail lines (commercial and commuter), LINK Light Rail, bus routes, numerous state highways, and numerous bridges can be impacted by dam failure.

Environment	The primary environmental impact from dam failure is natural and manmade debris from the inundation. Silt, wood, rocks and gravel, hazardous materials, construction debris, vehicles, dead animals may be carried by inundation waters to locations that may be spawning areas for local fish, wetlands for birds and reptiles, or inhabited areas that the County has invested in heavily. While recovery and impact will vary with each inundation area.
Economy	The Green River Valley is an economic powerhouse in the region. Flood damage prevented in the valley by Howard Hanson Dam since the January 2009 flood is estimated at $6 billion alone[21]. The economic impact of a failure would devastate the region. With large employers, such as Boeing, and economic centers like the South Center Mall, in the Valley, a dam failure would leave the local economy crippled. Commutes, roadways, and rail lines would all be impacted by a high release from Howard Hanson. Unemployment may follow in areas that experience a dam failure.

[20] Bonneville Power Administration. 2018 Transmission Plan. 2018. Page 77.
[21] USACE. Howard A. Hanson Dam. Accessed 8/28/2019. https://www.nws.usace.army.mil/Missions/Civil-Works/Locks-and-Dams/Howard-Hanson-Dam/

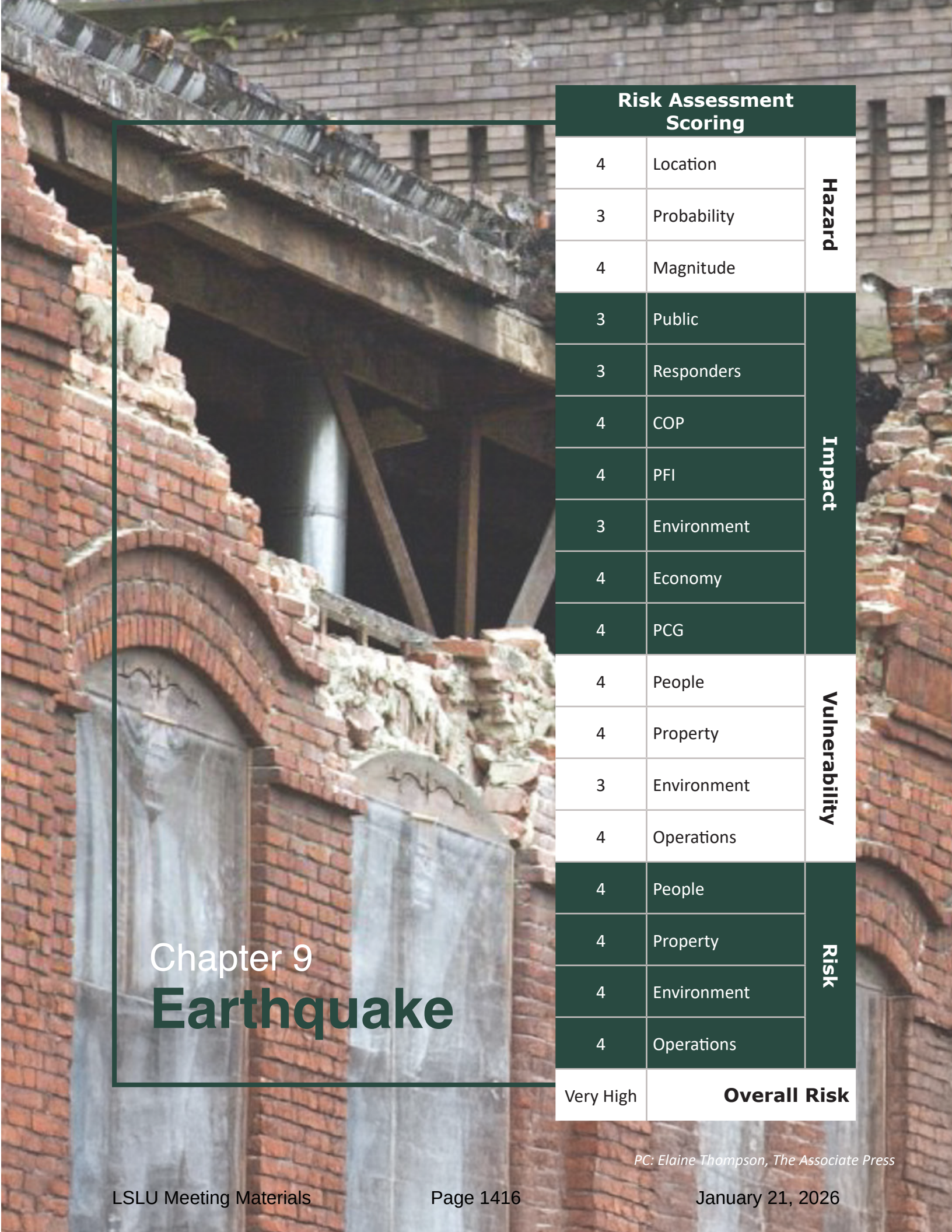
Public Confidence in Governance	A dam failure may cause the public to lose confidence in dam owners, both public and private, to manage local dams. Depending on the success of the response, the public may also lose confidence in first responders.

8.8 Vulnerability Assessment

Vulnerable Populations	Dam inundation areas consist of some of the highest Limited English Proficiency populations in the County. Spanish, Vietnamese, African Languages, and Mandarin are all spoken in high percentages in dam inundation areas. Auburn, Kent, and Riverview School District, as well as private schools, have locations that are vulnerable to dam failure. Riverview school district practices an evacuation of Carnation Elementary School and Tolt Middle School every September in the City of Carnation. Both schools would need to be evacuated if the South Fork Tolt Dam failed. Preliminary studies indicate that there are at least 15 assisted living facilities within dam inundation areas.[22] Evacuation will take longer for this population than most. A 2019 report indicates that there 11,199 individuals experiencing homelessness in the County.[23] Alert and warning can be especially challenging for this population as they may not be tied to a geo-coded database. **Lack of public knowledge** Most dams use a "For Official Use Only" designation on their inundation maps. This means that inundation maps only be shared on a need-to-know basis. A lack of public knowledge about dams, their presence in the community, and their failure potential creates an added challenge in creating a resilient community.
Property	Dam events, such as seepage, overtopping, or failure, can cause significant damage or destruction to homes, businesses, and other property in downstream flood areas. For this reason, it is recommended that people in these areas secure insurance or review their current coverage to ensure they're protected. The extent of downstream impacts can vary depending on the size of the dam and

[22] FEMA Region X. 2009. HAZUS Analysis for the Green River Valley. Page 168.
[23] All Home. 2019. Seattle/King County Point-In-Time County of Persons Experiencing Homelessness.

	the specific event, but generally, low-lying areas in floodplains with dense infrastructure are most at risk for physical damage and economic disruption.
Environment	Dam incidents, particularly dam failures, can have significant negative impacts on both downstream and upstream environments. A sudden failure often leads to severe erosion and a rapid increase in sediment in local water sources. Additionally, ecosystems in the area are affected by the sudden release of water and debris. In some cases, smaller dams may contain contaminated water, which can pose chemical or biological risks to the local environment. While these instances are rare and typically involve small dams with limited water storage, they still present a potential hazard. Moreover, such events can disrupt migrating fish populations, which in turn may affect local communities that rely on fishing as an economic resource.
Operations	**Small Local Government and Privately Owned Dams** These dams may not have access to funding, or have employees dedicated to dam safety. This means that there is a higher chance that maintenance and deficiencies go unmediated. Thus, leading to a higher chance of dam failure. **Emergency Action Plan** High and significant dams are required to have Emergency Action Plans in Washington State. Missing EAPs and out of date EAPs pose a risk if owners are unequipped to deal with an emergency at their dam. **Dam Standard** Any dam that is designated as “poor” or “unsatisfactory” by the Washington State Dam Safety Office should be brought to a higher standard.



Chapter 9
Earthquake

Risk Assessment Scoring		
4	Location	Hazard
3	Probability	
4	Magnitude	
3	Public	Impact
3	Responders	
4	COP	
4	PFI	
3	Environment	
4	Economy	
4	PCG	
4	People	Vulnerability
4	Property	
3	Environment	
4	Operations	
4	People	Risk
4	Property	
4	Environment	
4	Operations	
Very High	**Overall Risk**	

PC: Elaine Thompson, The Associate Press

Chapter 9: Earthquake

9.1 Hazard Description



Washington has the second-highest earthquake risk in the United States, after California. This risk largely originates from the Cascadia subduction zone (CSZ) off the coast of Washington where Juan de Fuca Plate collides and descends beneath the North American Plate. This tectonic activity generates significant stress in the earth, making the region prone to powerful earthquakes.

Earthquakes present the greatest regional threat in terms of potential damage, casualties, economic disruption, and social impacts. Disruptions to essential services, including communications, power, gas, water, and transportation infrastructure, are also inevitable. The severity of an earthquake's impact is driven by ground shaking and secondary impacts include liquefaction, landslides, tsunamis, and even post-earthquake fires.

Table 9-1 Earthquake secondary hazards

Secondary Hazard	Description
Ground shaking	The most immediate and widespread consequence of an earthquake. Ground shaking can also happen from foreshocks or aftershocks that can persist for days to even decades, worsening damage and injuries. While the shaking itself rarely causes fatalities, the resulting destruction—such as collapsing buildings and falling debris—is a major contributor to casualties.
Liquefaction	Occurs when soft, water-saturated soils lose their strength during an earthquake and behave like a liquid. This phenomenon can severely damage buildings and infrastructure that rely on solid ground for support, particularly in areas with loose sedimentary soils.
Landslides	Soil, rock or debris that detach and fall downslope – can be triggered by ground shaking. Depending on where the landslide occurs, this event can lead to additional cascading effects. For instance, in 1949 an earthquake landslide that occurred on the Tacoma Narrows generated a tsunami.
Tsunamis	A destructive movement of the ocean involving at least one 'wave', and strong currents. Even a relatively 'small' tsunami could be devastating to

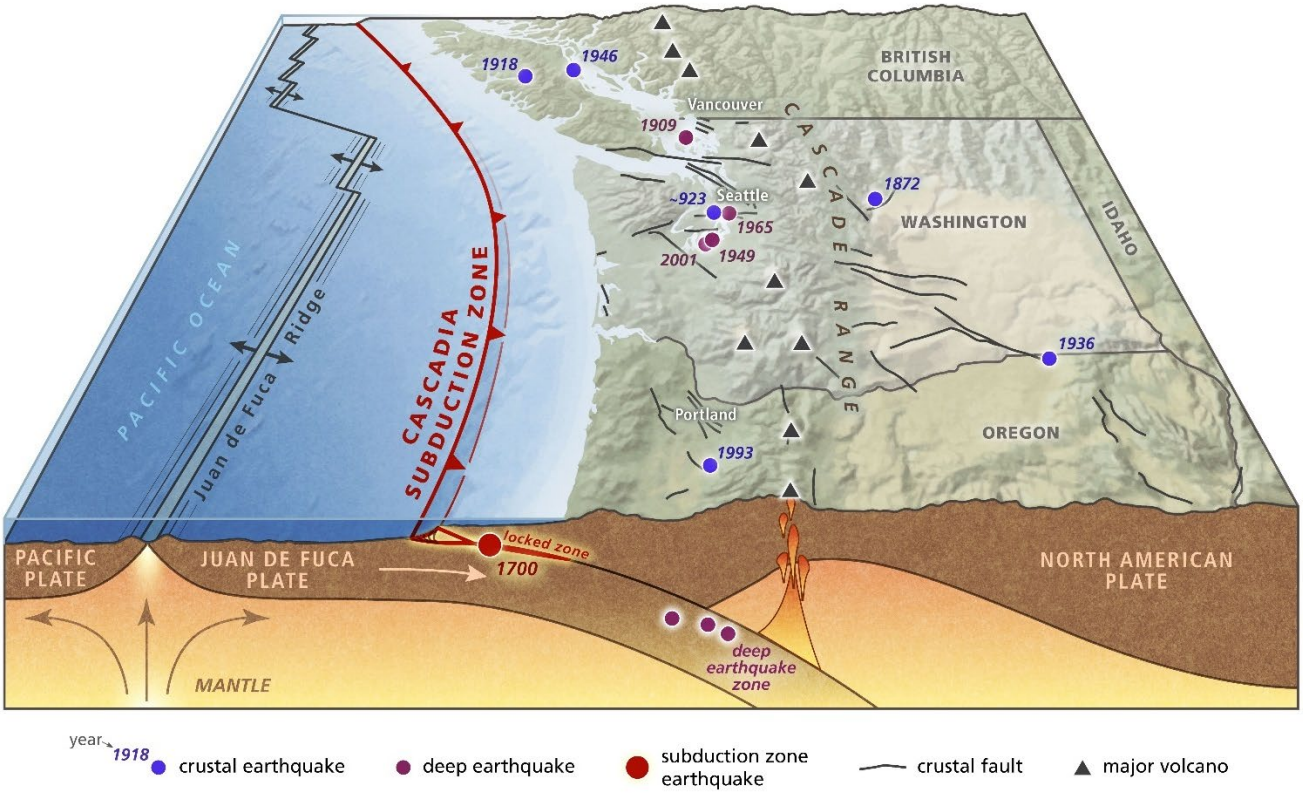
	port and maritime infrastructure within Puget Sound.[1] There is evidence that an earthquake on the Seattle fault that occurred around 923-24 CE produced a 16-foot tsunami.
Dam failure	Earthquakes can cause significant shaking that may compromise the structural integrity of dams. If a dam is already weakened by age, poor maintenance, or underlying geological issues, the seismic forces can cause cracks, ruptures, or even complete failure of the dam structure. This would result in the flooding of inundation zones.
Volcanic eruptions/ Lahar	The shaking from the earthquake can impact volcanic systems. Particularly if a volcano is already experiencing unrest, an earthquake could induce a landslide, the collapse of a volcanic vent, or disrupt the pressure balance inside a volcano, leading to an eruption. An example of this is the 1980 eruption of Mount St. Helens where an earthquake triggered a landslide. This led the volcano, which had already been at an elevated level of activity, to violently erupt out of the north face where the landslide had occurred.
Hazardous material release	Earthquakes can trigger hazmat releases from a pipelines rupture, underground fuel storage tanks fail, oil train derailment, or damage to port facilities.

9.2 Location

The Juan de Fuca plate is moving northeastward with respect to the North American plate at a rate of 3 to 4 centimeters per year. The boundary where these two plates converge, the Cascadia subduction zone, lies approximately 50 miles offshore from Washington and extends nearly 700 miles from northern Vancouver Island in British Columbia to northern California. The collision of these two tectonic plates produces three types of earthquakes: crustal (shallow) earthquakes, deep earthquakes, and subduction zone earthquakes. The relative frequency of these events varies across the region; for example, deep earthquakes have historically occurred more frequently in parts of western Washington, however, it dependents on the tectonic environment and in lots of places, shallow crustal earthquakes are more common than deep earthquakes. Subduction zone earthquakes are rarest events in the region but pose the most significant risk.

[1] Seattle Office of Emergency Management, "Tsunamis and Seiches" *Seattle.gov* (n.d.) https://www.seattle.gov/emergency-management/hazards/tsunamis-and-seiches.

Figure 9-1 Earthquake sources and past events



Subduction zone earthquakes originate from the Cascadia Subduction Zone (CSZ), located off the coast of Washington and Oregon. These earthquakes are the largest, because they happen on such a long fault. While they occur offshore and are distant from many communities, they still pose a major threat. A subduction zone earthquake has the potential to reach a magnitude of 9.0 or greater. If this occurs, it will trigger a tsunami along the entire fault line, from British Columbia to Mendocino, California. However, even if a megathrust earthquake along the CSZ doesn't reach a magnitude of 9.0, a tsunami could still be generated. The ground shaking from such an event would last several minutes, causing catastrophic regional damage from the earthquake itself and widespread destruction from the resulting tsunami. Additionally, these earthquakes are typically followed by numerous large aftershocks.

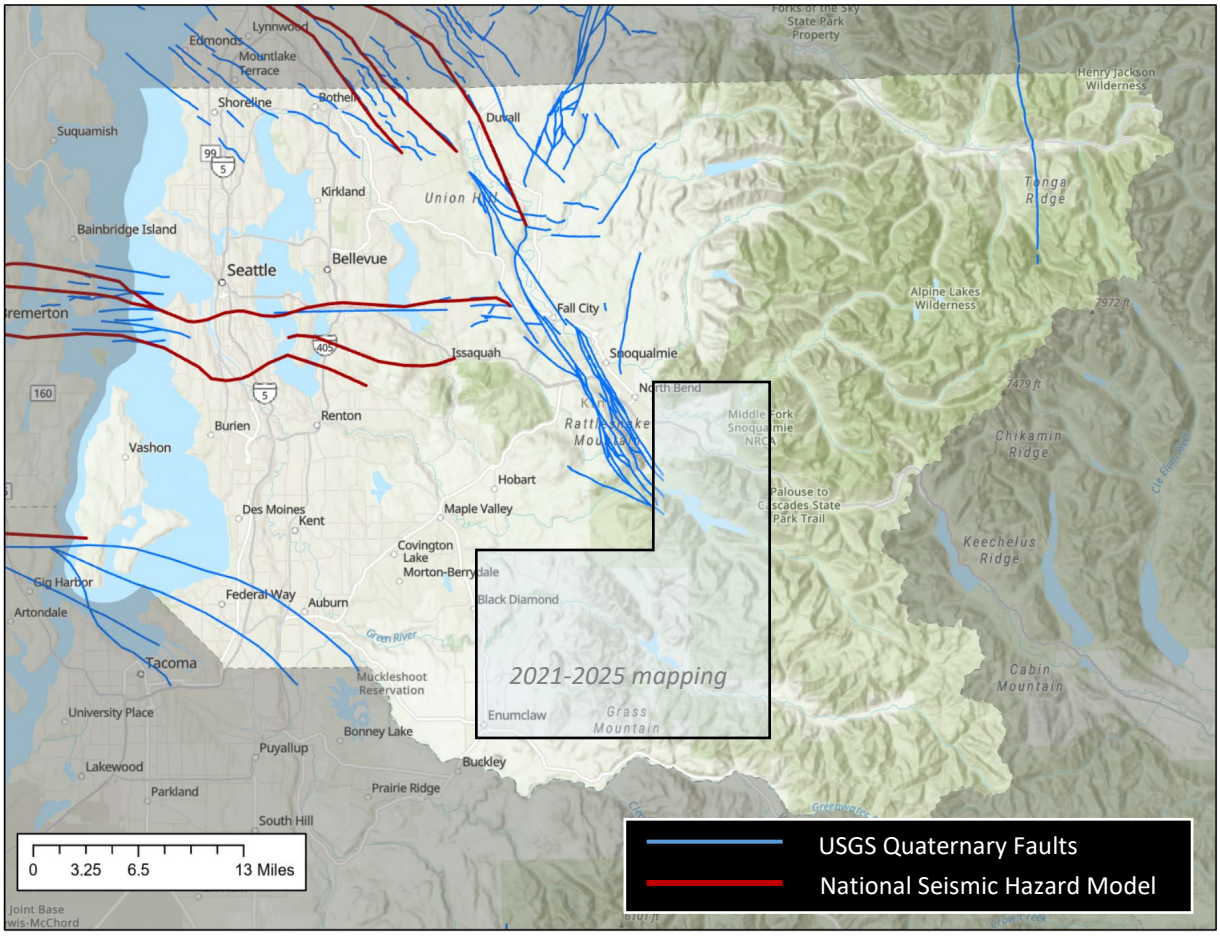
Deep earthquakes are the most frequent earthquakes in the Puget Sound area. They occur within the Juan de Fuca plate as it subducts beneath the North American Plate, at depths ranging from 16 to 60 miles. Due to their depth, aftershocks are typically not felt. Deep earthquakes usually last between 20 to 30 seconds and can reach magnitudes of 7 to 7.5 on the moment magnitude scale. The most recent major deep earthquake in the Puget Sound region was the 6.8 magnitude Nisqually Earthquake on February 28, 2001.

Crustal earthquakes occur within the North American plate at depths of 18 miles or less. Typically, they have magnitudes under 8 and last between 20 to 60 seconds. Local examples include:

- **Seattle Fault,** running east to west through downtown Seattle.
- **Rattlesnake Mountain Fault Zone,** running northwest to southeast through Fall City, Snoqualmie, and North Bend.

Of the three types of earthquakes, the timelines and recurrence intervals for crustal events are the least understood. In 2020, the USGS refreshed their documentation of crustal faults in Washington, and the WGS is currently engaged in mapping faults from North Bend to the southeast edge of King County.

Figure 9-2 2020 USGS Crustal Faults in King County, Crustal Faults



9.3 Magnitude

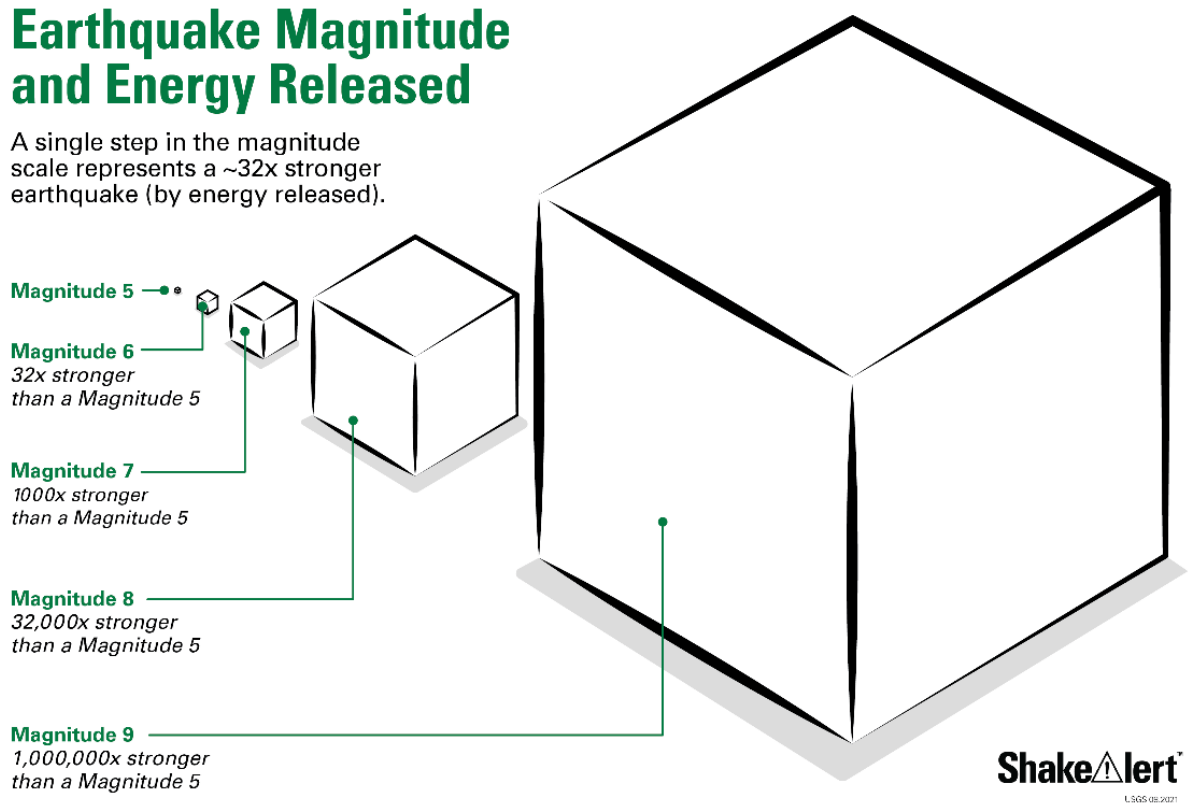
In earthquake science, there are two kinds of magnitude; the **Moment Magnitude Scale** (M_W) that measures amount of energy released when an earthquake happens, and the **Earthquake Intensity**

Scale (or Modified Mercalli Intensity MMI) that is based on impacts to people, property, and operations.

Moment Magnitude Scale

Washington Department of Natural Resources (WADNR) no longer uses the Richter scale, but the Moment Magnitude Scale. It's logarithmic, meaning for every single digit increase the moment magnitude, you have a 32 times stronger earthquake, which translates to 32 times the amount of energy released at the source. A magnitude 2 earthquake with be equivalent to 56 kilograms of explosive whereas a magnitude 10 earthquake would release over 60 trillion kilograms of explosive.

Figure 9-3 Moment Magnitude Scale



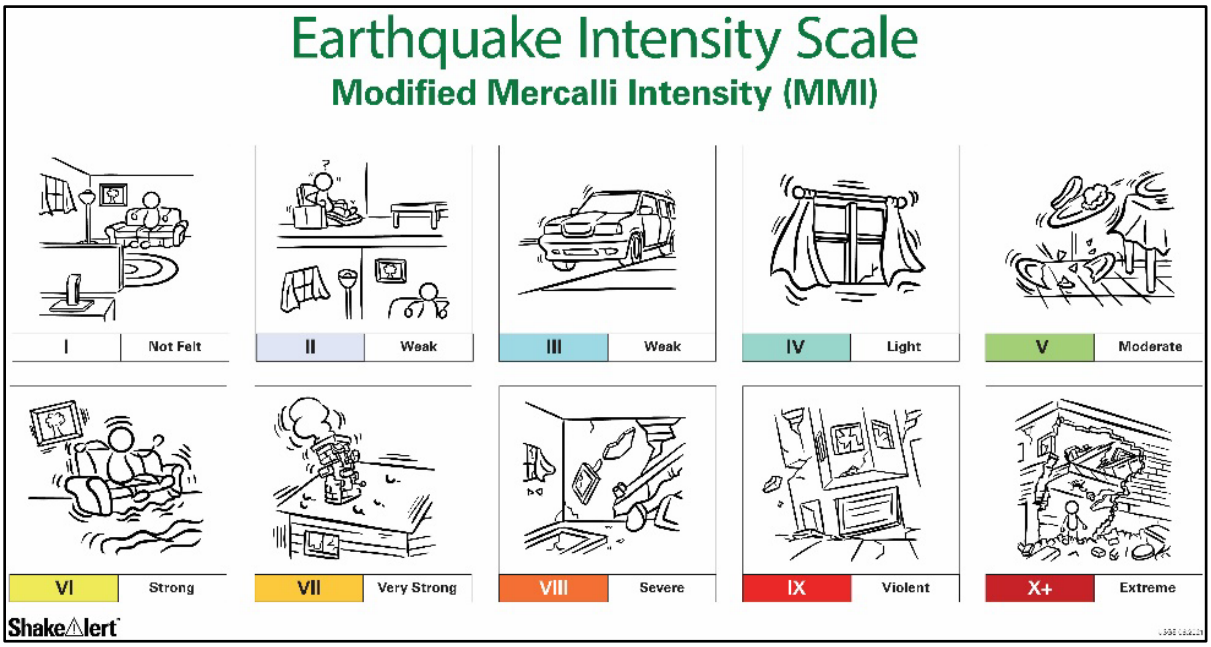
Earthquake Intensity Scale

Earthquake intensity, or ground shaking, is measured by the Modified Mercalli Scale. Its intensity depends on the original moment magnitude and the distance of where the earthquake started to where the impacts are being assessed, and the soil type and material near the surface at the area being shaken.

A shallowly-sourced earthquake that has relatively small magnitude, but nearer to populated areas is potentially more damaging than a much larger magnitude earthquake that is farther away from

populated areas. Even when an earthquake source is distant, unconsolidated soils, such as uncompacted sands, or gravels, found in many floodplains or river valleys, amplify shaking, leading to more potential damage.

Figure 9-4 Earthquake Intensity Scale



Liquefaction

The National Earthquake Hazard Reduction Program (NEHRP) supports map creation based on soil characteristics to help identify locations subject to ground shaking amplification and liquefaction during earthquakes. Areas with NEHRP soil classes D, E and F are prone to shaking amplification, and structures in these areas experience greater damage during shaking. These soils also tend to be more susceptible to liquefaction.

Table 9-2 NEHRP Soil Classification System

NEHRP Soil Type	Description	Mean Shear Velocity in Meters per Second
A	Hard Rock	1500
B	Firm to Hard Rock	760-1500
C	Dense Soil / Soft Rock	360-760
D	Stiff Soil	180-360
E	Soft Clay	<180
F	Special Study Soils (liquefiable soils, sensitive clays, organic soils, soft clays > 36 meters thick)	

Figure 9-5 shows the level of susceptibility areas in King County area to liquefaction. Liquefaction maps in Washington State have not been updated for some time. However, there is currently an academic government collaborative, CRESCENT, that is working with the Washington Department of Natural Resources to update state maps relating to ground shaking and liquefaction.

Figure 9-5 Liquefaction susceptibility in King County

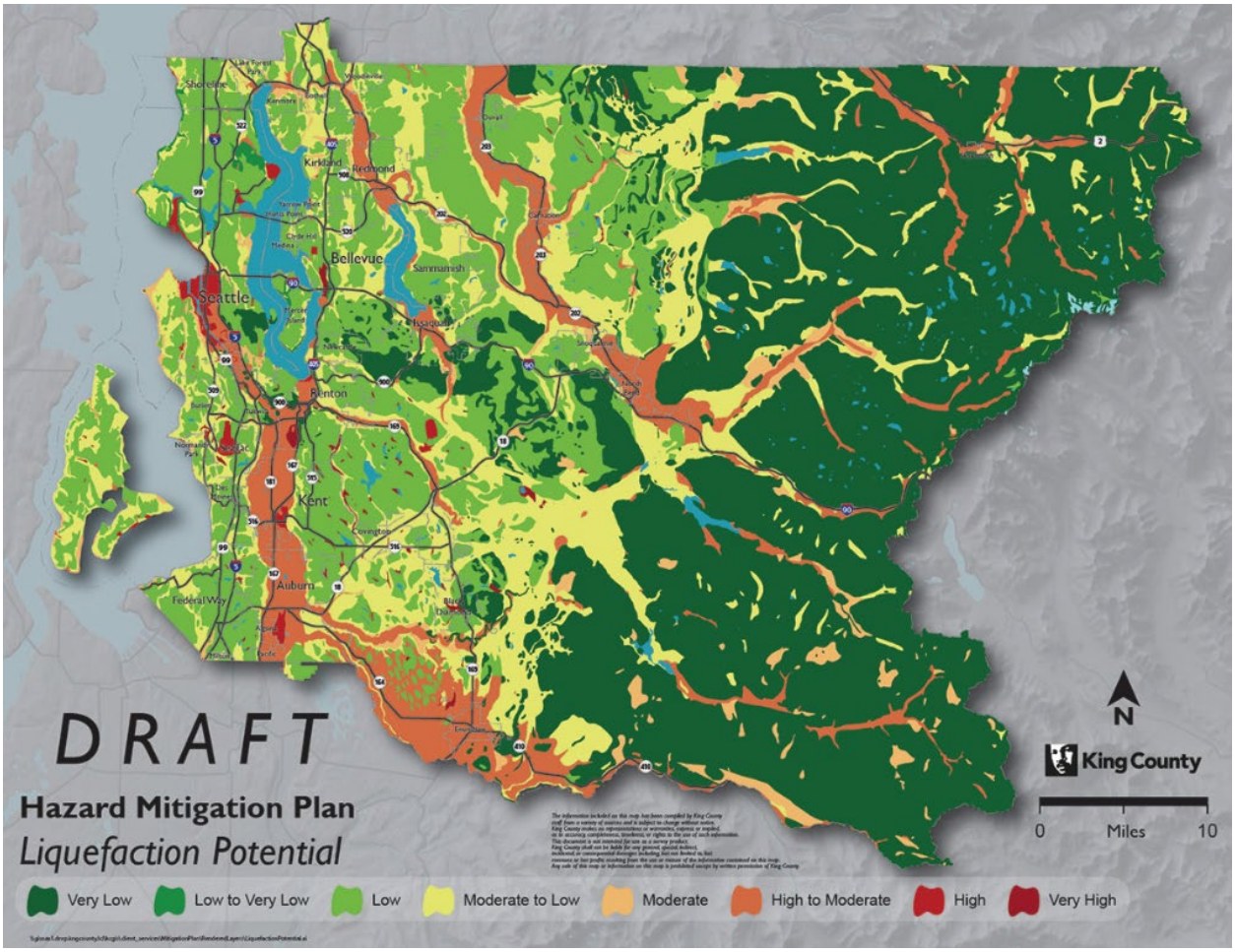
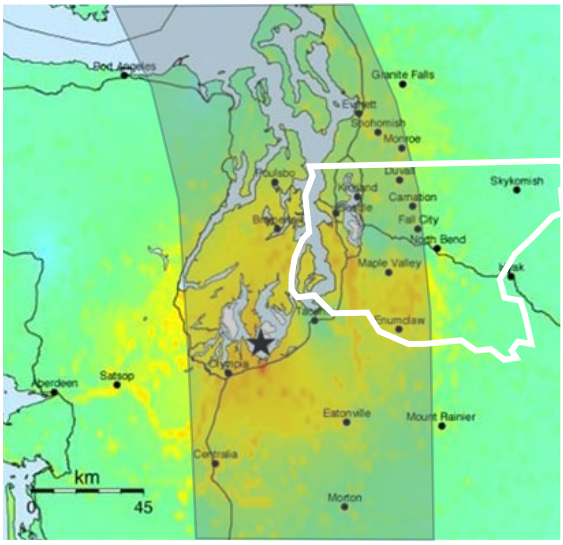


Figure 9-6 Nisqually Earthquake 2001, Impact Map

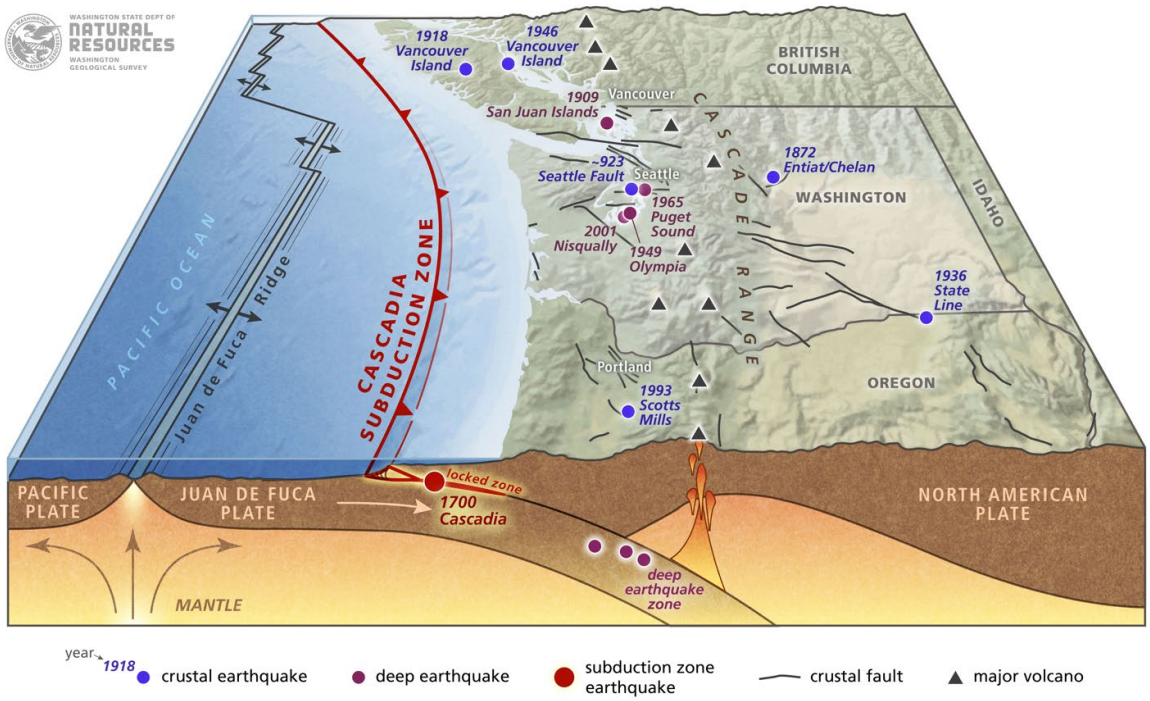


An example of an Intensity Scale map from the Nisqually earthquake of 2001. Colors match the scale in Figure 9-4.

This was a deep earthquake, which are the most frequently occurring types in Washington. The map shows only a few areas experiencing up to very strong to severe shaking. However, the shaking happened over a broad area. King County, highlighted in white, saw high impacts along the Duwamish River where there is soft surface material. The grey band shows the area in Washington prone to such deep-seated earthquakes.

9.4 Previous Occurrences

Figure 9-7 Past Earthquakes in Washington



Name	Source	Date	Size
Nisqually Earthquake	Deep – Juan de Fuca	February 28, 2001	M 6.8

This earthquake, with an epicenter 10 miles northeast of Olympia in Thurston County (over 40 miles from Seattle), resulted in statewide losses exceeding $2 billion and injured 700 people, many in King County.[2] A landslide in King County generated from the 2001 Nisqually Earthquake partially blocked the Cedar River – flooding several homes.

The 6.8 magnitude Nisqually earthquake was centered under Anderson Island in south Puget Sound. The most extensive damage occurred along the Interstate-5 corridor, where river sediments led to shaking amplification and liquefaction impacts. Damage was experienced in 300,000 households, many from settling foundations. Buildings built prior to 1950 located in the south downtown area and Pioneer Square in Seattle were the most impacted; structural damage to chimneys, walls, foundations, and nonstructural elements accounted for two-thirds of all damage reported.[3] Insured losses were recorded as $305M with $2B in losses overall. Of those persons impacted, 21% had earthquake insurance but did not meet the deductible. 75% of retail businesses in Seattle that were impacted closed for a period for cleanup or repairs. The average closure was 4.8 days in Pioneer Square. Of those businesses impacted, 50% were financially threatened with closure. Harbor Island saw 69 businesses impacted for an average of $30,900. The Nisqually Earthquake led to a new emphasis in Washington, and King County especially, on the importance of retrofitting historic, unreinforced masonry buildings (URMs). The loss of historic buildings is not only costly in financial terms but can alter the social fabric of a community and fundamentally change its feel and sense of place.

Puget Sound Earthquake	Deep – Juan de Fuca	April 1965	M 6.5

At magnitude 6.5, the earthquake killed seven people and caused $12.5 Million in damage (1965 dollars). Severe shaking was felt in Seattle and as far as Issaquah and beyond. Most damage was in the Pioneer Square area and waterfront. Older masonry buildings were most impacted. Damage patterns experienced in 1949 were repeated. Eight schools were closed for inspections and repairs; two were severely damaged. Areas along the Duwamish River experienced severe settling. Three water mains failed in Seattle.

Olympia Earthquake	Deep – Juan de Fuca	April 1949	M 7.1

The 7.1 magnitude earthquake was centered along the southern edge of Puget Sound. Eight people were killed and property damage in Olympia-Tacoma-Seattle amounted to about $25 Million in 1949 dollars. In Seattle, a sixty-inch water main ruptured, a radio tower collapsed, power lines and gas lines were broken in over 100 places. Three damaged schools needed to be demolished and one rebuilt. Three days after the event, a landslide entering the water along the

[2] EQE International, "Seattle Nisqually Washington Earthquake" (Feb 2001): http://www.propertyrisk.com/refcentr/seattleeq.pdf

[3] "Hazard Mitigation Survey Team Report, Nisqually Earthquake" *Federal Emergency Management Agency and Washington Military Department, Emergency Management Division* (February 2001)

steep bluff of the Tacoma Narrows said to have been correlated with the earthquake generated a tsunami.

Cascadia Earthquake	Subduction zone	1700	M 9.0

This earthquake, one of the largest in the history of North America, was found by combining First Nations and Native American oral histories with tree-ring dating and other geological evidence in North America and an "orphan tsunami" in Japan. From oral history of the Huu-ay-aht First Nation, people were just going to sleep in the longhouses at Anacla, on Pachena Bay, [present-day Vancouver Island] when the earthquake hit. It shook for more than half a minute, and many of the longhouses sank into the sand [a description of liquefaction]. The tsunami that followed had an estimated wave height of more than 50 ft (15 m) and flooded Anacla and other coastal villages. Only 1 out of more than 600 people in Anacla survived, and in all, seven Huu-ay-aht villages were destroyed. Only the village of Malthsit survived, since it was on high ground about 75 feet (23 m) above Pachena Bay. Several oral accounts describe a great flood on what is known today as the Olympic Peninsula of Washington.[4]

Seattle Fault	Crustal fault	in 923-924 CE	M 7.0 and 7.5

The Seattle fault runs east-west and cuts across Puget Sound, through downtown Seattle, and across Lake Washington. Geologic evidence indicates that it ruptured in a major earthquake (estimated magnitude 7.3) around in 923-924 CE, causing a maximum of 7 meters (~21 feet) of offset at the surface, generating a tsunami in Puget Sound, and large block landslides into Lake Washington. Native oral traditions from Puget Sound associate landsliding, earth-shaking, and rushes of turbid water with a monstrous serpent called A'yahos.[5]

9.5 Probability of Future Occurrences

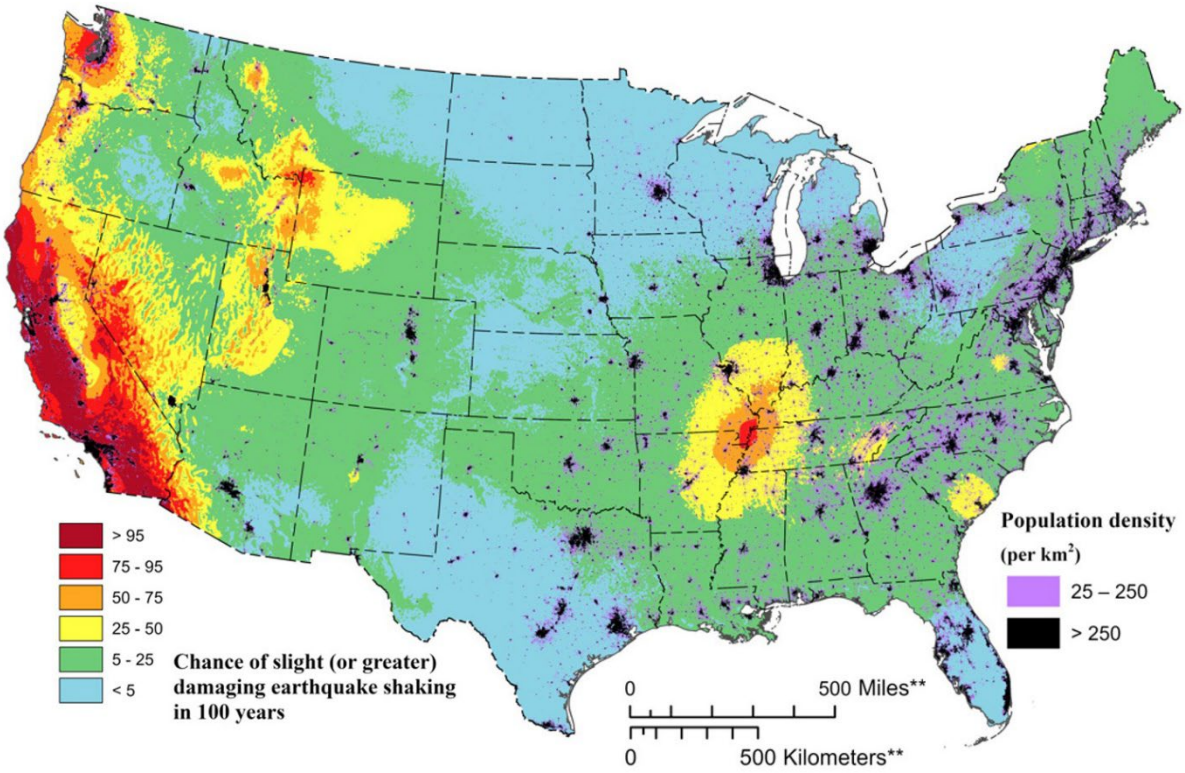
The likelihood of future earthquakes in King County is inevitable, with a 100% certainty that one will occur eventually. However, predicting the magnitude and exact location is not possible. Earthquakes occur at unpredictable intervals, and there are few scientifically verified early warning signs to indicate when one might strike. Estimating the probability of a future earthquake in Washington is challenging due to their rarity and the insufficient length of historical data needed to establish reliable recurrence patterns. Consequently, we rely on analyzing available data to detect potential trends that could inform planning and decision-making. However, pattern detection must be approached with caution, as it is prone to biases (e.g., pattern recognition bias), which could lead to misleading conclusions. Despite advanced analytical methods, earthquakes continue to defy reliable prediction.

In 2023, the US National Seismic Hazard Model (NSHM) updated seismic hazard estimates for all 50 states based on available seismicity, fault rupture, and ground motion data. Zooming in on this

[4] David Wiwchar, "Prepare for next tsunami, says chief" *Raven's Eye* vl 8 Issue 9(2005): p.3, https://www.ammsa.com/publications/ravens-eye/prepare-next-tsunami-says-chief
[5] R. S. Ludwin, et al., "Serpent Spirit-power Stories along the Seattle Fault" Seismological Research Letters, V. 76, No. 4, 426-431(July 2005)

map, you see the King County region has from 75% to greater than 95% chance of damaging shaking in the next hundred years.

Figure 9-8 2023 US National Seismic Hazard Model, Chance of Damaging Earthquake Shaking[6]



9.6 Impact Assessment

The severity of an earthquake is different depending on the conditions under which it occurs. Also, different sectors of the population, economy, or government will have different levels of exposure and vulnerability that impact their susceptibility to an earthquake. This risk assessment looks at impacts of five earthquake scenarios to a series of critical sectors. The impact data for physical structures is generated using the Hazus-MH tool for three different Seattle Fault M7.0 scenarios, a Tacoma Fault M 7.1 scenario, and a Cascadia M9.0 scenario. These scenarios are chosen based on their probability and potential impact. This earthquake model also includes information on liquefaction potential of soils and the age of buildings (as an instrument for building code levels).

This assessment considers impacts to physical and human elements of each of 11 impact areas. For example, for health systems, the locations of key facilities identified by Public Health Seattle – King

[6] Mark D. Petersen, et al., "The 2023 US 50-State National Seismic Hazard Model: Overview and implications" *USGS* (December 2023): https://www.usgs.gov/publications/2023-us-50-state-national-seismic-hazard-model-overview-and-implications#:~:text=The%20US%20National%20Seismic%20Hazard,than%20%E2%88%BC475%20or%20less

County will be assessed against data on high hazard areas. The impacts to the health system overall, including employees and existing patients, will also be examined.

The HAZUS scenarios used in this section were generated by the FEMA RiskMAP team for the 2018 King County Risk Report.[7]

Public	The entire population of King County is potentially exposed to the direct and indirect impacts from earthquakes. The degree of exposure is dependent on many factors, including the age and construction type of residence, the soil type homes are constructed on, the proximity to the fault, etc. Impacts to the population are not restricted to displacement and sheltering. People may be injured, lose their jobs, schools may be closed from their own damages, government services may be interrupted, health facilities and care may also be interrupted or be completely unavailable. Family members may be separated, including children, elderly in care facilities, may be moved to alternate facilities – and unaccounted for. Deaths of homeless and unidentified people may require burial before family can claim their remains.
Responders	First responders experience personal and professional impacts from an earthquake. Since responders are also local residents, they will be personally impacted by the disaster. Professionally, emergency services will be called upon to help with life safety operations while also seeking to restore day-to-day services.
Continuity of Operations	Any damaging earthquake has the potential to impact delivery of essential government services in the days, weeks, months, and even years following the earthquake. The damages to infrastructure and residential or business locations may curtail or even prevent government employees from reaching their work locations or may prevent services from reaching populations in need scattered around the county. Even after initial short-term repairs have been made, the impact on the taxable value of properties in the county may cause a revenue shortfall that reduces available services from budgetary impacts. Collection of available tax revenue, the revaluation process (including documentation), and appeals process might produce a further burden on already stretched government obligations. Earthquakes can damage anything at which services are provided. This may include adult and juvenile detention facilities, wastewater treatment facilities, solid waste disposal systems and facilities, the court system, health

[7] Federal Emergency Management Agency, "King County Risk Report" (2018) https://fortress.wa.gov/ecy/gispublic/AppResources/SEA/RiskMAP/King/KingCounty_RiskReport.pdf

	and medical institutions and clinics, fire and police stations or equipment, public transportation, schools, and libraries.
Property, Facilities, Infrastructure	**Property** Unreinforced masonry buildings are particularly vulnerable during an earthquake. The Nisqually Earthquake of 2001 caused extensive damage to such structures, as well as to those built prior to the 1949 earthquake. A similar pattern of damage was observed in roads and bridges. In contrast, buildings constructed after the 1949 and 1965 earthquakes, which influenced the development and improvement of seismic building standards, showed little to no significant damage, underscoring the effectiveness of modern seismic building standards. In October 2018, the Washington State Department of Archaeology and Historic Preservation (DAHP) developed a statewide inventory of identified and suspected unreinforced masonry (URM) buildings, excluding single-family homes. This data was integrated into an interactive online map, revealing 1,145 identified URM buildings within Seattle. Outside the city, King County has over 120 suspected URM buildings, with the highest concentrations in Bothell, Kirkland, and Redmond. Across the county, nearly 50% of buildings were constructed to pre- or low-code standards, leaving them susceptible to moderate to high-magnitude earthquakes. These are preliminary numbers and could go up after further assessment.

Figure 9-10 Identified Unreinforced masonry (URM) buildings in King County[8]

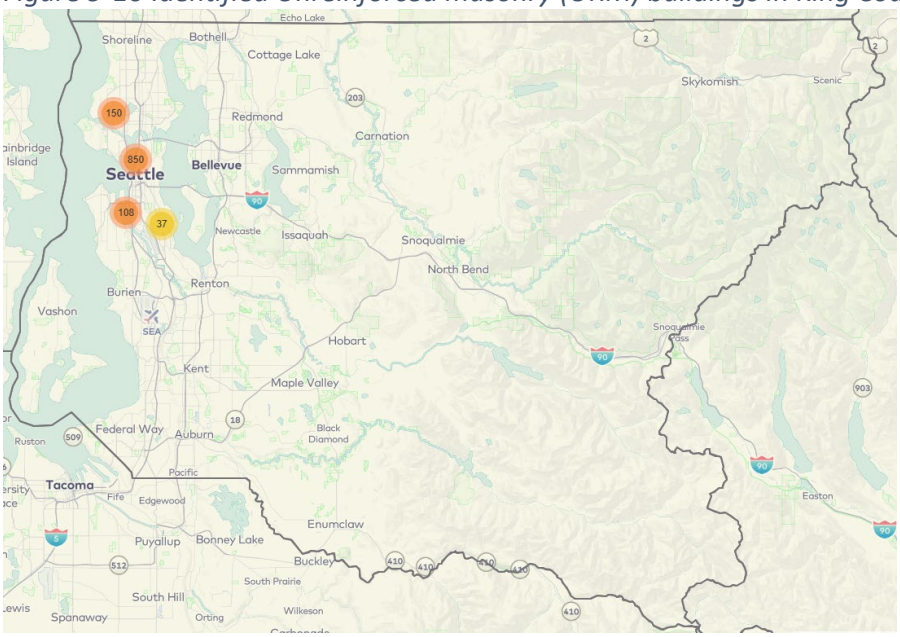
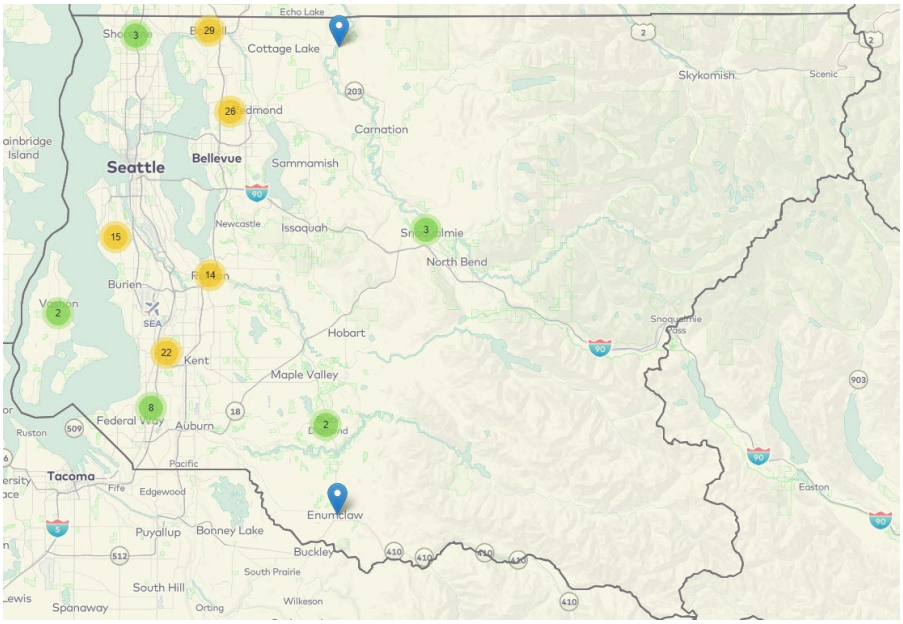


Figure 9-11 Suspected Unreinforced masonry (URM) buildings in King County



Facilities

Health system impacts from a major disaster include disruptions to emergency services, community health clinics, pharmacies, and hospitals.

[8] Department of Archaeology and Historic Preservation (DAHP), "Washington URM Dashboard" (2018): https://fortress.wa.gov/com/urmasonary/urmasonary/#11/47.6469/-122.3026/775

While new hospitals are required to meet criteria for seismic resilience and may engage in supply-chain and patient evacuation planning, much of the rest of the network is likely to be shut down after a disaster. This is an especially high threat to populations needing regular medical services, such as kidney dialysis and insulin injections (which require refrigeration). In Hurricane Maria in 2017, Puerto Rico was left without power for months and the majority of fatalities recorded due to the storm were from the elevated death rate among medically-fragile populations.

To function, hospitals require significant infrastructure inputs, including power and water that are likely to be disrupted after an earthquake. Backup services are available; however, may be insufficient to meet the need if infrastructure recovery takes too long.

Health system impacts therefore include large-scale disruptions to supply chains, disruptions to ongoing care regimens for certain medically-vulnerable populations, disruption of community care networks of pharmacies and local clinics, loss of trained staff, and potential damage to hospitals or loss of hospital functionality due to infrastructure damage.

Infrastructure

Energy: Dams are the primary source of electricity generation for the region and may be impacted by a major earthquake, even if failure is relatively unlikely. Furthermore, most generators have a maximum run time before needing to be serviced (~500 hours for natural gas generators). Pipelines cross the region carrying fuel and are susceptible to earthquakes. In the event of a catastrophic earthquake, the energy infrastructure could be impacted for months surpassing the generators capacity. Since Washington is home to the Pacific Northwest's only refineries, damage to this conveyance system will have far reaching, regional consequences. A major concern for maintaining power in facilities while the power grid is down after an earthquake is fuel distribution. With transportation networks seriously impacted, it will be difficult to ensure a supply of fuel is distributed to hospitals, public facilities, and communications centers. Without this fuel, systems are likely to fail after a few days of operation.

Water/Wastewater: Water and wastewater systems are among the most vulnerable to an earthquake of all lifeline infrastructure. Pipelines, especially those over NEHRP class D, E, and F soils, are vulnerable to rupture. King County maintains a wastewater treatment system that is connected to dozens of smaller systems and operates multiple water treatment plants. There are also many separate water systems that operate their own conveyance systems and reservoirs. All of these systems will be impacted.

Transportation: Transportation lifelines are both state and local responsibilities. According to a Regional Resiliency Assessment Program (RRAP) report published by DHS, WSDOT has operated a seismic retrofit program since 1991 and has been steadily retrofitting bridges through a three-stage process of stabilizing the bridge superstructure, strengthening single-column bridge supports, and reinforcing multi-column piers. As of January 2025, King County has 25 out of 229 bridges in the program. At least every two years, those bridges are inspected and recommendations are made for their repair or replacement.

Bridges, however, are only part of the transportation puzzle. Bridge approaches, and pavement crossing on unstable soils can be impacted. The WSDOT Seismic Lifeline route discussed above is only considering bridges, not pavement or approaches.

Railways are another highly-vulnerable piece of transportation infrastructure. Tracks can become misaligned and require repair before train travel is possible. Even in the relatively moderate 2001 Nisqually Earthquake, rail travel was disrupted for several days.

Port facilities are seriously threatened by a major earthquake due to liquefaction potential of port areas and tsunami threats. It is likely a major earthquake would completely destroy port facilities, requiring years of investment to completely recover. As with the 1995 Kobe, Japan earthquake, port operations may never again reach pre-disaster levels.

Airports are also vulnerable to earthquakes. In the 2001 Nisqually Earthquake, the air traffic control tower at Seattle-Tacoma International Airport was damaged, drastically reducing takeoff and landing capacity. Runway damage is also common as the ground shifts and would require repair before large jets could land. While the region has a number of airports, many of them will also be critical facilities for disaster response, medical patient evacuation, and food and fuel deliveries.

Communications: While the public sector maintains critical radio communications networks, the networks on which most residents depend is privately owned. While cell towers are equipped with backup generators, these generators may only have enough fuel for a few days of continuous operation.

Environment	Impacts to the environment from an earthquake include the creation and disposal of large quantities of debris, releases of hazardous materials, the disruption of environmental conservation programs, and the relaxing of environmental program rules during the cleanup and recovery. Moving

	debris out of the area, given the disruptions to transportation infrastructure, will be difficult. The greatest potential for environmental damage is from hazardous materials releases as fuel and waste pipelines rupture, underground fuel storage tanks fail, trains, including oil trains, may derail, port facilities are damaged by any tsunami or seiche, and other chemicals, including household items, are spilled. The multi-source nature of materials releases, the scale of potential releases, and the lack of resources for cleanup all complicate the scenario.[9] An example is the Northridge and Loma Prieta earthquakes, where hundreds of gas line ruptures and pipeline breaks, and releases of ammonia, chlorine, and sulfuric acid.[10]
Economy	The economic risks posed by a major earthquake are wide-ranging and multifaceted. The immediate impacts include the destruction of facilities and inventory, as well as the loss of employees and customers. In King County, which accounts for approximately 55% of Washington's gross domestic product, these disruptions could be particularly severe. Although the county's economy is diverse and has proven resilient to various types of disruptions, it is heavily dependent on global interconnectedness. A total loss of critical lifeline infrastructure—such as port facilities, communication hubs, and major highway corridors—could be devastating, particularly if these links are not swiftly restored. While some major companies in western Washington, like Amazon and Microsoft, may experience less disruption due to the global reach of their operations and the redundancy in their systems, others, like Boeing, would face significant setbacks. The loss of essential transportation routes, such as rail and highways crucial for material shipment, would severely impact their production. Additionally, a large earthquake could halt or reverse King County's population growth, as displaced residents might lose their jobs, struggle with uninsured housing recovery costs, and move to safer areas in the aftermath of the disaster.
Public Confidence in Governance	Disasters of the magnitude we can expect from a damaging earthquake have the potential to shake public confidence in government's ability to maintain law and order, provide essential services, repair or replace needed infrastructure for employment, process building permits and inspections, clear debris, and other needs. Restoration efforts may take longer than the public is willing to accept. Amendments to zoning and building standards may not be embraced by those seeking to rebuild. If rapid restoration is not possible, the area may lose employers and the population may relocate to

[9] Sengul et al., "Analysis of Hazardous Materials Releases Due to Natural Hazards in the United States" (2012)
[10] Stacy Young, Lina Balluz, and Josephine Malilay, "Natural and Technologic Hazardous Material Releases During and After Natural Disasters: A Review" *Public Health Resources* (2004)

other areas of the country in search of employment, as well as housing, schools, and services.

Earthquake hazards specifically have been the subject of significant reporting in recent years. Articles in the Seattle Times, the New Yorker, and on local television have argued that the Pacific Northwest is unprepared for the level of destruction expected following a Cascadia Subduction Zone 9.0 event.[11] These articles have led to both stepped-up state and local action on earthquake preparedness and to more public awareness.

9.7 Vulnerability Assessment

Vulnerable Populations	Vulnerable populations are more likely to suffer losses during an earthquake and are likely to take longer to recover after. Factors influencing likelihood of damage include living in higher hazard areas, living in older buildings, being less likely to have emergency supplies, and having a higher rate of persons with disabilities. Slower recovery is exacerbated by poorer populations likelihood of not having access to institutions leading recovery, not having insurance, not having a stable job, wealth, or savings, being more likely to be renters who are ineligible for many federal recovery programs, and having a lower-level of education on average, making it more difficult to find a new job and to navigate the complex post-disaster system. In many catastrophic disasters, most notably Hurricane Katrina, poor communities may never recover. **Populations without the means to care for themselves over multiple weeks, especially those with Access and Functional Needs** The response and initial recovery following a catastrophic earthquake will take weeks. Homebound populations, those requiring medications, the chronically ill, or others with access and functional needs may need to sustain themselves for an estimated two weeks in some places. **Populations without insurance, especially those without renters' insurance or homeowner insurance earthquake riders.** According to the Office of the Insurance Commissioner, which conducted a major earthquake insurance study in 2017, residential earthquake coverage in western Washington is 13.8%. Commercial coverage rates are much higher than residential, with 43.2% of

[11] Kathryn Schulz, "The Really Big One," *The New Yorker* (July 20, 2015)

	insurance policies having some earthquake coverage. A key finding is that, for both residential and commercial customers, insured properties have a much higher assessed value than uninsured properties, indicating that it is higher-income people that are, in general, purchasing earthquake insurance coverage. Earthquake insurance coverage rates are a good measure of resilience because insurance is the primary source of disaster recovery funding after an earthquake. Low levels of insurance coverage have stymied recovery efforts in major disasters, such as hurricanes, where hazard coverage is not automatically included in homeowner's policies. Populations communicating in languages other than English Information from responders, notifications, and other information will likely be communicated predominately in English. Special care will need to be taken to ensure that non-English speakers have access to relief supplies from established points of distribution.
Property	**Unreinforced masonry buildings, especially those built during pre or low-code eras (pre-1973)** Unreinforced masonry buildings (URMs) that characterize areas like Pioneer Square in Seattle are extremely susceptible to even minor earthquakes. Unreinforced masonry buildings are likely to collapse or partially collapse during a major earthquake and be a leading source of fatalities due to falling debris. **Structures, including roads and bridges, structures, built on vulnerable soils.** Structures on less stable soils are more likely to buckle or collapse. High risk areas cover the region and are especially common in historic river valleys where sediment has been deposited very recently. **Public facilities built to "life safety" codes that will be unusable after a major earthquake** Public facilities, such as city halls, schools, etc. are not required to be built to "immediate occupancy" standards. A major earthquake would render many of these facilities inoperable, leading to difficulties in organizing the recovery in affected jurisdictions. **Structures and populations on or near steep slopes** Steep slopes greater than 40% grade are likely to fail in an earthquake, unless properly stabilized by geological engineering techniques. This likelihood increases when the ground is saturated. Buildings on or

	below these slopes will be damaged or destroyed if these slopes were to fail.
Environment	**Hazmat** Hazardous materials, or Hazmat, sites dot the region and FEMA has recognized hazardous materials as a community lifeline due to experiences dealing with recovery after recent disasters. Hazmat releases are likely to occur at industrial facilities, on pipelines, and elsewhere around the region. The chemical cocktail of potential contaminants is likely to threaten the public, responders, and the environment, and to delay recovery in parts of the region for years.
Operations	**Dams, especially older, less regulated dams** Major dams in the region that provide electricity, such as the Tolt Dam and Howard Hanson Dam, play a vital role in future recovery. It is unlikely a total failure would occur at these dams because they are highly regulated. However, damage to these dams from an earthquake could require a shutdown to perform repairs before they can resume electricity generation. There are also many lower-priority dams that meet high-hazard throughout King County that are not recognized by their jurisdiction. A failure of some of these dams has the potential to cause numerous fatalities and the inundation of property and infrastructure. **Levees, dikes, and other flood control structures** Flood control structures are usually earthen and built on highly unstable soils. An earthquake during the winter months when these systems are running close to capacity could cause major failures and widespread flooding. **Rail systems** Rail systems require tracks to be perfectly aligned and will fail during an earthquake as the ground shifts and buckles. Landslides may deposit material on the tracks. Trains traveling at high speeds during an earthquake have a significantly greater chance of de-railing, potentially injuring passengers, or spilling cargo, which may cause additional hazardous material incidents. **Port facilities** Ports are almost always built on fill and other extremely unstable soils. Major earthquakes will damage and potentially destroy port facilities. Any seiche or tsunami will also have a greater impact on port facilities than inland facilities.

Water and sewer transmission lines

Water and sewer transmission lines, especially those built of cast iron, concrete, or wood, are vulnerable to fracturing or breaking in the event of an earthquake. Many of these lines are being replaced with ductile iron throughout the region. Nevertheless, most special purpose districts undertaking this work are decades from completing it. Water systems will likely fail throughout the region and will be difficult to restore due to limitations in transportation capacity. Even systems able to complete conversion to ductile iron will experience failures, especially in areas of unstable soils.

Chapter 10

Flood

Risk Assessment Scoring		
3	Location	Hazard
4	Probability	
2	Magnitude	
2	Public	Impact
2	Responders	
3	COP	
3	PFI	
2	Environment	
3	Economy	
3	PCG	
2	People	Vulnerability
3	Property	
2	Environment	
3	Operations	
3	People	Risk
3	Property	
3	Environment	
3	Operations	
High	**Overall Risk**	

PC: King County

Chapter 10: Flood

10.1 Hazard Description

Flooding is King County's most persistent and recurrent natural hazard, impacting tens of thousands of families and property owners across the region. These events have far-reaching impacts on life safety, economic stability, and the overall functioning of the county system.



Flooding along the Snoqualmie River in 2015

Flooding occurs when normally dry areas are inundated by overflowing rivers, coastal surges, or other accumulations of surface water. King County's diverse geography—from the Cascade Mountains to Puget Sound—leads to various forms of flooding, each with distinct causes. The most common types of flooding observed in King County include:

- **Riverine flooding:** a river or stream overflows its banks and spills into nearby low-lying areas due to excess water flow.
- **Tributary flooding:** a smaller stream or river overflows its banks and spills into nearby low-lying areas due to excess water flow. For example, Tokul Creek flows into the Snoqualmie River and is therefore a tributary of the Snoqualmie. King County has an extensive network of smaller tributary streams.[1]
- **Coastal flooding:** when high tides and storm surges inundate or cause damaging erosion to normally dry areas along the marine shoreline.[2] King County has 103 miles of saltwater shoreline, including incorporated areas along the east side of Puget Sound and the unincorporated areas of Vashon and Maury Islands. Additionally, compound flooding—resulting from saturated soils and significant freshwater inflow—exacerbates these conditions.

[1] King County. 2024. *King County Flood Management Plan*. kingcounty.gov/en/dept/dnrp/nature-recreation/environment-ecology-conservation/flood-services/flood-management-plan/about-plan source
[2] FEMA. 2023. *FEMA National Risk Index website, Coastal Flooding webpage.* hazards.fema.gov/nri/coastal-flooding.

- **Urban flooding:** Caused by stormwater runoff or overwhelmed urban storm sewer systems, leading to localized flooding in developed areas.

Several conditions can cause flooding from too much rainfall in a river's watershed to sustained offshore wind driving a high tide inland, but flooding can also be caused by events such as liquefaction of levees during an earthquake that release water the levees hold back. Causes of flooding are listed in Table 10-1.

Table 10-1 King County Flood Causation Types

Causation Type	Description
Heavy Rain	Intense rainfall, typically seen in the fall and winter months, can overwhelm rivers' ability to carry flows in their banks and cause inundation of the adjacent floodplains. These factors not only drive riverine flooding, but also urban flooding issues that can overwhelm local stormwater infrastructure.
Atmospheric Rivers	Atmospheric rivers are narrow bands of concentrated moisture in the atmosphere that transport water from the tropics to be dropped as heavy precipitation.
Storm Surge and King Tides	Strong winter storms combined with king tides can lead to significant coastal flooding, damaging properties and infrastructure, as seen during the 1982 king tide event in King County.
Sea level rise	Rising sea levels in Puget Sound elevates the base sea level, increasing the likelihood of inundation along King County coastlines during storm surge events.
Channel Migration	Rivers that significantly shift during high flow events or gradually through erosion of streambanks. This is a prevalent feature in northwest river systems including Green, Cedar, Tolt, Raging, and Snoqualmie River.[3]
Dam/Levee Failure	Dam and levee failure is the uncontrolled release of impounded water resulting in downstream flooding, affecting both life and property.
Overtopping	Overtopping, often a precursor of dam failure, is water spilling over the top of a dam. This can be the due heavy rain causing excess water or inadequate spillway design. For instance, water can seep through levees and cause weaknesses that lead to collapse.

[3] Seattle and King Hazard Ready, n.d. *Channel Migration Zones.* hazardready.org/seattle/static/img/data/flood_cmz.pdf

Landslide	Landslides can block rivers or add material, leading to mudflows and rapid property damage, notably on the Cedar River.
Earthquake	Earthen levee systems are prone to liquefaction in an earthquake. If water is being held back, this could lead to swift flooding.
Volcanic Eruption	In the event that Mt. Rainier erupts, lahars can fill river valleys and drastically change the course of rivers, streams, and shorelines.
Tsunami	Tsunamis, caused by underwater earthquakes or collapses, can generate significant wave action and damage coastal properties in King County.
Humanmade watershed changes	Development of impervious surfaces speeds up floodwater flow to streams, increasing flood severity.
Climate Change	Climate change is projected to intensify flooding risks through increased rainfall, sea level rise, and other altered weather patterns affecting King County.

The King County Flood Control District was established in 2007 to regionally manage flood hazards and reduce risk, in partnership with the Department of Natural Resources and Parks' River and Floodplain Management Section. The newly updated 2024 King County Flood Management Plan drives much of the work that both the District and King County do to reduce flood risk and manage flood-related hazards.

10.2 Location

King County is broken up into four watersheds: Snohomish, Cedar-Sammamish, Duwamish-Green, and Puyallup-White (shown in Figure 10-1). Within these watersheds are eight sub-basins, shown in Figure 10-2, that host six major river systems flow through King County (South Fork Skykomish, Snoqualmie, Sammamish, Cedar, Green and White Rivers) along with their significant tributaries (Tolt, Raging, Miller and Greenwater rivers). Additionally, the county has other smaller tributaries and streams, including but not limited to those with existing flood risk reduction facilities (Tokul, Kimball, Coal (Snoqualmie), Issaquah, Fifteen Mile, and Holder creeks).[4]

[4]King County Flood Control, "About Us," accessed October 23, 2024, kingcountyfloodcontrol.org/about-us/

Figure 10-1 King County Watersheds

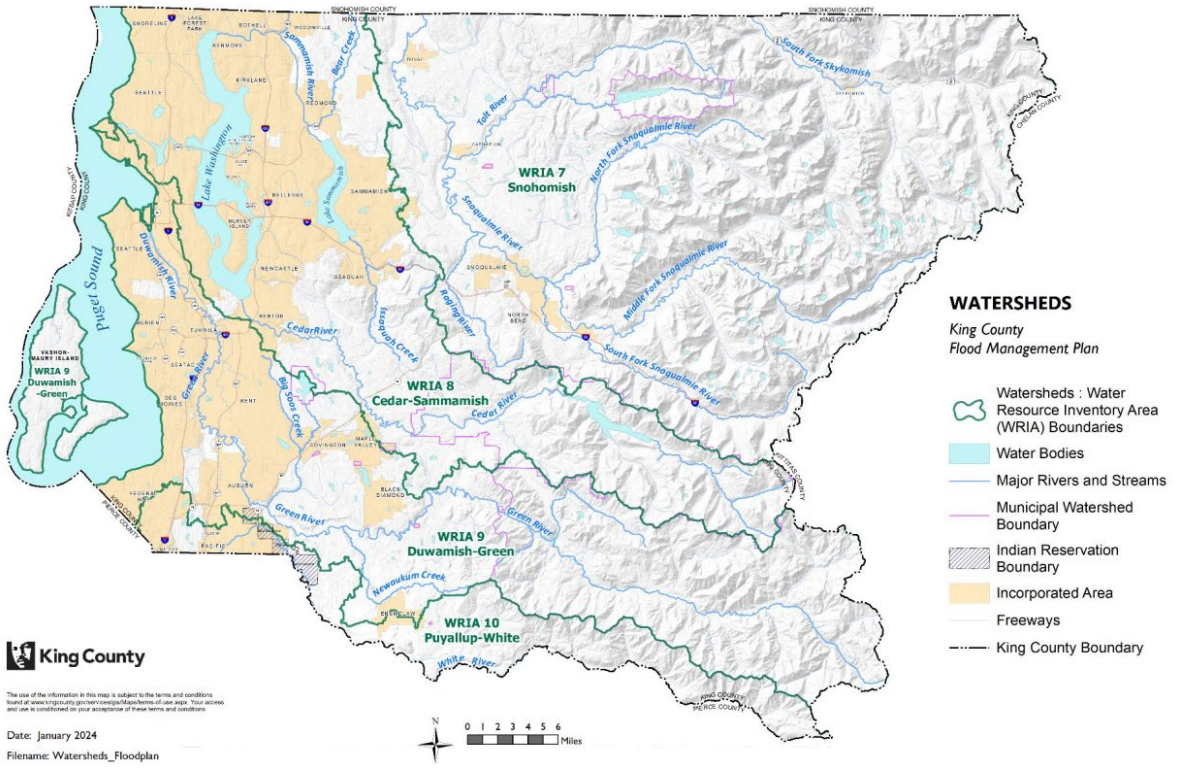
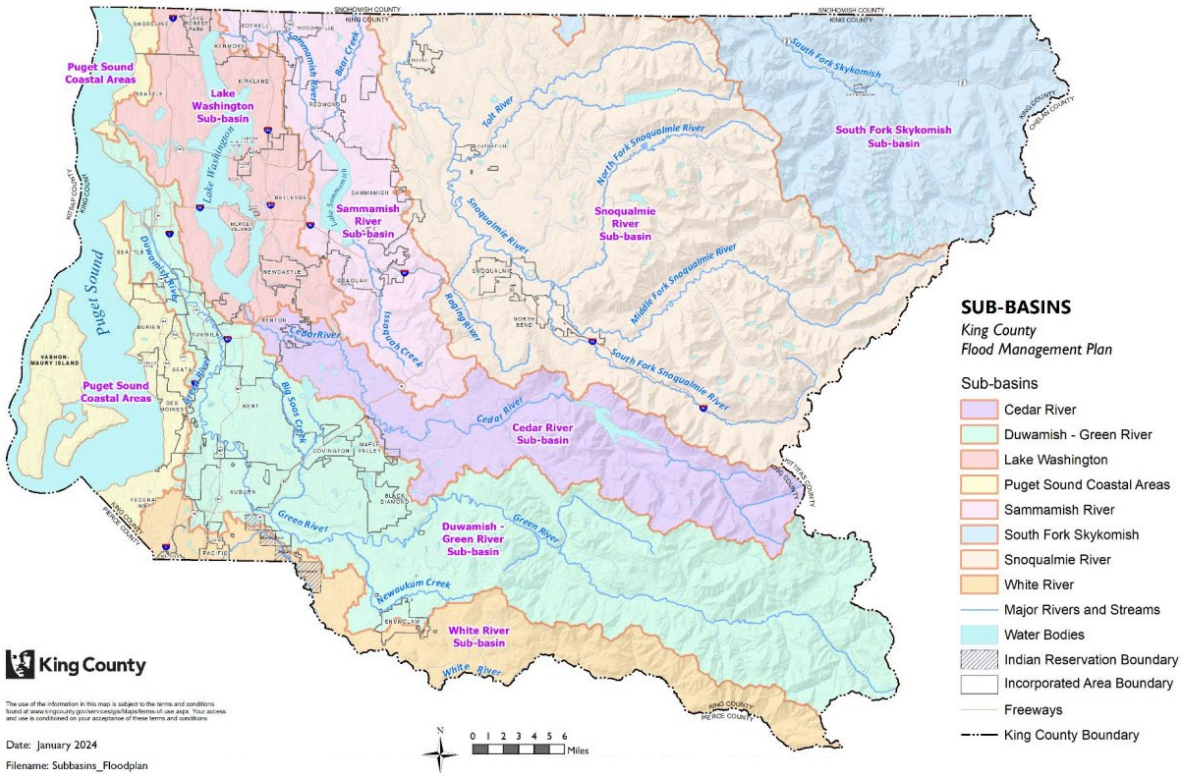


Figure 10-2 King County Sub-Basins



A variety of factors affect how flooding occurs and its severity. One main factor for riverine flooding is the "hydrology," which includes how much precipitation falls, how fast it falls, how fast it reaches the stream, and the amount of water already in the stream. The second main factor for riverine flooding is the "hydraulics" of the watershed, which includes characteristics like the topography, stream channel dynamics, and the overall slope of areas of the watershed.

The combination of hydrology and hydraulics plays a critical role in shaping the behavior of rivers in King County and directly contributes to the significant flood risks the region faces. Several rivers in King County face significant flood risks, each presenting unique challenges. The most flood-prone areas include:

- **Snoqualmie River Valley,** located within the Snohomish Watershed and Snoqualmie River sub-basin, is the most flood-prone area of King County. Flooding typically results in inundation by deep, slow-moving floodwaters, with some areas of deep and fast flows, especially along certain tributaries. The Upper Snoqualmie River and some of the major tributaries are characterized by steep gradient headwater systems and some lower gradient floodplains near the incorporated communities of North Bend and Snoqualmie. The cities of Carnation and Duvall and the unincorporated community of Fall City all lie within the broad Lower Snoqualmie Valley that features wide floodplains along the low gradient channel.[5]
- **South Fork Skykomish River** generates deep, fast-moving flood flows capable of severe bank erosion. This sub-basin drains 234 square miles of mountainous terrain within King County and includes major tributaries such as the Foss, Tye, Miller, and Beckler Rivers. The cities of Skykomish, Baring, and Gold Bar as well as many unincorporated area neighborhoods are located near or on the banks of the rivers and frequently experience impacts from flooding. The basin features steep slopes in the upper portion, thus significant runoff can result in fast major flooding. The rivers in the basin are also very prone to channel migration.
- **Cedar River** that connects to the south end of Lake Washington experiences fast, erosive flows. The basin has been heavily altered from its natural condition, with major projects constructed including Masonry Dam and the Landsburg Diversion, both to serve as water supply infrastructure. Along the Cedar River are many unincorporated community neighborhoods as well as cities like Maple Valley and Renton. Naturally-occurring large wood is a prevalent hazard in the basin.
- **Issaquah Creek**, located in Sammamish River Basin, can experience "flashy" flows that can rise quickly during storms with minimal infiltration.
- **Green River** which becomes the Duwamish River at the Black River confluence in the city of Tukwila, can experience fast flowing flooding in some areas and slow-moving overbank inundation in others. The Howard Hanson Dam in the upper reaches of the Green River,

[5] King County. 2024. *2024 King County Flood Management Plan*. Seattle: King County Department of Natural Resources and Parks, Water and Land Resources Division.

built and managed by the U.S. Army Corps of Engineers, provides flood control to the highly developed downstream areas of the river corridor.

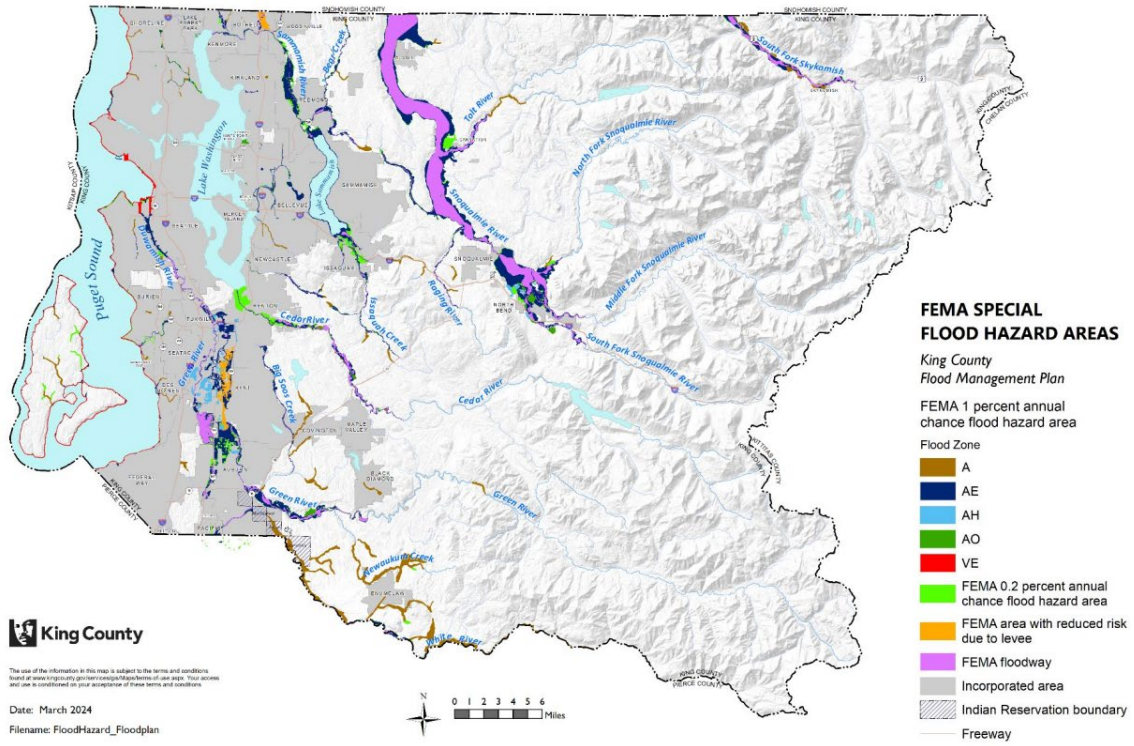
- **Duwamish River** is characterized primarily by slow-moving inundation primarily driven by precipitation as well as tidal influence from the Puget Sound.
- **White River** is lightly populated flowing through the Muckleshoot Indian Tribe reservation before reaching more developed areas in the most downstream part of the river. These developed areas face significant flood risk due to being in a depositional reach of the river. The river carries the most significant sediment load of any river in King County, and reduced channel capacity arising from ongoing sediment deposition is a primary flood risk in this watershed. However, the Mud Mountain Dam has a significant effect on reducing flooding in the basin. Additionally, water is diverted from the river to Lake Tapps.

Coastal flood hazard areas also pose potential risks to King County. There is approximately 100 miles of shoreline, about half of which is on Vashon Island in unincorporated King County and the other half is the incorporated shoreline through the cities of Shoreline, Seattle, Burien, Des Moines, and Federal Way. Storm surge and wave action are significant flood hazards facing development along shorelines. Coastal erosion also is a prevalent hazard, including along the steep bluff areas around the shoreline in King County. Many miles of shoreline are variably armored by bulkheads and other structures. Coastal flooding will be exacerbated by sea level rise and other impacts of climate change.

10.3 Magnitude

FEMA Special Flood Hazard Areas (SFHAs) in King County were first mapped in 1975 and last updated in 2020. SFHAs encompass regions at risk for flooding, mudflow, or flood-related erosion. These areas are classified based on their annual probability of occurrence, with larger flood events generally associated with a lower likelihood of occurrence. These classifications are illustrated in Figure 10-3.

Figure 10-3 King County Special Flood Hazard Areas



King County's SFHAs are broken up into the following flood zones:

- **100-Year Floodplain:** areas with a 1% annual chance of flooding. FEMA floodplain regulations and federal flood insurance are based on this flood event forms the basis for community regulations for participating communities in the National Flood Insurance Program. Flood zones A, AE, AH, AO, and VE are all Special Flood Hazard Areas (SFHAs) in King County, Washington, which are areas that have a 1% chance of flooding in any given year.
- **500-Year Floodplain:** area with a 0.2% (or 1 in 500 chance) annual chance of flooding.
- **Floodway:** Channel of a river or other watercourse and the adjacent land areas that must be reserved in order to discharge the base flood without cumulatively increasing the water surface elevation more than a designated height.

Figure 10-3 shows the 100-year floodplain areas and floodways. Note that Lake Washington does not have an identified floodplain because its water levels are controlled by the US Army Corps of Engineers operated at Chittenden Locks in Seattle.

King County experiences a wide range of annual precipitation amounts depending on location. Western areas including Seattle receive approximately 37 inches per year while areas along the cascade foothills to the east can exceed 100 inches annually.

10.4 Previous Occurrences

King County has faced 29 presidentially declared flooding disasters since 1956, resulting in millions of dollars in property damage. Historical data indicates that minor flooding occurs every winter, while significant flooding events happen every two to five years.

The most recent county-wide flood event occurred in between January to February 2020, when an atmospheric river arrived in the region bringing heavy and sustained rain. The Tolt River reached the highest flow in over 10 years and other rivers overflowed their banks causing widespread road closures. Dams on some of King County's major rivers captured large volumes of water that are typically slowly released over several days to make room for the next storm. The next atmospheric river arrived without enough time to allow for sufficient release of water from several of these dams. The combination of prolonged rainy conditions, high river flows, saturated soils, and elevated pools behind dams caused some areas in King County to experience the most severe flooding in decades.

The most recent high impact coastal flooding event occurred in December 2022. King tides and strong winds resulted in major coastal flooding with the Puget Sound water level peaking at 3.76 feet above the normal mean higher high water (MHHW) mark. Impacts were seen in numerous locations along the marine shoreline but were especially significant in the South Park neighborhood on the lower Duwamish River, which overtopped its banks. This lead to the evacuation of 15 to 18 homes and damage to several businesses.

The following table summarizes flood events throughout King County dating back to 1990. Data was collected from the National Center for Environmental Information (NCEI) Storm Events Database.[6]

Table 10-2 NCEI Flood Related Events in King County, 1990 - 2023

Date	Type of Flood	Location	Deaths/ Injuries	Property Damage	Narrative
9/3/1996	Flood	Seattle, Bellevue	0	Unknown	Urban flooding
3/1/1999	Heavy Rain	County-Wide	0	$5,500,000	The heavy rain, which in turn caused flooding and mudslides, over the winter season.
11/17/1999	Heavy Rain	Issaquah	0	$85,000	Heavy rains led to a road being washed out by Issaquah Creek.

[6] National Oceanic and Atmospheric Administration, "Storm Events Database," accessed October 23, 2024, www.ncdc.noaa.gov/stormevents/

2/28/2001	Heavy Rain	County-Wide	0	$200,000	An earthquake triggered a mudslide that damaged a home. The slide also blocked the Cedar River, which then backed up and flooded a road, forcing its closure.
11/13/2001	Heavy Rain	County-Wide	-	Unknown	Urban flooding and mudslides
9/8/2003	Heavy Rain	Kirkland	0	$5,000	Urban flooding
8/22/2004	Heavy Rain	Bellevue	0	$50,000	Urban flooding
01/05/2006	Heavy Rain	County-Wide	0	$800,000	The Governor declared a state of emergency after 10-day long rainstorm, causing over 7 million in damage, mainly to transportation infrastructure throughout western Washington. In King County, there were 19 road closures from water over the roadway. Many homes had flooded basements or crawlspaces.
11/4/2006	Flood	Snoqualmie Falls	0	$11,100,000	Major flooding on the Tolt, Snohomish, Skokomish, Skagit, and White rivers.
12/14/2006	Flash Flood	Seattle	1	$750,000	The strongest reported rain and windstorm struck producing areas of urban and small stream flooding and overwhelming drainage systems. In the Madison Valley area of Seattle, heavy rainfall produced excessive street runoff, flooding 25 basements and drowning one woman trapped in her basement by rapidly rising water.
12/3/2007	Heavy Rain	Bothell		$12,000,000	Flooding occurred on the Snohomish, Skykomish, Snoqualmie, and Issaquah Creek. Impact was felt in Snohomish, King, Lewis, Thurston, Mason, and Kitsap counties.
11/12/2008	Flood	Snoqualmie	0	$100,000	Major flooding caused by heavy rain on the Snoqualmie River.
1/7/2009	Flood	Snoqualmie, Carnation,	0	$14,000,000	The cities of Snoqualmie, Carnation, Duvall and Fall City flooded, some residents had to be rescued, many

		Duvall, Fall City, Pacific			homes were flooded. The Issaquah Creek flooded some residences and businesses. It also eroded part of the riverbank, which caused a guest house to fall into the creek. About 40 King County roads were closed. In Pacific, about 1000 people evacuated their homes due to flooding from releases from the Mud Mountain dam, 100 of those homes were damaged, some with 3 feet of water in them.
12/12/2010	Flood	Covington, North Bend, Vashon Island	0	$3,000,000	There was major flooding along the Snoqualmie River. Westside Hwy on Vashon Island was closed due to a portion of the road sinking. Some basements flooded as China Creek in Newcastle, overflowed. Several roads around North Bend and Carnation were closed due to flooding.
1/16/2011	Flood	Snoqualmie Falls, Fall City, Carnation	1	$20,000	The Snoqualmie Falls golf course in Fall City and parts of Highway 202 were flooded after the Snoqualmie river near Carnation reached major flood stage. A 66 year old state DOT worker was killed when a tree fell on Highway 203 south of Carnation, hitting him and his truck. Several mudslides blocked roads.
9/5/2013	Heavy Rain	Burien	0	$10,000	Rain caused flash floods and mudslides in several locations and closed a 24-mile section of the North Cascades Highway for several days. Also heavy rain caused a sinkhole which damaged a road in Burien.
11/17/2015	Heavy Rain	Skykomish	0	$200,000	Heavy rain swelled a creek that undermined the foundation of a US Hwy 2 bridge outside of Skykomish, closing a 15-mile stretch of the highway for about a week.
2/9/2017	Heavy Rain	Seattle	0	$33,000,000	Heavy rainfall in the Puget Sound area lead to high storm runoff. damaged the West Point sewage treatment plant in Seattle. King county dumped an estimated 235 million gallons of untreated wastewater - including 30 million gallons of raw sewage - into

					Puget Sound because of damage to the plant.
1/12/2021	Flood	Duvall	0	$474,000	The Snoqualmie and White Rivers exceeded flood stage. Urban and small stream flooding occurred as well. Heavy rain caused some landslides.
1/7/2022	Heavy Rain	Seattle, Renton	1	$1,520,000	Two atmospheric river events from Jan 5 - 7 and Jan 11- 13 that resulted in heavy rain, minor to major flooding, and landslides. 2 flood fatalities occurred, and possibly a third from a landslide.
12/27/2022	Coastal Flood	Seattle	0	Unknown	Duwamish river and tidal flooding leading to evacuation of 15-18 homes and damage to several businesses. It was reported that 18 homes did sustain damage.
12/05/2023	Heavy Rain	Seattle	0	Unknown	An atmospheric river event brought flooding, record breaking rainfall, and record high temperatures to Western Washington.

10.5 Probability of Future Occurrences



House destroyed due to channel migration along the Raging River.

King County is inherently vulnerable to flooding due to its distinctive geography and heavy precipitation patterns. As a result, flooding is an annual reality for the region. King County sees at least minor flooding ever year in the fall and winter and big events are often driven by atmospheric river narrow bands of concentrated moisture in the atmosphere transport water from the tropics to be dropped as heavy precipitation in western Washington. On average, major floods occur every two to five years, and projections indicate that both the frequency and severity of these events will likely increase due to the broader impacts of climate change.

According to King County's Flood Frequency Analysis conducted in 2016, certain areas exhibit particularly high probabilities of severe flooding. For instance, the upper Snoqualmie River Valley has a 22% annual probability of severe flooding, with an expected return period of approximately 4.5 years. The Tolt River faces an even higher annual probability of 38%, translating to a return period of about 2.8 years.[7]

10.6 Climate Change Considerations

According to the 2023 Fifth National Climate Assessment, the northwest region in the United States is projected to see an increase in frequency and intensity of extreme precipitation events.[8] While results will vary by location and flood interval, river flooding is expected to increase due to the combined effects of wetter winters, more intense heavy rain events, and more winter precipitation falling as rain rather than snow in mountain watersheds.

Sea level rise will also increase the frequency and extent of coastal flooding. Sea level in King County is projected to rise approximately 1 to 2 feet by mid-century and 2 to 5 feet by 2100 under a high greenhouse gas scenario. This expected increase may also exacerbate compound flooding in coastal drainages, which could impact public health, life, and safety.

10.7 Impact Assessment

Flooding, no matter the source, causes widespread and long-lasting damage. The force of moving floodwaters can tear homes from their foundations, sweep cars off the road, and destroy public infrastructure. Houses and businesses damaged by flooding can take many months to repair and are often unsuitable to live in during the repairs. Certain types of flooding can leave buildings inundated for several days, which can further worsen property damage. Flood-damaged buildings can pose health risks including mold, contaminated food and drinking water, and mental health stresses from the traumatic experience.

Public	Flooding can impact anyone who lives, works, or travels in or near floodplains. There are over 50,000 people residing in designated flood hazard zones. For those situated within the 100-year floodplain, there is a 26% likelihood of experiencing flooding over a 30-year period, the length of a typical mortgage. Not only can it impact people's safety, but flooding can also have significant financial costs. It's estimated that one foot of water in an average size home can

[7] King County. 2016. *Flood Frequency Analysis of King County Rivers with an Emphasis on the January 2009 Floods*. Prepared by Curtis DeGasperi, Water and Land Resources Division. Seattle, Washington.
[8] U.S. Global Change Research Program. "2023 National Climate Assessment." Accessed October 23, 2024. nca2023.globalchange.gov/.

	cause over $50,000 in damage. Without flood insurance, this level of damage can overwhelm a family's finances. Flooding also affects those who work in flood-prone areas or commute through them. In a flood event, most deaths occur from people driving through floodwaters and being swept away in their cars. Many farmworkers are employed in the Snoqualmie, Sammamish, and Green River valleys that are susceptible to river or tributary flooding.
Responders	Police, firefighters, and paramedics play key roles in the response to flooding. Police officers often help shut roads down to prevent people from driving through floodwaters; firefighters often rescue people trapped by flooding; and paramedics transport people hurt by flooding, often from hypothermia or other causes. If any of these first responders' buildings are in the 0.2% annual chance floodplain, their ability to respond is seriously threatened. Additionally, neighborhoods with roads that are inaccessible during flooding pose challenges to first responders. They may not be able to drive to homes and may require helicopters or boats to access.
Continuity of Operations	There are few government facilities located within flood prone areas in King County. Thus, flooding does not pose a substantial risk to the continuity of government operations. Those within flood areas include city buildings located in Snoqualmie, North Bend, and Carnation. Although the facilities themselves are relatively safe, government employees may still need to traverse flood-prone regions to reach their workplaces. This may necessitate the development of alternative work sites to ensure continuity of operations during flood events.
Property, Facilities, and Infrastructure	**Properties** Flooding often results in many millions of dollars in property damage. For families, damage to homes may mean difficult financial decisions, displacement for weeks, and lost belongings. For business owners, flood damage may mean lost economic output from shutdowns, destroyed inventory, and inability to pay employees. The National Flood Insurance Program is the primary way building owners financially protect their property in flood prone areas. As of June 2019, flood insurance policies cover over $2 billion worth of property throughout King County. Many larger commercial or industrial facilities are insured through private contracts, the value of which is not available to government agencies. Below is the cost estimate for Repetitive Loss (RL) properties across the county, along with a breakdown of the number of structures and their types by jurisdiction. Jurisdictions not listed do not have any RL properties. These

properties are defined as insurable buildings for which the National Flood Insurance Program (NFIP) has paid two or more claims exceeding $1,000 each within any 10-year rolling period.

Table 10-3 County-wide Damages of Repetitive Loss Properties

Flood Event	Total Structure Value Damages	Total Content Value Damages
10-year – Riverine	$4,815,178	$2,409,442
10-year – Coastal	$0	$0
25-year – Riverine*	$8,504,655	$4,528,211
25-year – Coastal*	$0	$0
50-year – Riverine	$14,653,784	$8,059,492
50-year – Coastal	$0	$0
100-year – Riverine	$14,899,809	$9,755,949
100-year – Coastal	$55,146	$23,262
500-year – Riverine	$27,152,762	$15,839,880
500-year – Coastal	$55,146	$23,262

NOTE:
* 25-year flood event values were linearly interpolated between the 10- and 50-year flood results modeled for each structure

Table 10-4 NIFP Repetitive Loss Properties by Jurisdiction

Jurisdiction	2-4 Family	Business – nonresidential	Other – Residential	Other – Nonresidential	Single Family	Total
Auburn					1	1
Bellevue			1			1
Burien					1	1
Carnation				1	17	18
Duvall				1	4	5
Fall City				1	1	2
Issaquah	1		1		9	11
Kent	1				1	2
Maple Valley					3	3
Normandy Park					1	1
North Bend					18	18
Sammamish					1	1
Seattle			1		1	2
Skykomish					3	3
Snoqualmie	4	1	1	2	127	135
Vashon					1	1
Grand Total	6	1	4	5	189	205

Critical Facilities

There are 498 critical facilities county-wide that could be exposed to the 1% annual chance riverine flood event, and 26 critical facilities for a coastal flood event. Potential damages could exceed $114 million for a 1% annual chance riverine flood event and approach $500,000 for a 1% annual chance coastal flood event.[9]

In unincorporated King County, one medical facility is located in the 1% annual chance floodplain, and an additional four medical facilities are in the 0.2% annual chance floodplain. No hospitals are in the 0.2% annual chance floodplain. While these five facilities are at risk, the risk from flooding to the overall healthcare and medical system is low.

There is concern that residents in sole-access neighborhoods, such as the lower Snoqualmie Valley, could become isolated in a flood event and won't be able evacuate for medical reasons.

Infrastructure

Transportation: Flooding regularly causes impacts to our roadways and bridges, which can cause very extensive and expensive repairs. Roads through the lower Snoqualmie Valley are particularly susceptible to flooding and close regularly during high water events. During these events, Valley residents can become isolated making evacuation and access for emergency responders challenging. Repeated roadway inundation also accelerates infrastructure deterioration and increases lifecycle costs.

Energy systems: Most overhead powerlines are not susceptible to impacts from flooding unless the power poles are not resistant to flooding. Buried cables typically aren't affected by flooding very often.

Water/Wastewater: Flooding, particularly from king tides and coastal storm systems can damage wastewater infrastructure such as the County's West Point Treatment Plant. Some city wastewater treatment plants are also located in flood prone riverine areas. Where these linear systems cross rivers, flooding can pose issues. The Tolt Pipeline, a water supply line for Seattle, was at risk from the Snoqualmie River migrating further toward its alignment. In 2019, a project was completed to provide some protection from that risk.

Communications: Most communications infrastructure is not vulnerable to flooding, with the primary exception being a regional fiber optic line that runs under the Cedar River Trail and along State Route 169. In some locations, the river abuts the trail, and erosion of the trail prism presents risk to this

	infrastructure. King County regularly monitors at-risk locations, and the King County FCD has implemented several projects to ensure the continued protection of this significant infrastructure.
Environment	Flooding is a natural process and supports unique ecosystems and habitats. Many riparian and aquatic ecosystems depend upon some amount of regular flooding or high-water events. Various salmonid species use high water events to seek refuge as juveniles or access more favorable habitats, which makes flooding an important part of recovery for the endangered salmon species in Puget Sound. Natural floodplain functions typically result in slower-moving floodwaters with less intense flood height peaks. When upland forest areas are logged or burned, rain and snowmelt reach streams faster, which can cause flooding to be more intense and push water through the floodplain more quickly. King County often incorporates natural functions into the design of projects, which helps reduce flood risk as well as protect and restore ecosystems. Reconnecting rivers and coastlines to their historic floodplains through levee setbacks, creating side channels, and removing obstructions help restore natural functions and bring flood risk reduction benefits as well. The large Countyline project near Auburn restored 121 acres of floodplain along the White River and reduce flood risk for over 200 residential properties.
Economy	Flooding can significantly impact industries that rely on floodplain locations such as agriculture, aerospace, manufacturing, and distribution. In the lower Snoqualmie valley, there are nearly 200 farms that produce a wide range of products from dairy to herbs and row crop vegetables. The Sammamish River valley supports a number of wineries and other small farms. And the Green River valley hosts many large fields of row crops as well as a large County-owned farm leased out by a diverse group of farmers. Flooding can negatively impact these operations, particularly if it occurs before harvest or late into the spring planting season. Farmers cannot sell food products from flood-damaged fields. Flooding, however, also provides nutrients to the soil that supports productive agriculture. While some agricultural sectors are dependent on natural floodplain functions, other economic sectors have located in the floodplain over decades for other reasons. Large warehouses in the Green River valley, many in the floodplain, make the region one of the largest logistics hubs in the nation. But, the square footage of warehouse and aerospace facilities means that billions of dollars are at risk of flooding every year as well as thousands of jobs.

[9] King County. 2024. *King County Flood Management Plan*. kingcounty.gov/en/dept/dnrp/nature-recreation/environment-ecology-conservation/flood-services/flood-management-plan/about-plan source

	In 2007, an economic study was conducted to understanding the economic impact of flooding. The study found that 6% of the county's jobs are located in floodplains and nearly 7% of the county's wages and salaries are generated in the floodplain ($3.7 billion). Approximately 20% of the county's manufacturing employment and 30% of the county's aerospace employment are found in floodplains. While new data have not been generated since that time, the study found that a major flood that would shut down economic activity in floodplains would result in at least $46 million per day in lost economic output. The figure is likely much higher today.
Public Confidence in Governance	Flooding occurs frequently enough in King County that residents often turn to the King County River & Floodplain Management Section for help and information during flooding events. Confidence is high in the government's ability to respond to flooding events. The multiple iterations of the Flood Management Plan have featured robust stakeholder involvement processes, which has inspired confidence in King County's ability to manage floodplains with higher regulatory standards and other programs to keep people and property safe from flooding.

10.8 Vulnerability Assessment

Vulnerable Population	Vulnerable populations that are particularly susceptible to the long-term impacts of flooding include low-income individuals, renters, and people with limited English proficiency, and communities of color. **Low-Income** Low-income individuals and families are among the most affected by flooding. The financial burden of flood damage can be overwhelming, making recovery difficult. Without flood insurance, families may have to deplete their savings to cover repair costs. Even with insurance, flood-damaged homes can remain uninhabitable for months, prolonging the disruption to their lives. **Renters** Renters are far less likely to have a flood insurance policy and may not even be aware of their flood risk. Generally, renters are not required to obtain such coverage, and it can often be unaffordable, especially in

	flood prone areas. Renters may also have less wealth or savings to draw from to pay for uninsured losses. **Limited English** Those who do not speak English do not have easy access to government resources. Most flood warning systems are in English and much of the flood insurance, floodplain regulations, and any mitigation programs are made up of materials in English. Flooding is a complicated hazard to understand and accessing flood warning, flood insurance, and other information often requires command of English, understanding of government bureaucracy, and access to financial resources. **BIPOC** In King County, approximately 41% of the 57,737 residents living in mapped flood hazard areas are Black, Indigenous, and other People of Color (BIPOC). The Green/Duwamish watershed is the only major river watershed in King County in which more BIPOC residents (59%) than white residents (41%) reside in mapped flood hazard areas. Other watersheds exhibiting a high percentage of BIPOC community members residing in flood hazard areas include the Sammamish (43%), Cedar (36%), and White River watersheds (38%).[10]
Property	The exposure analysis determined that approximately $11.9 billion of structural value for the general building stock is at risk to the 1% annual chance riverine flood event, and approximately $15.3 billion to the 0.2% annual chance flood event. Flooding and channel migration pose a risk to commercial and residential areas in the cities of Snoqualmie and North Bend and to residential areas in unincorporated King County. The lower reaches of the Middle and North Forks are subject to flooding and channel migration where rural residential development and agricultural land use are present.
Environment	Along the Snoqualmie Valley River, the three forks (North Fork, South Fork, Middle Fork) are vulnerable to sediment accumulation that reduces channel capacity. This is the result of intense flooding causing bank erosion and landslides. This can degrade salmonid habitats and their ability to migrate.

[10] King County. 2024. *2024 King County Flood Management Plan*. Seattle: King County Department of Natural Resources and Parks, Water and Land Resources Division.

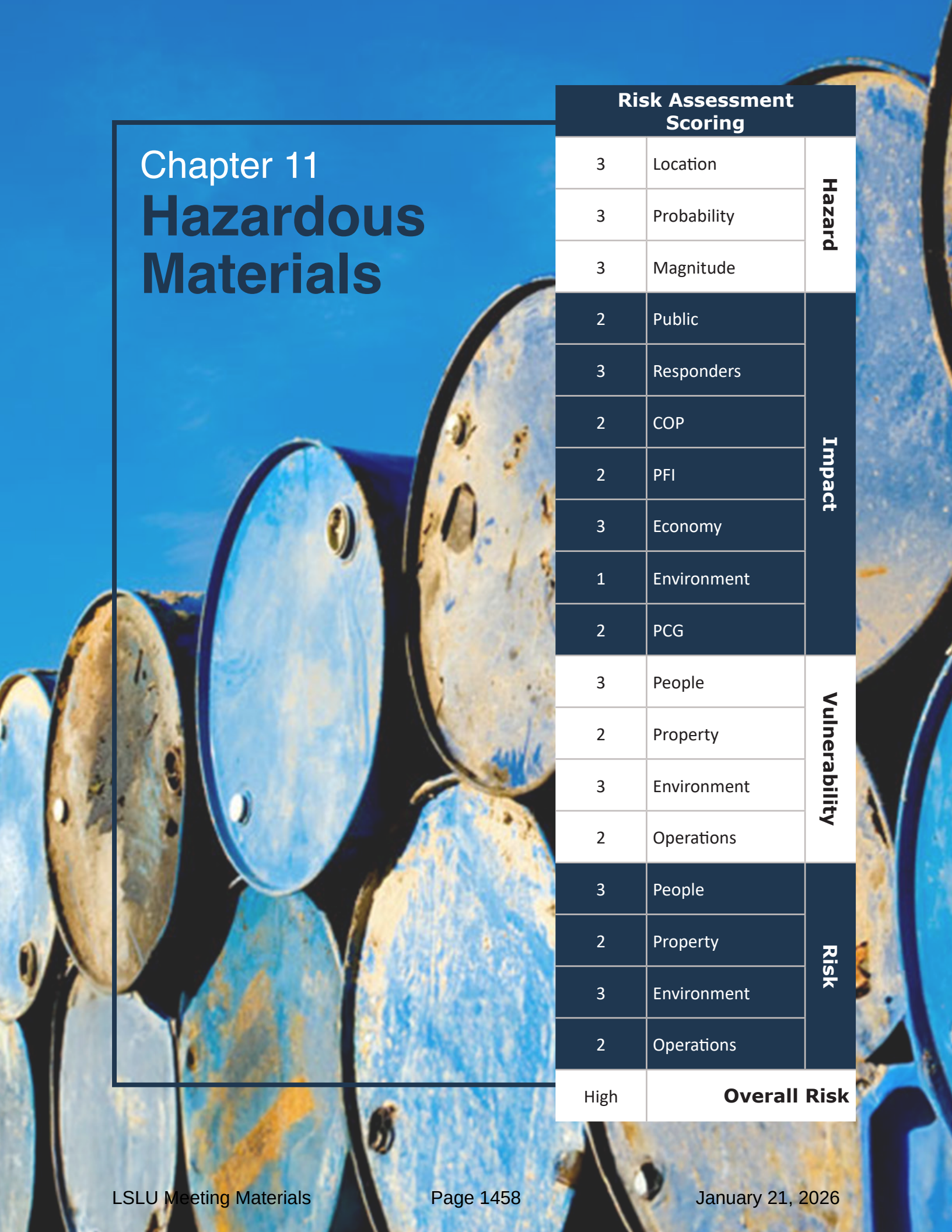
Operations

A handful of government operations are located within the flood areas of King County. For first responders we have, 3 out of 64 police stations in the 0.2% annual chance floodplain (located in Skykomish, Redmond, and Issaquah), 6 out of 161 fire stations (located in Skykomish, Seattle, North Bend, Renton, Issaquah, and near Enumclaw), and 3 city buildings (located in Snoqualmie, North Bend, and Carnation).

For critical facilities, there are 498 county-wide that could be exposed to the 1% annual chance riverine flood event, and 26 for a coastal flood event.

Chapter 11

Hazardous Materials



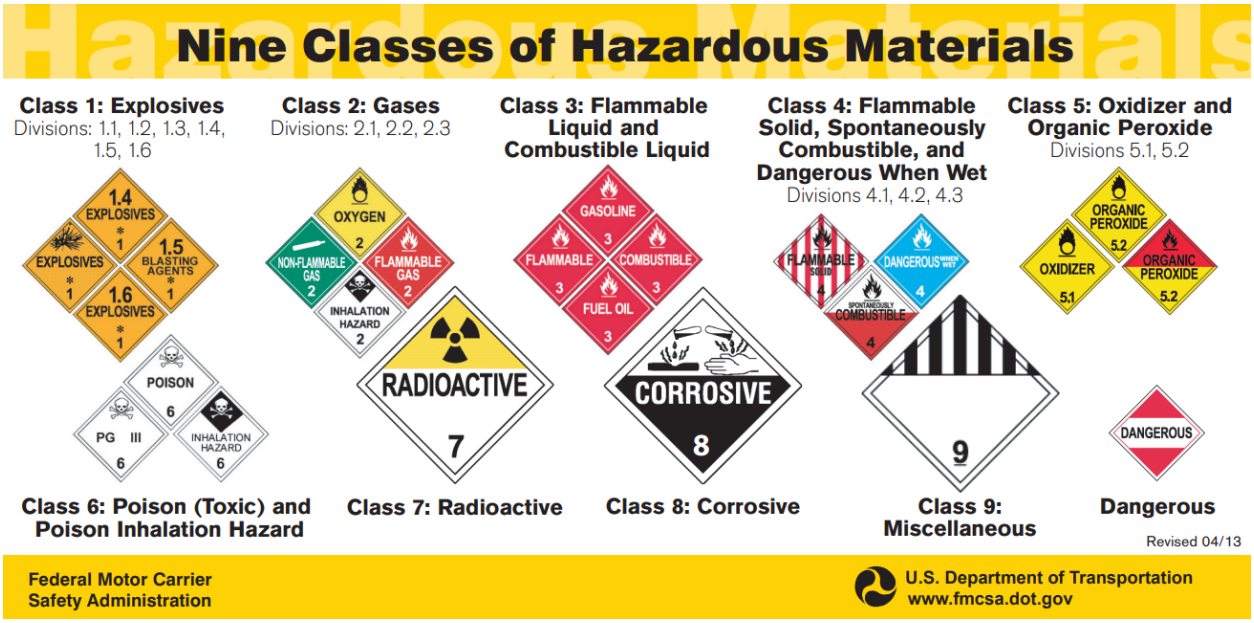
Risk Assessment Scoring		
3	Location	Hazard
3	Probability	
3	Magnitude	
2	Public	Impact
3	Responders	
2	COP	
2	PFI	
3	Economy	
1	Environment	
2	PCG	
3	People	Vulnerability
2	Property	
3	Environment	
2	Operations	
3	People	Risk
2	Property	
3	Environment	
2	Operations	
High	**Overall Risk**	

Chapter 11: Hazardous Materials

11.1 Hazard Description

Hazardous materials (hazmat) releases are among the most common types of incidents. These "releases" can occur through spills, leaks, toxic vapor emissions, or any other process that allows a material to escape its container, enter the environment, and create a potential hazard.[1] Hazmat is classified into nine different categories based on its characteristics:

Figure 11-1 Classifications of Hazardous Materials[2]



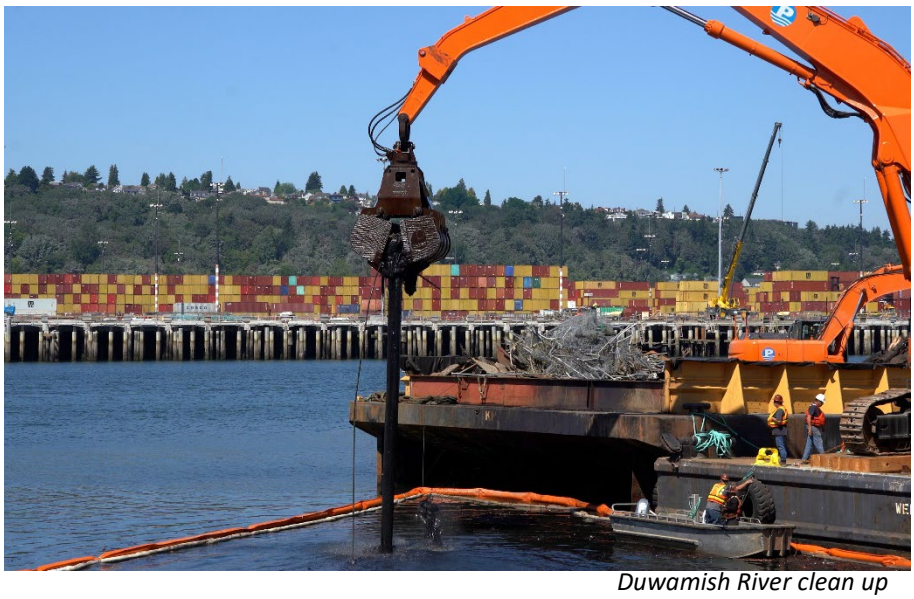
Common hazardous materials include substances like anhydrous ammonia (used as a refrigerant), gasoline and diesel (used as fuels), paints and dyes (used in residential and commercial applications), and various corrosives (used in industries such as aircraft manufacturing). Pipelines and rail lines transport crude oil to refineries and finished fuels to homes (like natural gas) and retail fueling stations.

Hazardous material releases can occur through a variety of causes, ranging from accidents and mismanagement to natural disasters and malicious attacks.

[1] US DOT Pipeline and Hazardous Materials Safety Administration, "List of Hazardous Substances and Reportable Quantities" *49 CFR 172.101 Appendix A* (n.d.)
[2] FMCSA, "Nine Classes of Hazardous Materials (Yellow Visor Card)" *Regulations* (April 2013)

- **Accidents and Mismanagement:** Hazmat releases can occur from leaking containers or pipelines due to corrosion or punctures. Accidental overflows during the transfer of hazardous materials, loading dock and warehouse accidents, careless handling, and even illegal activities such as drug labs can also lead to dangerous spills. For example, when someone dumps paint down a sewer, they are releasing hazardous material into the environment. Similarly, illegal drug labs not only use hazardous substances but also create hazardous waste, while car accidents that result in fuel, oil, or antifreeze spills also create hazardous cleanup situations. Another growing concern is the dumping of electronic waste, which releases toxic chemicals like lead, zinc, nickel, flame retardants, barium, and chromium into the environment.
- **Natural Hazards:** Hazmat releases can also result from natural events like earthquakes, volcanic activity, severe flooding, and wildfires, which can cause containers or pipelines to rupture or overflow.
- **Malicious Attacks:** The risk of a CBRNE event (chemical, biological, radiological, or nerve agent attack) is low, but its potential impacts would be severe. Despite the minimal daily risk, it remains a top priority for counterterrorism planners due to the catastrophic consequences. In Washington, over 20 billion gallons of oil and hazardous chemicals are transported annually by various means.

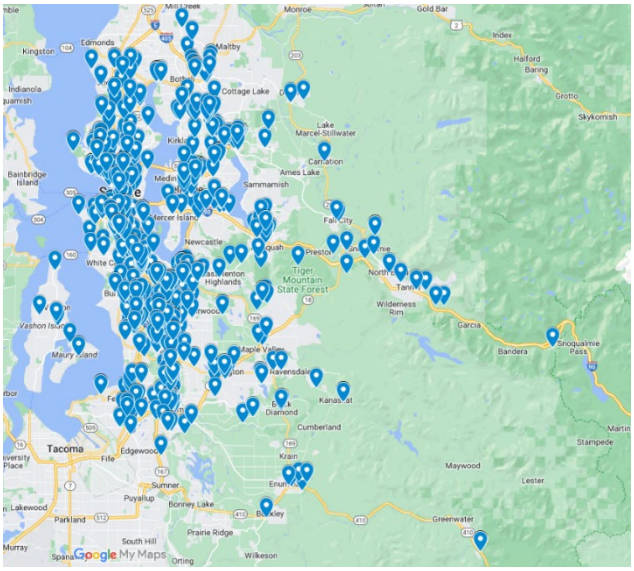
11.2 Location



Duwamish River clean up

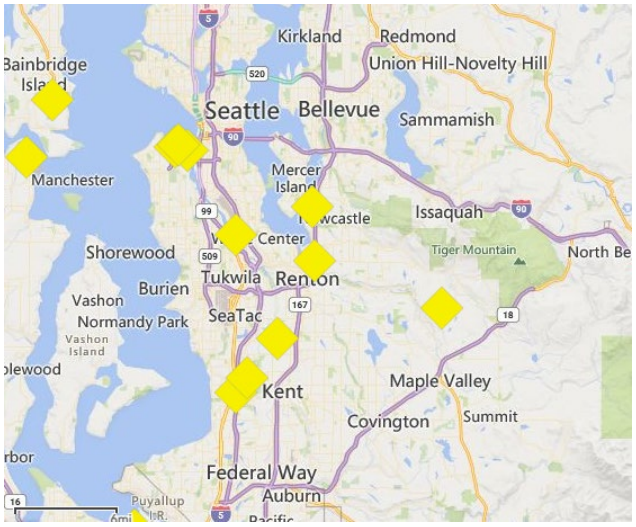
Hazardous materials can be present in a variety of locations, ranging from residential homes and workplaces to medical facilities and industrial sites. These materials can include cleaning products, engine fuels, chemicals, and everything in between. Certain areas are more prone to hosting or interacting with hazardous substances, such as distribution centers, ports, industrial zones, Tier II facilities, and transportation networks (including highways, rail lines, and pipelines). Additionally, there are identified contaminations sites such as Superfund and brownfield sites that face both short- and long-term exposure to hazardous materials. Below is a detailed overview of the most concerning areas.

Figure 11-2 Tier II Facilities[3]



There are 3,164 facilities that submitted Tier II reports in 2023. In the City of Seattle alone there are thousands of facilities with hazardous materials regulated under the fire code. Other areas with high concentrations of hazardous materials usage include Auburn, Redmond and the Kent Valley. Business types that commonly use hazardous materials include: hospitals, schools and universities, metal plating and finishing, the aircraft industry, public utilities, cold storage companies, the fuel industries, the communication industry, chemical distributors, research, and high technology firms. Each of these facilities is required to maintain plans for warning, notification, evacuation and site security under various regulations. Primary hazardous materials stored are motor oil, sulfuric acid, and lead acid batteries. A facility failure, including an explosion or release of chemicals, could endanger or kill many people. In Waco, Texas in 2013, an ammonium nitrate explosion occurred at a distribution facility, leveling a neighborhood and killing 15 people. A train derailment in 2013 in Lac Megantic in Quebec, Canada killed 60 people and destroyed much of the town.

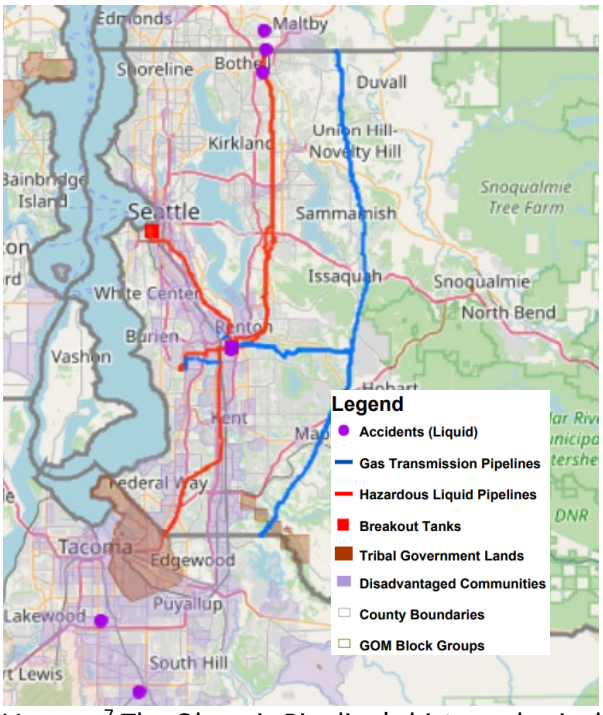
Figure 11-3 Superfund National Priorities List (NPL) Sites[4]



There are currently 10 active superfund sites and 8 brownfield sites in King County. Superfund is a US EPA program that cleans up severely contaminated sites that have significant risk to the environment and public health. On the other hand, a brownfield site is a property, the expansion, redevelopment, or reuse of which may be complicated by the presence or potential presence of a hazardous substance, pollutant, or contaminant.[5]

[3] WA Department of Ecology, 2023
[4] US Environmental Protection Agency, "Superfund National Priorities List (NPL) Where You Live Map" *Learn About Superfund* (September 2024): https://www.epa.gov/superfund/search-superfund-sites-where-you-live#advanced
[5] US Environmental Protection Agency, "Brownfield Overview and Definition" (n.d.): https://19january2017snapshot.epa.gov/brownfields/brownfield-overview-and-definition_.html

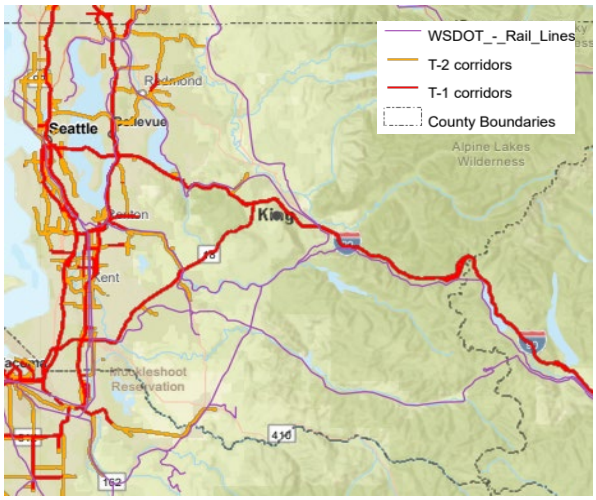
Figure 11-4 Pipelines in King County[6]



King County is home to several major pipelines, including those operated by Phillips 66, TransMontaigne, Williams Pipeline, Northwest Pipeline, Olympic Pipeline Company, Puget Sound Energy, and Swissport Fueling. These pipelines transport essential fuels and chemicals across the region, but mismanagement and poor maintenance can lead to failures or shutdowns, which may cause contamination in nearby communities and significant economic impacts, including fuel shortages and price increases.

One notable incident occurred in 2023 when a valve failure on the Olympic Pipeline in the Skagit Valley, just north of King County, caused a spill of approximately 30,660 gallons of gasoline. This spill impacted nearby creeks not far from Mount Vernon.[7] The Olympic Pipeline's history also includes a tragic explosion in 1999, which killed three people and caused over $58 million in property damage. Other past incidents include a 2005 spill in Renton (40 gallons) and one in Bothell (30 gallons), as well as a 2020 spill in Bothell of 11.7 gallons.

Figure 11-5 Transport restrictions for hazardous materials



King County hosts a variety of unique transportation and geographic conditions, including one of the largest deep-water seaports on the west coast, an International Airport in SeaTac that handles cargo from all over the world, as well as fuel pipelines running south from Whatcom County through King County and down into Portland carrying jet fuels, diesel, gasoline, etc. Additionally, local highways like Interstate-5, Interstate-90, Interstate 405, US Highway 2, State Route (SR) 18, SR 516, SR 167, US Highway 99 and others transport hazardous materials throughout the region. Restricted HM routes include I-90 through Mercer Island, I-5 in

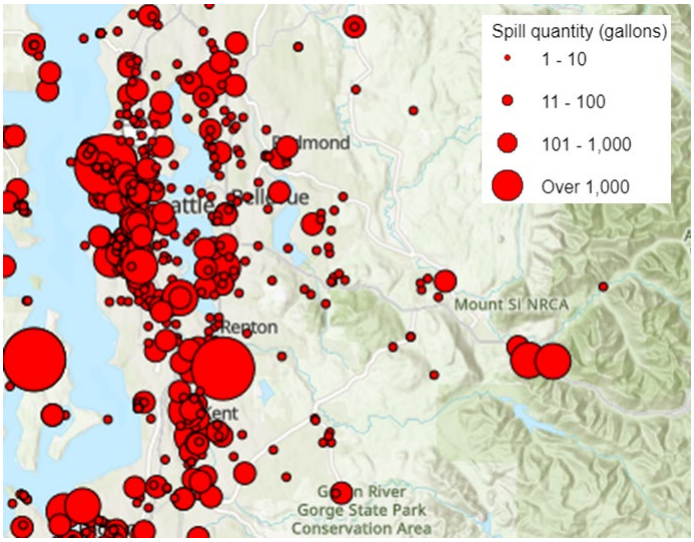
[6] US DOT, "National Pipeline Mapping System (NPMS)" (n.d.): https://pvnpms.phmsa.dot.gov/PublicViewer/
[7] Lauren Girgis, "Olympic Pipeline leak released 25,000 gallons of gasoline" *The Seattle Times* (December 2023): https://www.seattletimes.com/seattle-news/environment/olympic-pipeline-leak-released-25000-gallons-of-gasoline/

Seattle under the Convention Center, SR-99 Seattle Tunnel, and 188th S in Sea Tac. An oil spill in 2016 in Mosier, Oregon along the Columbia River very nearly caused the destruction of the entire town and an ecological catastrophe in the river. The community was saved by luck of the weather and because most of the oil that spilled flowed into a water treatment plant, where it was safely contained.

11.3 Magnitude

Several systems are used to evaluate the either release of hazardous materials or areas that formerly acted as hazmat storage. These factors are based on contamination levels, risk to human health, environmental damage (for soil and water), and local impact. Although the likelihood of large numbers of fatalities from a single materials release is low, the effects can be devastating to impacted communities, the economy and the environment. A major oil spill in Puget Sound would destroy the fishery, including $4.5 billion in commercial fishing, plus tourism, and sport fishing. The Puget Sound is also a culturally sacred and environmentally critical resource that cannot be replaced or valued in dollars. In this way, the hazardous materials incident hazard is one of the most complex. It includes frequent spills and releases from day-to-day human activities, the threat of a major release from a massive spill or accident, and the threat of an intentional release from an attack. The impacts from hazardous materials are also complex, including slow-acting releases that kill people and the environment over years and catastrophes that kill thousands.

Figure 11-6 Reported spills to waterways in King County, 2019 – 2023[8]



Spill Quantity	No. Incidents
1 to 10	3056
11 to 100	812
101 to 1000	145
over 1000	32

[8] WA Department of Ecology, *Spill Map* (December 2024): https://gis.ecology.wa.gov/portal/apps/experiencebuilder/experience/?id=591270509d254f189fb63d4c2d0af340&page=Page&views=Reported-Incidents

Between 2019 and 2023, Washington State Department of Ecology received 4,045 reports of oil spills of one gallon or more reaching a water source, including both running into storm drains and running directly into a waterway. This only includes reported spills and only includes oil spills. This does not include the uncountable quantity of micro-spills that occur and are later washed into waterways by rain. For example, the rough spot of pavement in a parking lot that is the result of fluids dripping onto the pavement from parked vehicles is an oil spill.[9] In Washington, the state Department of Ecology is the lead agency for hazardous materials. Local response is led by fire services.

11.4 Previous Occurrences

Though they occur every day, many spills are not reported or go undetected. Some industrial spills from the 1970's and 1980's are still being cleaned up in the Kent Valley, Harbor Island, Duwamish corridor, and Seattle/South Park as federal Superfund cleanup sites. There are currently 10 active superfund cleanup sites in King County and eight brownfield sites.[10] Currently active sites include:

Table 11-1 Superfund and Brownfield sites within King County

Site Name	City	Site Type	Description
Superfund Sites			
Harbor Island (lead)	Seattle	Recycling	Batteries/scrap metals/secondary smelting/precious metal recovery groundwater contains benzene, ethyl benzene, xylene, mercury, cadmium, lead and zinc with poly chlorinated bi-phenols (PCB) sediments.
Lockheed West Seattle	Seattle	Manufacturing, Processing, Maintenance	Trucks/ships/trains/aircraft and related components heavy metal contaminants: arsenic, chromium, copper, lead, silver, and zinc with butyl tins and PCBs.
Lower Duwamish Waterway	Seattle	Other	Contaminated sediment site with no identifiable source. River sediments are contaminated with mercury, arsenic, PCBs, dioxins, furans, and phthalates.
Midway Landfill	Kent	Waste Management	Co-disposal landfill (municipal and industrial). Ground water contaminated with heavy metals and volatile organics.

[9] Washington State Department of Ecology. Coastal Atlas. Accessed online on 7/2/19 from https://fortress.wa.gov/ecy/coastalatlas/storymaps/spills/spills_sm.html.
[10] U.S. Environmental Protection Agency. Superfund Sites Where You Live. Accessed online on 6/25/19 from https://www.epa.gov/superfund/search-superfund-sites-where-you-live

Site Name	City	Site Type	Description
Pacific Car & Foundry Co.	Renton	Manufacturing, Processing, Maintenance	Trucks/ships/trains/aircraft and related components. Soil is contaminated with heavy metals, PCBs and solvents. Approximately 37,000 obtain drinking water from wells within three miles.
Pacific Sound Resources	Seattle	Manufacturing, Processing, Maintenance	Lumber and wood products/wood preserving/treatment. Soil and ground water contaminated by PCBs and heavy metals from former wood treatment operations.
Queen City Farms	Maple Valley	Waste Management	Industrial waste facility (non-generator). the site is a former landfill. Ground water, surface water, and sludge contaminated by volatile organic compounds. Soil contaminated with PCBs and metals.
Quendall Terminals	Renton	Manufacturing, Processing, Maintenance	Chemicals and allied products. Soil and ground water contaminated with benzene and creosote from former manufacturing plant. Contaminants release to Lake Washington.
Seattle Municipal Landfill (Kent Highlands)	Kent	Waste Management	Landfill contains volatile organic compounds like toluene, xylene, vinyl chloride, and others – plus heavy metals.
Western Processing Co. Inc.	Kent	Recycling	Chemicals/chemical waste (e.g., solvent recovery). former industrial processing facility ground water and sediment contains volatile organic compounds, PCBs, phenols, and heavy metals.
Brownfield Sites			
Boathouse Inc Renton Skyway	Seattle	Dry cleaning facility	The 0.48-acre site was formerly home toa dry cleaning facility. The facility's operations led to hazardous chemical releases into the soil and groundwater. Located 5,700 feet from the Duwamish River and the Skyway Water District and City of Renton are within 2 miles.
Rainier Court	Seattle	Housing	7-acre Rainier Court Property Phase IV Development, built on land with contaminated fill, has seen past uses such as vehicle storage, welding, and small residences with heating oil tanks.

Site Name	City	Site Type	Description
Goodwill Corp Dearborn Campus	Seattle	Retail, Storage, Learning Facility	Goodwill site located in Seattle's Central District. Contaminants in the soil and groundwater are linked to past activities, including a dry cleaner, hazardous materials storage, petroleum USTs, metal plating, and contaminated fill.
Grand Street Commons	Seattle	Housing	Located in Judkins Park neighborhood has hosted manufacturing, dry cleaning, and vehicle repair businesses, leading to hazardous substance releases into the soil and groundwater. Cleanup includes excavation and disposal of PCE- and petroleum-contaminated soil. Additionally, groundwater treatment began in June 2021.
Chubby & Tubby	Seattle	Gas Station	Half acre commercial space formerly used as a gas station that had petroleum contaminated soil.
Boeing Auburn	Auburn	Manufacturing	Auburn Plant has caused groundwater contamination with volatile organic compounds (VOCs), chemicals that emit vapors. Contaminated groundwater flows north and northwest from the site, affecting areas in Algona and Auburn.
Betty Brite Cleaners	SeaTac	Dry cleaning facility	This site has confirmed contamination of halogenated solvents that could potentially harm people and the environment. Currently awaiting cleanup.
Mt Baker Properties	Seattle	Housing	Since 2016, the Mt. Baker Housing Association (MBHA) has been cleaning up the contaminated site. Former business activities impacted the soil and groundwater, including contamination from a former gas station and Mount Baker Cleaners.

While the majority of incidents tend to involve petroleum products, a significant number involve extremely hazardous materials. Extremely hazardous materials include chemicals like chlorine, ammonia, sulfuric acid, nitric acid, some pesticides (EHS is a technical designation, so not pesticides- although the chemistries used as pesticides might be on the EHS list), and other chemicals that can cause immediate death or injury when inhaled, ingested, or come in contact with skin.

An example of the cleanup costs for a Superfund site is illustrated by the Harbor Island Cleanup. The former owner, RSR Corporation agreed to pay $8.5 million in fines toward the cleanup that will cost (when completed) over $32 million.[11] The cost to cleanup an illegal drug lab (in a home) can cost between $5,000 and $100,000 depending on the size of the home. Often the occupants vacate or abandon the sites – leaving a bank or credit union holding the mortgage and cleanup costs.[12]

11.5 Probability of Future Occurrences

Given the widespread use and distribution of hazardous materials across the county, including in residential homes, medical facilities, and industrial sites, the risk of a hazmat release within the next year is inevitable. Certain areas are more vulnerable to these incidents, such as the 3,164 reported Tier II facilities, transportation networks like the Olympic Pipeline, and Superfund sites. Historical data shows that most spills are relatively small, with over 75% involving 1 to 10 gallons oil and 20% falling within the 11 to 100-gallon range. However, approximately 5% of spills exceed 101 gallons, underscoring the potential for more substantial environmental damage.

11.6 Climate Change Considerations

Climate change increases the risk and impact of hazardous material (hazmat) releases due to more extreme weather events like floods, storms, and wildfires, rising sea levels, and higher temperatures. These factors can damage infrastructure, such as chemical storage tanks and pipelines, causing spills and leaks. Changes in precipitation patterns, including droughts and heavy rainfall, can overwhelm containment systems and lead to toxic runoff. Additionally, aging infrastructure may be more vulnerable to climate stresses, and extreme weather can disrupt emergency response efforts, making it harder to manage hazmat incidents. Climate change also affects ecosystems, making them more susceptible to contamination from spills.

11.7 Impact Assessment

Public	Potential Impacts to the public from a hazardous materials spill can vary widely. Temporary or even permanent displacement through evacuation from an unsafe area can result in relocation/displacement of populations. Employment disruption, school closure, impacts to private and community wellheads and other impacts can change whole communities. Long term exposure to toxic

[11] U.S. Department of Justice. 2006. Former Harbor Island Smelter Operator to Pay $8.5 Million in Superfund Cleanup Costs. Accessed online on 6/25/19 from https://www.justice.gov/archive/opa/pr/2006/January/06_enrd_047.html.
[12] Dewan, Shaila and Robbie Brown. July 25, 2009. When an ex-meth lab is home. *The Seattle Times.* Accessed online on 6/25/19 from https://www.seattletimes.com/business/real-estate/when-an-ex-meth-lab-is-a-home/.

	chemicals can cause birth defects and temporary or permanent health problems – especially for the young, old and infirm.[13]
Responders	Hazardous materials make response and recovery activities in all disasters a threat to the health and safety of responders. During local events, such as house fires, stores of chemicals can catch fire and explode, injuring responders. During larger events such as earthquakes, large-scale releases can surprise and overwhelm responders without proper equipment. It can also be extremely difficult to determine the chemical or chemicals that have been released from a given spill, adding to first responder danger.
Continuity of Operations	King County is the operator of several facilities that are vulnerable to hazardous materials spills. The county has three waste water operations (South Plant, West Point Treatment Plant, and Brightwater). These expensive facilities are vulnerable to the introduction of chemicals (when in large volumes) to the sanitary sewer system. The county also has solid waste (garbage) transfer stations and a major landfill operation at Cedar Hills. While contaminants are avoided, some material may make its way into the landfill and the ground water table. Drinking water facilities including private and community well heads and reservoirs may also be vulnerable to introduction of chemical or biological contaminants. Any chemical spill that impacts a major roadway or rail line may impact public transit routes in the county.
Property, Facilities, and Infrastructure	**Property** Spills of hazardous materials to soil or buildings can result in extensive and costly cleanup efforts. Cleanup standards are established by federal (U.S. EPA), state (Washington State Department of Ecology), and local standards (fire agencies and environmental agencies). Until a site is cleaned up to those standards, residential or business occupancy can be denied under the Health Code. The responsible party (property owner) may be required to pay for the cleanup. Often this can lead to bankruptcy and clean up by state or federal agencies and contractors. Contaminated property can drastically reduce the value of the property and the King County subsequent property taxes available to local and state government. Similar impacts can be expected for transportation accidents with hazardous material spills. **Facilities** Hospitals can be overwhelmed by major releases of hazardous materials as populations, both those exposed and those who feel they may have been, check in at emergency rooms. Hospitals and pharmacies are also sources of hazardous materials, including some radioactive materials such as those associated with cancer treatment.

[13] U.S. Centers for Disease Control. Health Effects of Chemical Exposure. Accessed online on 6/25/19 from https://www.atsdr.cdc.gov/emes/public/docs/Health%20Effects%20of%20Chemical%20Exposure%20FS.pdf.

	Infrastructure With hazardous materials being everywhere in our modern community, it is possible to impact almost any critical facility in the county. Any roadway or rail line is vulnerable to the many chemicals transported over them daily. Spills to soils and surface water sources can impact drinking water and the environment. Materials dumped into sanitary sewers can contaminate wastewater treatment plants. Airborne chemicals can cause the evacuation of the area downwind of the spill, including critical facilities. Damage to road surfaces from chemical spills may require the removal and replacement of the entire road surface and foundational roadbed. Transformers used in power transmission contain chemicals called PCB (Poly chlorinated bi-phenols) that can be released during wind storms or lightning strikes and traffic accidents. The impacts to business from interrupted commute/road or railroads closures can last for hours, days, weeks, or longer. White powder incidents have closed postal facilities and government buildings until the substance was identified and removed
Environment	Any chemical spill on or along rails, roads, pipelines, fixed industrial facilities or illegal drug labs/dumping may impact the natural environment. Wetlands, streams and rivers, lakes, and reservoirs may all be damaged from chemical spills. In some cases these damages may injure the plant and animal life irreparably. Birds, reptiles, amphibians, fish, and mammals may all be impacted. Air pollutants may impact human inhabitants as well as the natural environment. Recreational areas can be closed until a suitable solution can be found to recover the natural environment.
Economy	Small spills can close businesses and have a rather large impact on employment and land use including the properties of neighbors not responsible for the chemical release. Superfund sites can impact a community for decades until they are cleaned up. The large salmon and fishing fleet that calls King County home may be impacted when some of a year's fish stock – or even the entire run is impacted.
Public Confidence in Governance	The Community Right to Know Act, and other related legislation, resulted from serious breaches in public confidence following massive releases, explosions, or other failures in hazardous materials systems. Any major incident in and of itself seems to offer proof to the public of a regulatory failure. Maintaining Local Emergency Planning Committees and a regular structure to report and analyze hazardous materials releases is critical to maintaining public confidence.

11.8 Vulnerability Assessment

Vulnerable populations	Vulnerable populations often live in closer proximity to facilities with the risk of hazardous materials release. In King County, this includes residences near the Duwamish industrial area, in Kent, Renton, and south Seattle. These are also the locations of the superfund sites in the region. In cases of major releases or system failures, the most impacted populations are frequently lower-income, often ethnic minority communities that live nearby. Populations with respiratory issues are also at a heightened risk of impacts due to an airborne release of chemicals. **Low-income communities in or around industrial facilities** Low-income communities are more likely to be impacted from major releases due to the proximity of affordable housing to industrial areas and historic environmental injustices. **Individuals with respiratory issues** Individuals with respiratory issues are more likely to succumb quickly to an airborne release of a chemical.
Property	Properties vulnerable to hazardous material (hazmat) release typically include former industrial sites, dry cleaning facilities, gas stations with underground storage tanks, landfills, and vehicle maintenance or repair shops. These properties often suffer from contamination due to the improper disposal or leakage of chemicals, solvents, petroleum products, heavy metals, and other toxic substances. Sites with contaminated fill or former military and chemical storage areas are also at risk, as they may harbor pollutants that persist in the soil and groundwater.
Environment	Oil tankers are expected to traverse Puget Sound in growing numbers due to Canada's approval of a major pipeline and terminal in Vancouver, BC. When this occurs, it will significantly raise the risk of a spill that could destroy much of the aquatic life in Puget Sound.
Operations	**Transportation** Major transportation facilities store huge amounts of chemicals and fuel in depots. A failure or fire at one of these facilities could damage or destroy these assets. Interstate highways are a major artery carrying chemicals. Accidents happen every day and major chemical spills can shut down a roadway

for an extended period of time. Additionally, oil slicks contribute to traffic injuries and fatalities when it rains.

Rail facilities transport chemicals and fuels, including highly combustible crude oil. There have been multiple derailments and spills. In Mosier, Oregon in 2016, a train derailed causing a fire that nearly destroyed the town, and the fuel avoided leaking in large quantities into the Columbia River by luck.

Chapter 12

Health Incidents

Risk Assessment Scoring		
4	Location	Hazard
3	Probability	
3	Magnitude	
3	Public	Impact
3	Responders	
3	COP	
1	PFI	
1	Environment	
3	Economy	
3	PCG	
4	People	Vulnerability
1	Property	
1	Environment	
2	Operations	
3	People	Risk
2	Property	
3	Environment	
3	Operations	
High	**Overall Risk**	

PC: Ken Lambert

Chapter 12: Health Incidents

12.1 Hazard Description

For the purpose of this risk assessment, health incidents are referred to as infectious disease outbreaks affecting the population, agriculture, and/or wildlife. While there have been great advancements in public health and medicine to address and even eradicate dangerous infectious diseases, the emergence of evolving and novel pathogens, as well as increased mistrust in government and health institutions, present new challenges for the coming years. This risk is a growing concern for the county in the wake of the COVID-19 pandemic, which led to a substantial morbidity (illness) and mortality (death) as well as strained healthcare systems and economic losses. Proactive planning by federal, state, and local agencies is essential for mitigating the future spread of illnesses and their impacts. The county's primary concerns include communicable and agricultural diseases.

Communicable diseases are vector-borne illnesses that people spread to one another through contact with contaminated surfaces, bodily fluids, blood products, insect bites, or through the air. Examples include influenza, norovirus, and hepatitis A.

Agricultural diseases encompass a variety of animal and crop diseases, pest infestation, and food safety outbreaks. Examples include highly pathogenic avian influenza (HPAI), Chronic Wasting Disease and *e coli*.

An outbreak can be characterized by the extent of spread of the disease:

- **Endemic**, seen in more common diseases, are at baseline levels within a community. Animal and crop diseases are endemic in many parts of the world.
- E**pidemic** refers to an increase, often sudden, in the number of cases of a disease above what is normally expected in that population in that area.
- **Pandemic** refers to an epidemic that has spread over several countries or continents, usually affecting a large number of people.

Outbreaks of any scale can have significant impacts on public health and healthcare resources. New or emerging diseases can also quickly become an epidemic or pandemic if there is little or no immunity in the population.

12.2 Location

All King County jurisdictions are susceptible to infectious disease outbreaks. However, several factors can increase the likelihood of a disease spreading, including population density, the amount of international travel and trade in an area, likelihood of exposure to animals, the availability of accessible healthcare services, and the pre-existing health conditions of those exposed or infected.

Population Density

King County is the largest county in Washington State, home to over 2.2 million residents with a population density of approximately 985 people per square mile. Comparatively, urban centers in the county such as Seattle has a population density of about 9,000 people per square mile across its 83.83 square miles. Similarly, the City of Bellevue has around 4,612 people per square mile within its 33.5 square miles. High population density in these cities create environments conducive to the rapid spread of infectious diseases, as close human contact is a primary driver of transmission.

Port and Travel

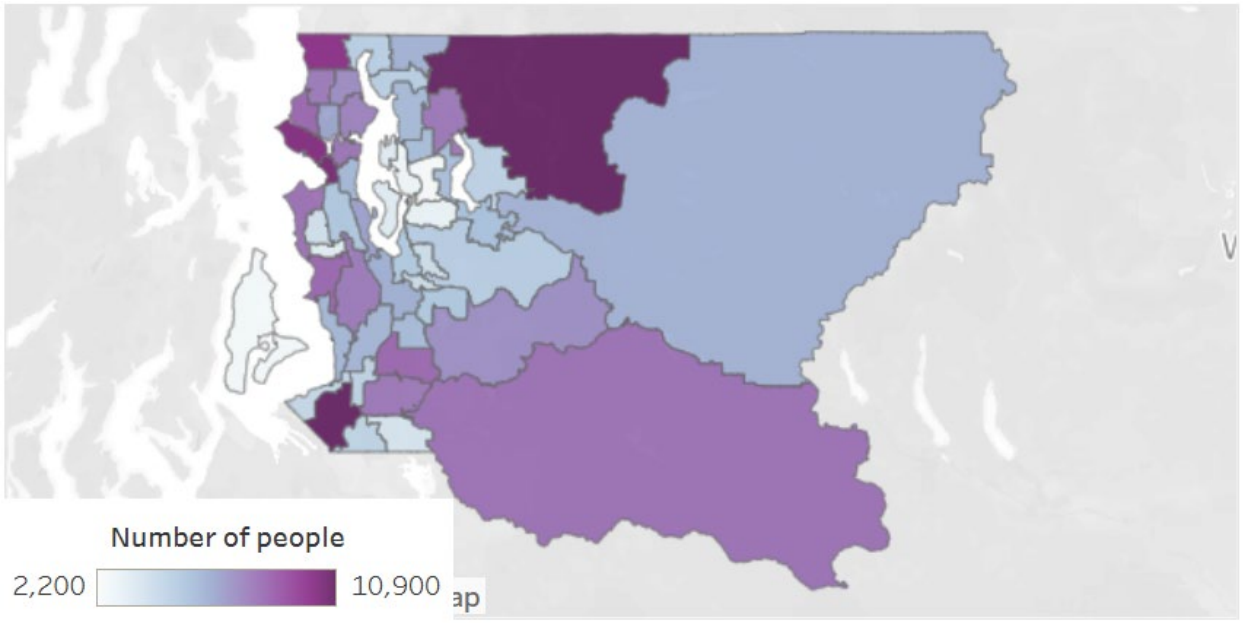
Seattle is home to the eighth largest port and the eleventh busiest airport in the United States, and the Seattle Tacoma airport is one of the first points of entry for international travelers across the Pacific. The presence of major international air and sea ports, along with a thriving cruise ship industry creates a steady flow of visitors to our area, raising the risk of importing (and exporting) infectious diseases. Diseases that are not endemic to Washington have the potential for introduction and spread among our residents. Vaccine preventable diseases (e.g., acute viral hepatitis, measles, and influenza) are significant contributors to morbidity and potential mortality in international travelers and can cause local outbreaks among susceptible persons. Furthermore, unvaccinated individuals travelling abroad risk acquiring and spreading diseases that are not common in the United States.[1]

Health Risk Populations

Those who are often hit the hardest by disease outbreaks include young children, the elderly, the poor, and those with underlying health conditions. There is extensive healthcare infrastructure within King County that provides care for the wider region, including one of the area's only pediatric hospitals and the only Level 1 Trauma center for Washington, Idaho, Montana, and Alaska. Similarly, Airlift Northwest is the only life-flight agency serving the same four-state region. The areas with the highest number of adults with high-risk health conditions, shown in Figure 12-1, include Carnation, Duvall, Federal Way, Downtown Seattle, Queen Anne, Magnolia, Shoreline, Ballard, Burien, and Kent.

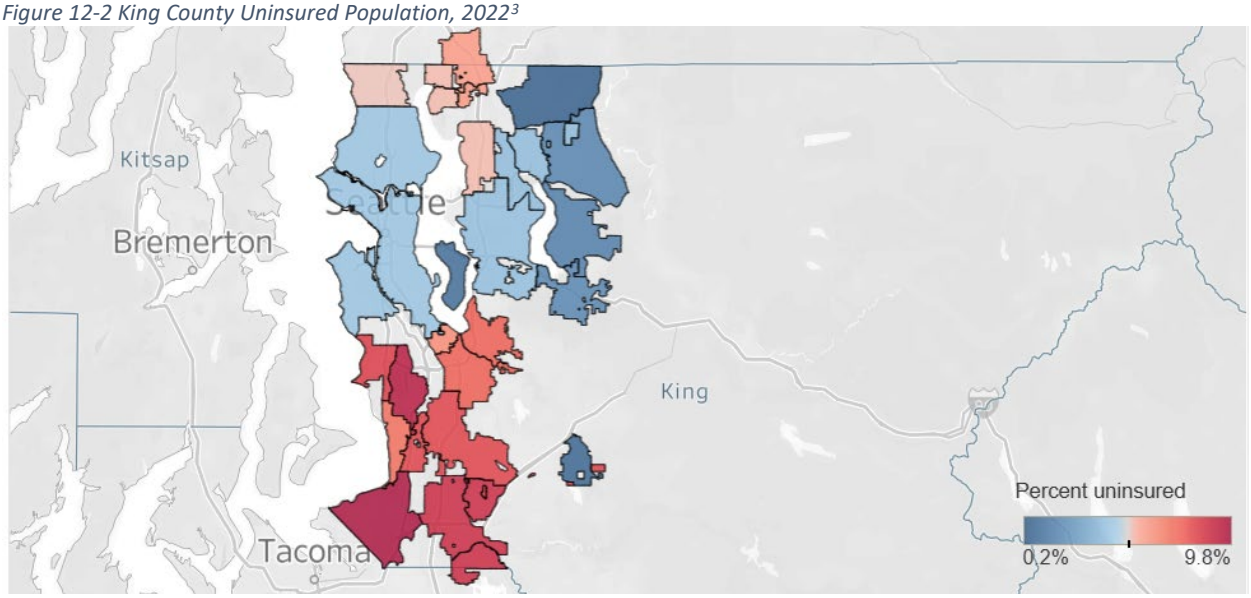
[1] CDC, "Routine Vaccines" *CDC Travelers' Health* (September 2024): https://wwwnc.cdc.gov/travel/page/routine-vaccines

Figure 12-1 King County Map of Adults with High-Risk Health Conditions[2]



The communities Shoreline, Burien, Federal Way, and Kent are also shown to have high percentages of uninsured community members. People who experience homelessness often have limited access to medical care and may not be fully represented in this data set.

Figure 12-2 King County Uninsured Population, 2022[3]

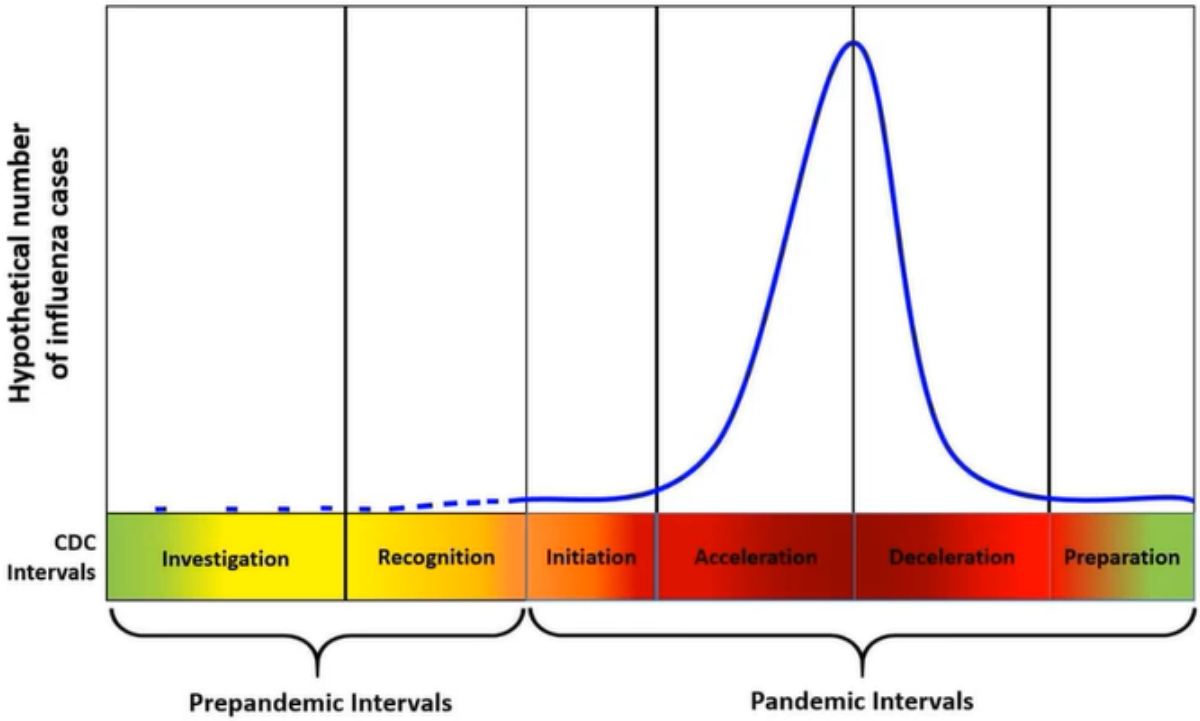


[2] "COVID-19 Vulnerable Communities Data Tool" *Communities Count* (n.d.): communitiescount.org/covid19vulnerable
[3] "Health Insurance" *Communities Count* (2023): communitiescount.org/health-insurance

12.3 Magnitude

When monitoring communicable diseases, the King County Department of Public Health employs the Centers for Disease Control and Prevention (CDC) Pandemic Intervals Framework (PIF), which delineates the progression of an influenza pandemic through six distinct intervals. This widely recognized framework not only visualizes fluctuations in disease activity but also provides a standardized method for describing pandemic phases, thereby guiding public health responses effectively.

Figure 12-3 CDC Pandemic Intervals Framework (PIF)[4]



The CDC PIF is also cross referenced with the World Health Organization (WHO) phases along with federal, state, and local indicators which notes when one interval moves into another. The impact of a disease can be tracked and characterized using several different indicators. These indicators can help Public Health – Seattle & King County (PHSKC) assess and respond to potential disease outbreaks.

[4] "Pandemic Intervals Framework (PIF)" *CDC Pandemic Flu* (n.d.): https://www.cdc.gov/pandemic-flu/php/national-strategy/intervals-framework.html

Table 12-1 WHO Phases, CDC Intervals, Indicators[5]

World Health Organization phases	CDC intervals	Federal indicators for CDC intervals	State/Local indicators for CDC intervals
Interpandemic phase: Period between influenza pandemics **Alert phase:** Influenza caused by a new subtype has been identified in humans	**Investigation:** Investigation of novel influenza A infection in humans or animals	Identification of novel influenza A infection in humans or animals anywhere in the world with potential implications for human health	Identification of novel influenza A infection in humans or animals in the United States with potential implications for human health
	Recognition: Recognition of increased potential for ongoing transmission of a novel influenza A virus	Increasing number of human cases or clusters of novel influenza A infection anywhere in the world with virus characteristics, indicating increased potential for ongoing human-to-human transmission	Increasing number of human cases or clusters of novel influenza A infection in the United States with virus characteristics indicating increased potential for ongoing human-to-human transmission
Pandemic phase: Global spread of human influenza caused by a new subtype	**Initiation:** Initiation of a pandemic wave	Confirmation of human cases of a pandemic influenza virus anywhere in the world with demonstrated efficient and sustained human-to-human transmission	Confirmation of human cases of a pandemic influenza virus in the United States with demonstrated efficient and sustained human-to-human transmission
	Acceleration: Acceleration of a pandemic wave	Consistently increasing rate of pandemic influenza cases identified in the United States, indicating established transmission	Consistently increasing rate of pandemic influenza cases identified in the state, indicating established transmission
	Deceleration: Deceleration of a pandemic wave	Consistently decreasing rate of pandemic influenza cases in the United States	Consistently decreasing rate of pandemic influenza cases in the state

[5] Sonja A. Rasmussen MD, et al., "Updated Preparedness and Response Framework for Influenza Pandemics" *CDC Morbidity and Mortality Weekly Report (MMWR)* (September 2014): https://www.cdc.gov/mmwr/preview/mmwrhtml/rr6306a1.htm#Tab

Transition phase: Reduction in global risk, reduction in response activities, or progression toward recovery actions	**Preparation:** Preparation for future pandemic waves	Low pandemic influenza activity but continued outbreaks possible in some jurisdictions	Low pandemic influenza activity but continued outbreaks possible in the state

12.4 Previous Occurrences

Since 2000, there have been several large-scale health incidents around the world which have had a devastating impact on lives and livelihoods, including the 2003 SARS outbreak, 2009 H1N1 influenza pandemic, 2014 Ebola outbreak, 2015 Zika epidemic, COVID-19 pandemic, and the 2022-2023 mpox outbreak.[6] While the impacts, risk factors, and causes vary, infectious disease outbreaks are an ongoing threat that requires preparedness and vigilance.

Table 12-2 Previous infection disease outbreaks in King County

Disease	Time	Description
E. coli.	1993	E. coli-contaminated hamburger meat from a local Jack in the Box caused illness in 400 people and led to the death of two people within one month in the Washington area. Cases were seen in California, Idaho, and Nevada as well.
Pertussis	2002-2005	Between 2002 and 2003 Public Health reported an 82% increase in the number of Pertussis infections in infants, and a three-fold increase in the number of cases in children <6 months. The occurrence of Pertussis in adolescents and adults has been on the rise since 1990, culminating in a national epidemic in 2005 when 25,616 reported cases nation-wide. Outbreaks within healthcare facilities can occur quickly because the bacterial infection is highly contagious.
Influenza	2009	The H1N1 outbreak of 2009 affected the young and healthy populations as well as those with chronic diseases. This increase in morbidity caused strain on the local healthcare system. Although the H1N1 virus was not as virulent and there were not

[6] Public Health – Seattle & King County (PHSKC), "Biological Incident Response Annex" (June 2024): https://kingcounty.legistar.com/LegislationDetail.aspx?ID=6458573&GUID=7E04B4F2-35E5-47B8-BA78-6FD7C85966AB

		nearly as many fatalities as previous pandemics, the outbreak caused a larger than usual amount of disease in the community than seasonal influenza virus does.
Hepatitis A	2017, 2019	In 2017, several state and local health departments responded to hepatitis A outbreaks, spread through person-to-person contact, that occurred primarily among persons who use injection and non-injection drugs, and/or person who experienced homelessness and their close contacts. Multistate outbreaks of hepatitis A infections have also been linked to food products (i.e. strawberries in 2016 and pomegranate seeds in 2013). A large outbreak centered in Seattle would cause a strain on the public health system and potentially have strong impacts on local businesses, especially any that the public perceives as responsible for the outbreak.[7]
COVID-19	2020-Present	Severe acute respiratory syndrome Coronavirus 2 (SARS-CoV-2), the virus that causes coronavirus disease 2019 (COVID-19), was first identified in Wuhan, China in December 2019. On January 20, 2020, the first case of COVID-19 in the United States was identified in Washington state. Since February 2020 there have been almost 600,000 reported cases, close to 18,000 hospitalizations, and more than 3,600 deaths from COVID-19 in King County.
Mpox	2022	In May 2022, an outbreak of mpox (formerly known as monkeypox virus disease) suddenly and rapidly spread across Europe, the Americas, and all six WHO regions, with 110 countries reporting a combined approximate 87,000 cases and 112 deaths. Cases of mpox were reported from countries where the disease was not endemic and cases were increased in several endemic countries, i.e., most confirmed cases with travel history reported travel to countries in Europe and North America, rather than West or Central Africa where the mpox virus is endemic. The global outbreak affected primarily (but not only) gay, bisexual, and other men who have sex with men and spread person-to-person through touching, kissing, sex, or contact with contaminated sheets, clothes, or needles.
Avian Influenza	2022 – Present	A strain of H5N1 highly pathogenic avian influenzas (HPAI) circulated in wild birds and poultry was first identified in Washington state in May 2022. The first human cases of H5 avian

[7] "Hepatitis A Outbreak Linked to Person-to-Person Contact" *CDC Viral Hepatitis* (April 2024): https://www.cdc.gov/hepatitis/outbreaks/ongoing-hepatitis-a/index.html

		influenza were reported in Washington state in October 2024. There are now 9 cases of human with H5. CDC currently the risk to the general public's health to be low.[8]
Varicella (chicken pox)	2023	In May 2023, at least 3 confirmed cases of varicella among asylum seekers at an encampment located in Tukwila.[9]
Measles	2024	In 2024, several confirmed cases of measles were reported in King County, all linked to international travel. In April, a group of international travelers in King County came into close contact with a confirmed measles case in Georgia. Several of these individuals lacked documented immunity to the virus. On May 10th and 11th, an adult with a confirmed case of measles passed through Seattle-Tacoma International Airport. The individual is believed to have contracted the virus while traveling in Europe or while en route to the region. On June 10th, a child at Franciscan Urgent Care in West Seattle was diagnosed with measles. The child, who had not been vaccinated, likely contracted the virus during international travel.

12.5 Probability of Future Occurrences

While it is impossible to predict the timing or nature of the next outbreak, history demonstrates that they are not uncommon and can have devastating effects on communities. Although advancements in medicine over the past century have enhanced our ability to combat diseases, several factors—such as rapid population growth in our city centers, increasing number of individuals without adequate healthcare, the evolution of antibiotic-resistant bacteria, globalization, and societal upheaval —contribute to the rapid spread and increased severity of outbreaks.

Emerging variants of COVID-19, novel strains of influenza, and severe acute respiratory syndrome (SARS) all pose risks with the potential to trigger outbreaks. These diseases and variants can also have limited or no medical countermeasure (therapeutic treatment or vaccine), posing as a high risk/low frequency event that have the potential to broadly impact health and medical capacity as well as disrupt critical resources and support infrastructure.

[8] "Avian Influenza" *Washington State Department of Health (DOH)* (n.d.): doh.wa.gov/you-and-your-family/illness-and-disease-z/avian-influenza
[9] Public Health – Seattle & King County (PHSKC), "Varicella cluster in Tukwila, King County" *King County* (December 2023): https://kingcounty.gov/en/dept/dph/health-safety/disease-illness/health-advisories/2023/13-december

12.6 Climate Change Considerations

Climate change and globalization have significantly heightened the reach of invasive species, pathogens, and diseases affecting people, agriculture, and the environment. With extensive global travel networks and increasing urbanization, novel pathogens can quickly spread far beyond their origins. This rapid transmission poses a particular threat to individuals on the front lines of exposure, especially those with fewer resources, as well as vulnerable populations.

Key ecological concerns include the introduction of diseases and parasites to wild species, competition between wild and farm-raised species, threats from invasive species, and the negative effects of pollution and fish farming on shellfish beds, among others. These climate-driven changes in ecosystems further exacerbate the risk of emerging infectious diseases by altering the interactions between humans, pathogens, and animals.[10]

Rising temperatures have also allowed the spread of diseases and vectors that previously were not of concern to King County. For example, Coccidioides fungus that causes Valley Fever detected in south-central Washington State and spreads through dust or disturbed soil.[11] Warmer average temperatures have resulted in expanding mosquito distribution. Warmer temperatures also speed up the life-cycle of mosquitoes, allowing adult mosquitoes to mature faster, increasing people's risk of exposure to diseases such as West Nile virus (WNV).[12] Between 2003 and 2023, more than 1 million cases of vector-borne diseases were reported in the United States. Rising temperatures and changing rainfall patterns can boost mosquito and tick populations and make it easier for them to spread harmful pathogens to people.

12.7 Impact Assessment

Epidemics directly affect the health of people who live, work, and visit a community. They have the potential to be one of the deadliest hazards a community can face. As demonstrated during the COVID-19 pandemic, they can have cascading impacts to the economy and society at large.

[10] KC Ernest, et al., "Focus on Covid-19 and Climate Change" *Fifth National Climate Assessment* (2023): https://doi.org/10.7930/NCA5.2023.F3
[11] "Valley Fever (Coccidioidomycosis)" *Washington State Department of Health (DOH)* (n.d.): https://doh.wa.gov/you-and-your-family/illness-and-disease-z/valley-fever-coccidioidomycosis#:~:text=Valley%20Fever%2C%20also%20called%20coccidioidomycosis,severe%20forms%20of%20the%20disease
[12] "Infectious Diseases and Climate Change" *Washington State Department of Health (DOH)* (n.d.): https://doh.wa.gov/community-and-environment/climate-and-health/infectious-diseases#:~:text=Environmental%20Fungal%20Diseases,will%20change%20with%20changing%20environments

Public	Infectious diseases can have a profound impact on human health, leading to a range of negative consequences, including increased healthcare costs, lost income due to time away from work, and, in the most severe cases, loss of life.
Responders	Emergency services would be severely impacted during a serious outbreak because they are likely to be exposed early due to public contact. As responders become sick, response times and capabilities would be severely limited. Public Health teams widely reported that they were overwhelmed with workload during many phases of the COVID-19 pandemic. Response demands often outpaced Public Health resources.[13]
Continuity of Operations	Many government operations may cease to function on a normal basis during the most severe outbreaks. Agencies may have to adopt work from home policies and take other steps to protect employees. Due to employee illness, many non-essential functions may have to be curtailed.
Property, Facilities, and Infrastructure	**Facilities** King County has a large concentration of healthcare resources, but in an epidemic or pandemic these resources can be stretched or overwhelmed by the outbreak situation. As facilities become unable to take additional patients, it may be possible to treat people in outpatient facilities. **Infrastructure** • Energy: There are no direct impacts, outside of employee absenteeism, to the energy sector. • Water/Wastewater: King County has many open reservoirs that provide water to the city. These reservoirs could become contaminated and be a source of infection for area residents. This system is a potential target of bioterrorist activities. • Transportation: A disease would not cause any direct damage to the transportation system, but high absenteeism would affect it. Public transit, shipping, and other services may only function at 50% during especially severe outbreaks. • Communications: There are no direct impacts, outside of employee absenteeism, to the communications sector.

[13] Public Health – Seattle & King County (PHSKC), "Biological Incident Response Annex" (June 2024): https://kingcounty.legistar.com/LegislationDetail.aspx?ID=6458573&GUID=7E04B4F2-35E5-47B8-BA78-6FD7C85966AB

Environment	In the case of a pandemic that requires quarantine, the reduced amount of travel can have positive effects on the local air quality, as decreased vehicular and industrial activity reduces emissions of harmful pollutants and greenhouse gases. Regarding agricultural diseases, there is large negative impact on natural resources including landscape, livestock, and forests. In the event of a outbreak of livestock such as avian flu, farmers are required to put down their flock in order to prevent further spread of the virus.
Economic	The economy may come to a virtual standstill for weeks on end during severe outbreaks as people avoid public places. Many small businesses may lose too much revenue and be forced to close. On March 15, 2020, of non-essential businesses closed down in order to limit the spread of COVID-19. This resulted in a dramatic increase in the number of people laid off or furloughed in King County. Workers residing in King County filed an average of more than 30,000 initial claims per week between March 1 and May 2, 2020. During an outbreak of infectious disease in livestock, large-scale depopulation of livestock may be necessary to curb further spread of the pathogen and prevent associated welfare problems arising. This puts large financial constraints on farmers.
Public Confidence in Governance	The public understands that an outbreak is a severe natural event; however, restrictions on public gatherings are not popular and create frustration. Some people may believe they are not getting enough attention from the medical community. Others may begin to doubt the efficacy of treatment options if the disease worsens. In the most extreme cases, confidence in the medical system can be shaken.

12.8 Vulnerability Assessment

Vulnerable Populations	Data shows the burdens of infectious diseases are not evenly borne across the population. Viruses have had disproportionate impacts on the elderly, people with weakened immune systems, those with several pre-existing chronic medical conditions and disabilities, and communities of color. During a serious epidemic, older adults, individuals with compromised immune systems, children, people without health insurance, people who speak a language other than

English, and people who are recent immigrants to the country are likely to be the most at-risk and suffer the worst impacts.

Young and Old People

People who are either old or young have weaker immune systems and are usually more likely to succumb during an outbreak. In 2017-2018 flu season, there were nearly 1,000,000 hospitalizations and 79,400 deaths. The most at-risk group is adults over 65 years of age (70% of hospitalizations).[14] Older adults account for nearly 90% of deaths.

People with Disabilities and Compromised Immune Systems

People with disabilities experienced gaps regarding translation and interpretation services, gaps in testing and vaccine site accessibility in early phases of the pandemic, inadequate disability representation on public health data dashboards, and limited transportation options to obtain resources. Those with compromised immune systems are also most likely to become infected and succumb from a serious disease.

BIPOC

In King County, American Indian/Alaskan Native, Black, Hispanic, and Native Hawaiian/Pacific Islander residents experienced higher rates of COVID-19 cases, hospitalizations, and deaths than Asian and White residents. Through June 12, 2022, King County has had 2,850 deaths (0.6% of positive reported cases). Age-adjusted death rates of confirmed cases are highest among residents who are Native Hawaiian/Pacific Islander (749 per 100,000), American Indian/Alaska Native (452 per 100,000), Hispanic/Latinx (260 per 100,000), and Black (219 per 100,000). Case rates for most communities of color are higher than among White residents (106 per 100,000).

Immigrants and Refugees

Immigrants and refugees make up more than 24% of King County population. There are also over 100 languages spoken in King County.[15] This can lead to communication barriers on important

[14] Centers for Disease Control, "Estimated Influenza Illnesses, Medical visits, Hospitalizations, and Deaths in the United States — 2017–2018 influenza season" (November 2019) https://www.cdc.gov/flu/about/burden/2017-2018.htm
[15] Public Health – Seattle & King County (PHSKC), "Equity Response Annex" (June 2024)

	health protocol. It also makes navigating the American health system challenging. **People without health insurance** People without health insurance are more likely to delay getting care, allowing the disease to spread farther before it is identified. **Healthcare Staff** Healthcare staff are on the front line of any infectious disease outbreak. They come into regular contact with sick patients and are likely to be exposed both before the illness is identified and during treatment.
Property	No property is vulnerable in the event of an infectious disease outbreak.
Environment	Certain environments can be a conduit for infectious diseases. They can create conditions that support the spread of toxic fungi or the increased population of virus transmitters such as mosquitoes. However, the spread of communicable diseases in humans does not have known impacts on the environment.
Operations	The health system is likely to be overwhelmed in any serious epidemic. In especially serious outbreaks, it may be inadvisable for patients to even come to the hospital and treatment may have to occur outside of hospital facilities. For example, many Public Health employees during the early COVID response worked 80–100-hour work weeks, often going months without a day off.[16]

[16] Public Health – Seattle & King County (PHSKC), "Biological Incident Response Annex" (June 2024): https://kingcounty.legistar.com/LegislationDetail.aspx?ID=6458573&GUID=7E04B4F2-35E5-47B8-BA78-6FD7C85966AB

Chapter 13
Landslide

Risk Assessment Scoring		
2	Location	Hazard
3	Probability	
2	Magnitude	
1	Public	Impact
1	Responders	
1	COP	
2	PFI	
3	Environment	
2	Economy	
2	PCG	
1	People	Vulnerability
2	Property	
2	Environment	
1	Operations	
2	People	Risk
2	Property	
2	Environment	
2	Operations	
Moderate	**Overall Risk**	

PC: WADNR

Chapter 13: Landslide

13.1 Hazard Description

The term “landslide” encompasses a variety of geomorphic processes in which masses of soil, rock, and debris (a mixture of soil and rock) become detached and move downslope. Typically, this mass is wet, saturated, or suspended in water. Landslide movement can occur rapidly or slowly, and the displaced material may remain solid or behave like a liquid. The size of landslides can vary significantly, ranging from a few cubic yards to millions of cubic yards. The specific nature of this movement is referred to as the "landslide style," which depends on the local geology, topography, and hydrology at the site of the failure.

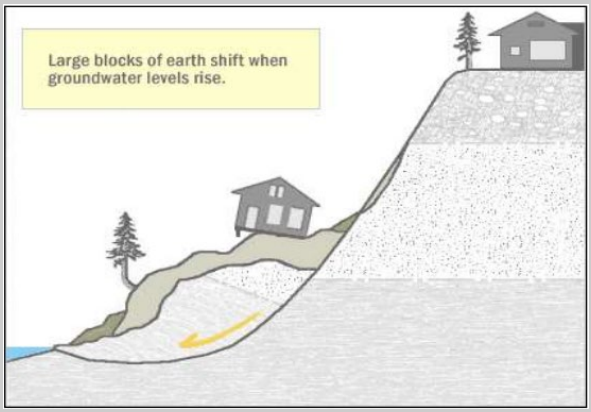
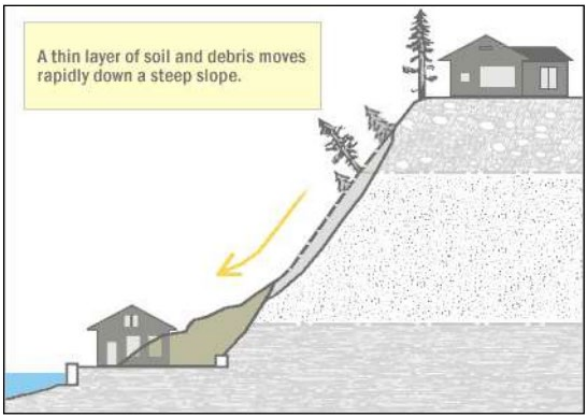


1996 Perkins Lane landslide in Seattle’s neighborhood Magnolia

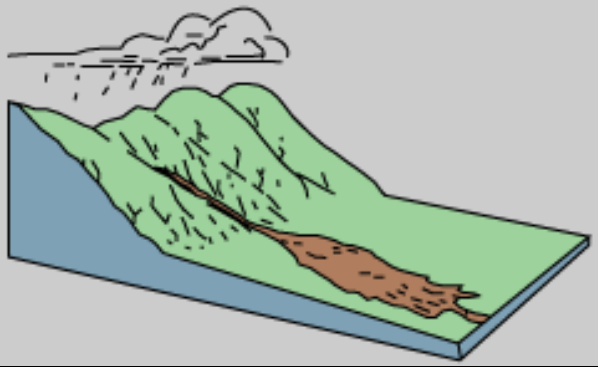
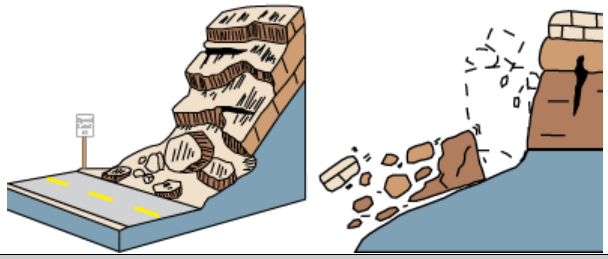
Causation

Landslides are generally considered secondary hazards, triggered by precipitation, earthquakes, wildfires, and human activities. Smaller, shallower landslides often occur in response to short-term storm events lasting hours or days, while larger, deep-seated slides may be initiated by prolonged wet conditions persisting for months. Historical records and geological evidence indicate that significant earthquakes, though infrequent, can also serve as powerful landslide triggers. Areas affected by wildfires are particularly susceptible, as burn scars can lead to debris flows. Human activities such as improper clearing, grading, or stormwater discharge can also contribute to landslide occurrences. Additionally, landslides tend to occur in areas where there is a history of previous occurrences. Five general styles of landslide phenomenon have been identified in King County:

Table 13-1 Landslide styles that occur in King County[1]

Name	Description
Deep-seated landslides 	Deep-seated landslides are those that fail below the rooting depth of trees and vegetation. They are often slow moving but can also move rapidly. Deep-seated landslides can cover large areas and devastate infrastructure and housing developments. These landslides usually occur as translational slides, rotational slides, or large block slides. Deep-seated landslides are typically much larger than shallow landslides, in terms of both surface area and volume. A deep-seated landslide may appear stable for years, decades, or even centuries. These long-lived features can be partially or entirely reactivated for a variety of reasons.
Shallow debris slides 	Shallow debris slides (also known as shallow landslides, infinite slope failures, and colluvial slides) are a common style of slope - movement both in the Puget Lowland and Cascade Mountains. Shallow landslides are rooted in the soil layer and often form slumps along roadways or fast-moving debris flows down valleys. These types of landslides are often called 'mudslides' by the news media. Shallow landslides also occur as flows, slides, or rockfalls and topples. Shallow landslides typically occur during the winter months in western Washington.

[1] King County DNRP, "Mapping of Potential Landslide Hazards along the River Corridors of King County, Washington" *River and Floodplain Management Section, Water and Land Resources Division, Department of Natural Resources and Parks* (2016): https://your.kingcounty.gov/dnrp/library/2016/kcr2783.pdf

Debris flows 	Debris flows and debris floods usually occur in steep gullies, move very rapidly, and can travel for many miles. Debris flows and floods deposit material on alluvial or depositional fans. They may contain more coarse material than a mudflow when channelized. Slopes where vegetation has been removed by fire or humans are at greater risk for debris flows and many other types of landslides.
Rock fall[2] 	Falls and topples are usually rapid, downward movement of large pieces of rock or debris. Sometimes this is enough rock to cover a road or block a stream or river. Rockfalls and topples are common in Washington's mountain highways.
Rock avalanches	Rock avalanche is a style of landslide characterized by the simultaneous failure of an entire bedrock hillslope and with the dislodged mass cascading to the valley below. Extremely rapid, massive, flow-like motion of fragmented rock from a large rockslide or rock fall. Although no rock avalanches have occurred in King County in historical times, fields of angular boulders at the base of steep mountainsides are clear evidence of prehistoric failures.

[2] Washington Department of Natural Resources (DNR), "Falls and Topples" *Landslides* (n.d.): https://www.dnr.wa.gov/programs-and-services/geology/geologic-hazards/landslides#types-of-landslides.9

13.2 Location

King County is shaped by multiple glacial advances over the past two million years, the most recent occurring around 14,000 years ago. Landslides are most prevalent in areas where post-glacial erosion has created steep slopes in glacial deposits, particularly along beach bluffs, ravine slopes, and river valley walls. Interestingly, some areas with lower slopes may actually be remnants of old, deep-seated landslides that could be at risk of reactivation.

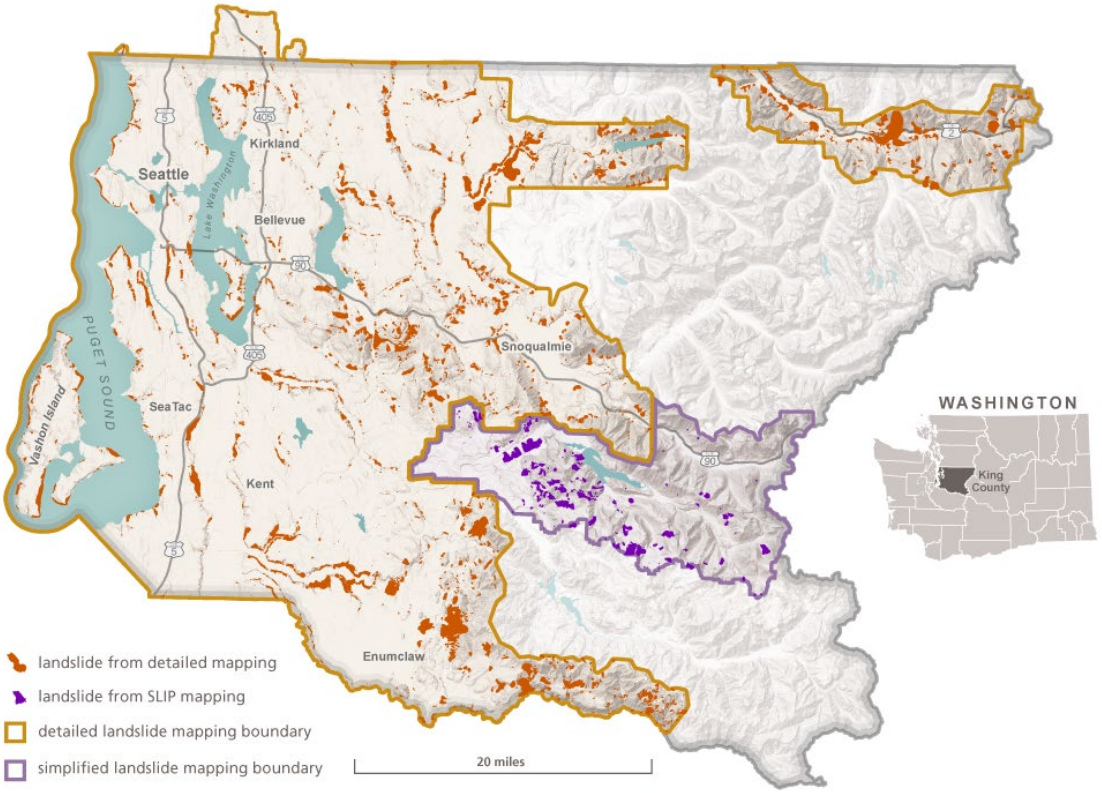
Key characteristics of landslide hazard areas include:[3] [4]

- A slope greater than 40 percent
- Landslide activity or movement in the last 10,000 years
- Stream or wave action with erosion or bank undercutting
- The presence of a depositional fan that may indicate a history of debris flows, debris floods, or rockfall
- The presence of impermeable soils, such as silt or clay, which are mixed with granular soils such as sand and gravel

In 2019, The Washington Geological Survey (WGS) published a landslide inventory for Washington State. The Landslide Hazards Program is actively creating inventories for densely populated areas, successfully mapping 60% of King County where people and infrastructure are present. Utilizing LiDAR derivatives, landslide geologists have identified and mapped 2,838 landslides and 1,251 alluvial fans. High landslide density was noted along Puget Sound bluffs, river corridors, and in the upland areas of the Cascade Range.

[3] Federal Emergency Management Agency (FEMA), "King County Risk Report: Landslide Exposure Assessment" (2018): p 52.
[4]

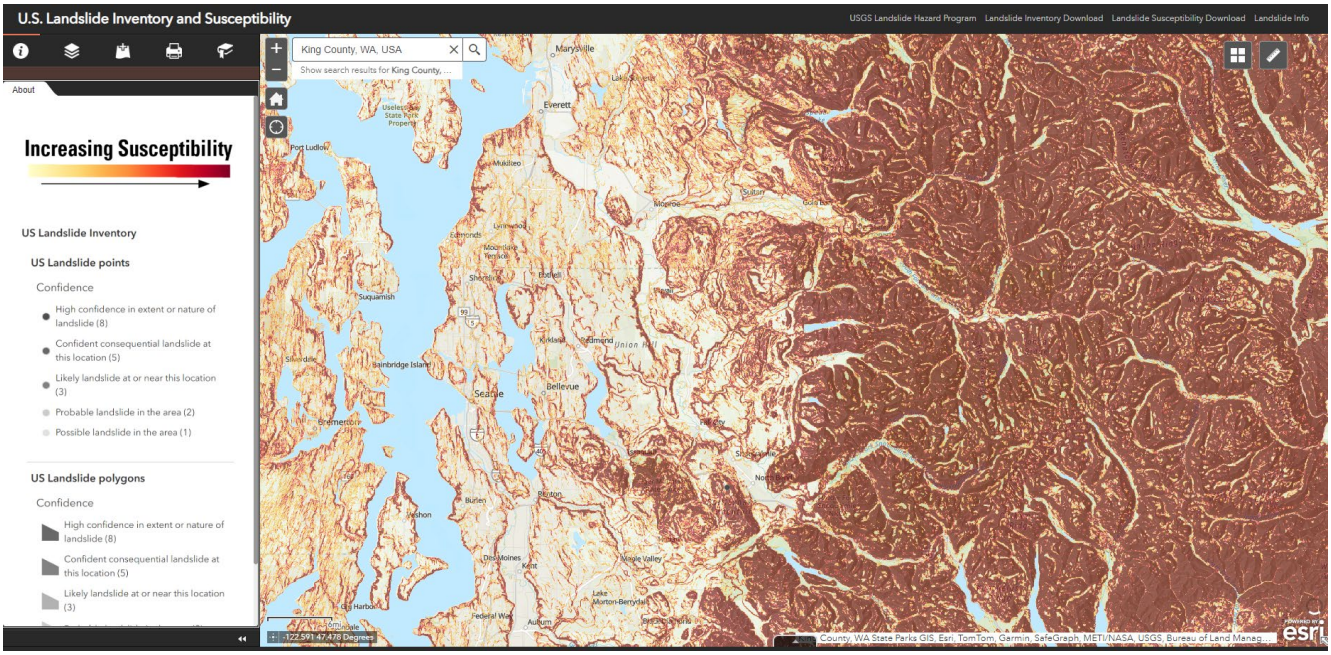
Figure 13-1 King County Landslide Inventory[5]



While landslide polygons indicate areas where landslides have already occurred, landslide susceptibility attempts to highlight areas that could experience a landslide in the future. WA DNR have not done landslide susceptibility for the county. But the USGS just published a national scale landslide susceptibility map.

[5] Washington Department of Natural Resources (DNR), "WSG Landslide Inventory" (2019): https://www.dnr.wa.gov/programs-and-services/geology/geologic-hazards/landslides#find-mapped-landslidesl

Figure 13-2 Landslide inventory and susceptibility[6]



13.3 Magnitude

Landslides in King County, Washington, are most commonly of small magnitude, but they have the potential to become large and highly destructive, especially when triggered by significant weather events, human activities, or disturbances like major wildfires. For planning purposes, King County focuses on three types of landslides, which are particularly deadly and often occur after extreme weather events or other disruptions.

Warning time

Landslides are dangerous and unpredictable. Some landslides may show indications of impending or incipient movement; others may happen suddenly without any warning signs. Warning signs of a potential or impending landslide include:

- Rapidly growing cracks in the ground; downslope movement of rock, soil, or vegetation.
- Sudden changes in creek water levels, sometimes with increased sediment, especially during or right after large or protracted storm events
- Sounds of cracking wood, knocking boulders, groaning of the ground, or other unusual sounds, especially if the sound increases

[6] United States Geological Survey (USGS),"US Landslide Inventory and Inventory." (2024): https://usgs.maps.arcgis.com/apps/webappviewer/index.html?id=ae120962f459434b8c904b456c82669d

- A hillside that has increased spring and (or) seep activity, or newly saturated ground, especially if it was previously dry
- Formation of cracks or tilting of trees on a hillside
- New or developing cracks, mounds, or bulges in the ground
- Sagging or taut utility lines; leaning telephone poles, deformed fences, or bent trees
- Sticking windows or doors; new and (or) growing cracks in walls, ceilings, or foundations
- Broken or leaking utilities, such as water, septic, or sewer lines
- Separation of structures from their foundation; movement of soil away from foundations
- Changes in water well levels or water wells that suddenly run dry

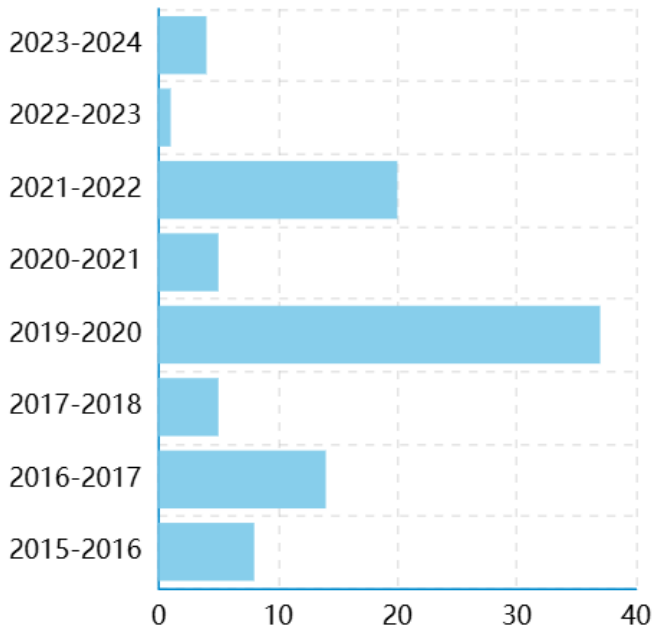
Susceptible areas

King County's geography makes certain areas particularly susceptible to landslides. The most vulnerable areas include:

- **Puget Sound Shoreline:** The region's stratigraphy, consisting of permeable sand and gravel deposits over less permeable silts and clays, creates ideal conditions for landslides. When sand and water accumulate on top of the clay layer, it can increase pore water pressure, destabilizing the slope and causing it to fail.
- **Steep Bluffs Along Incised Rivers:** The steep, unstable bluffs along rivers in King County are particularly vulnerable to landslides due to erosion and the shifting of materials over time.
- **Eastern Cascade Foothills:** In the eastern portion of the county, particularly in the Cascade Range, weakly consolidated and tectonically deformed sediments make the area highly susceptible to landslides. These areas often experience landslides after heavy rainfall or during seismic activity.
- **Fire Burn Scars:** Areas that have been affected by wildfires are more prone to landslides due to the loss of vegetation and soil stability. Without the root systems to anchor the soil, heavy rains can quickly trigger landslides in these fire-impacted zones.
- **Previous Landslide Zones:** Areas that have experienced landslides in the past are more likely to experience them again. Landslides often reoccur along the same paths, with new movement triggered by a variety of factors, including stormwater, changes in vegetation, or human development.

13.4 Previous Occurrences

Figure 13-3 Reported landslides in King County by water year



Since 2006, there have been 10 disaster declarations impacting the county, including DR-4168 for the SR 530 (Oso) landslide in Snohomish County. Landslides occur during virtually every major storm event and earthquake. Landslides are especially likely in areas where they have been recorded before. A good method of assessing likelihood of a future landslide is to know if the area has had a history of landslides.

WGS has complied and mapped reports of landslides from a variety of media sources as well as city, county, and state agencies. Since 2016, there has been 98 landslides. The bulk are occurring during December, January, and February making about 80% occur during rainy winter months.

The most significant landslide event in King County occurred in March 1997 in the Magnolia neighborhood of Seattle, Washington, known as the Perkins Lane Landslide. The primary trigger for the landslide was prolonged heavy rainfall in the days leading up to the incident. As the soil became saturated from the continuous rainfall, its stability was compromised, and the added weight of the water caused the deep-seated slide to reactivate. The landslide resulted in the collapse of five homes situated at the top of the slope, causing significant property damage and displacement.

Figure 13-4 King County's Recent Landslides 2016-2023[7]

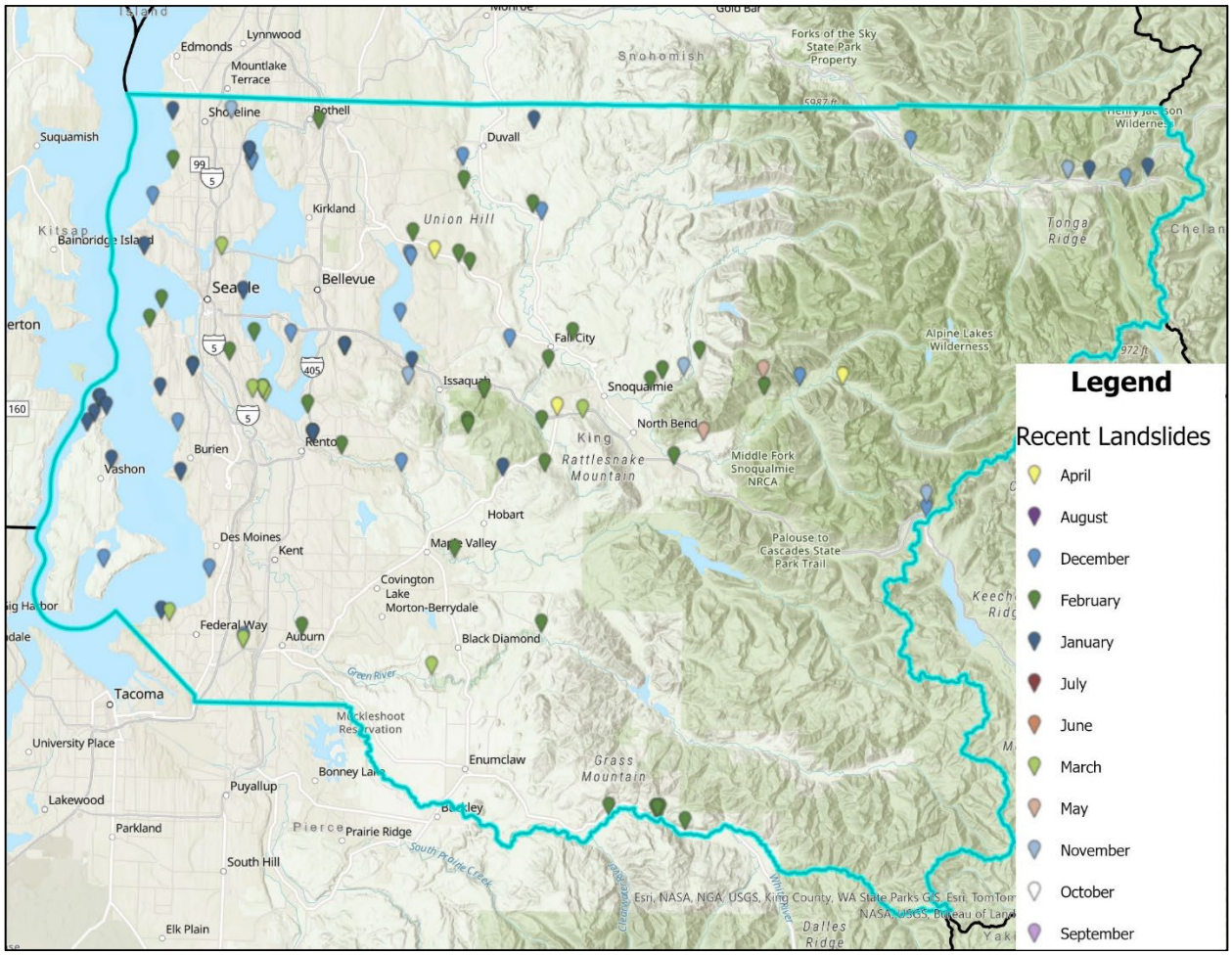


Table 13-2 Past landslide disaster declarations in King County

Date	Declaration #	Description
2001	DR 1361	Nisqually Earthquake triggers landslides around the state. $66.7M in Public Assistance was authorized.
2006	DR 1737	Severe storms trigger flooding and landslides. $29.5M in Public Assistance (statewide) was authorized along with $5.4M in Individual Assistance.
2007	DR 1734	Severe winter storms trigger landslides. $61.3M in Public Assistance was authorized along with $21.2M in Individual Assistance.
2009	DR 1817	Sever winter storms trigger flooding and landslide.

[7] Washington Department of Natural Resources (DNR), "WSG Recent Landslides" (2024): https://wadnr.maps.arcgis.com/apps/webappviewer/index.html?id=ef7ea514f7e54dde8cf1e8eefd2037b4

2011	DR 1963	Severe winter storms trigger flooding and landslides.
2012	DR 4056	Severe winter storms trigger flooding and landslides. $30.1M in Public Assistance was authorized.
2014	DR 4168	A slope along SR 530 in Snohomish County fails, bringing with it an entire neighborhood and killing 43 people. This is one of the deadliest disasters in Washington State History. There is a long history of landslides in this area and the tragedy leads the state to invest in a new landslide mapping program.
2017	DR 4309	Severe winter storms trigger flooding and landslides. $12.5M in Public Assistance was authorized.
2019	DR 4418	December 10 to December 24, 2018 - resulting from severe winter storms, straight-line winds, flooding, landslides, mudslides, and a tornado
2020	DR 4539	January 20 to February 10, 2020 - resulting from severe storms, flooding, landslides, and mudslides
2024	DR 4775	January 5 to January 29, 2024 - resulting from severe winter storms, straight-line winds, flooding, landslides, and mudslides

13.5 Probability of Future Occurrences

Due to the region's topography and geological conditions, the probability of landslides in King County will continue to be moderate to high in specific areas, especially following heavy rainfall, snowmelt, or other destabilizing events. As the climate warms, the frequency of heavy rainfall events and extreme weather may increase, leading to more frequent landslides, particularly in fire-impacted and urbanized areas.

13.6 Climate Change Considerations

Climate change is poised to significantly elevate the risk of landslides in King County, particularly in unincorporated areas, due to a combination of wetter winters, drier summers, and increased severe weather events. Projections indicate that more intense and frequent rainstorms will saturate soils, making them more susceptible to movement, especially along coastal bluffs and river corridors. As winter rains intensify, the saturation of soil increases the likelihood of landslides, particularly in steep, unstable slopes common in the region.[8]

Rising summer temperatures and drought conditions contribute to an increase in wildfires, which further destabilize the landscape. After wildfires, areas with exposed land—especially those with glacial soils—become highly vulnerable to erosion. The loss of vegetation results in denuded ground, depleting topsoil and exacerbating the risk of post-fire debris flows.

[8] King County DNRP, "Mapping of Potential Landslide Hazards along the River Corridors of King County, Washington" *River and Floodplain Management Section, Water and Land Resources Division, Department of Natural Resources and Parks* (2016): https://your.kingcounty.gov/dnrp/library/2016/kcr2783.pdf

Moreover, larger and more frequent storm events are expected to lead to increased flooding in Pacific Northwest rivers, which may cause significant channel migration and bank erosion. These changes can further destabilize steep slopes in river valleys, heightening the risk of landslides. While sea level rise is less of a concern in the river corridors of unincorporated King County, it can still accelerate erosion at the base of coastal bluffs, especially during high tides and storm surges, compromising the stability of these marginally stable landforms.

13.7 Impact Assessment

People	While the total number of people exposed to landslides is relatively small, and the risk of a rapid slope failure has tended to be low, many homeowners do not carry insurance to cover losses from landslide hazards. The total number of people exposed to the landslide hazard is unknown since landslide hazards are spatially limited and do not align with population information in Census data.
Responders	Most commonly, homes are isolated and ready access to communities by first responders is impeded by slide activity. Access to schools, businesses, and public services may be impeded by road blockages from slide activity. While no recent deaths or injuries have been reported in King County from land movement, the incident in Snohomish County referred to as the SR 530 Slide or the Oso Slide, 43 people were killed (2014).
Continuity of Operations	Most impacts to King County delivery of essential services are indirect. Roadways closed may impede the county work force from reaching work locations. Transfer stations for solid waste management and sewer lines and lift stations feeding the Metro South Plan, West Point Treatment facility or Brightwater facility may be impacted by slide activity. Only a small number of bus routes use roadways with the potential for impacts by slide activity. Slide activity has resulted in first responder access issues and diverted road and infrastructure maintenance resources. Resulting detours have also impacted the commute of essential workers to their normal work locations. Some slide activity has caused temporary access issues for solid waste transfer stations and to the Cedar Hills Landfill locations.
Property, Facilities, and Infrastructure	**Property** In total, 2.6 percent of structures in King County are identified as being within a landslide hazard area, resulting in an estimated $9.8 billion in exposed value. The City of Lake Forest Park has the highest percentage of structures exposed in a landslide hazard area at 16.4 percent. The cities of Bellevue and Seattle and unincorporated King County are estimated to each have over $1 billion of estimated exposed value within landslide hazard areas. The slopes of Magnolia, West Seattle, Burien, Des Moines, Vashon Island, Newcastle, Federal Way and many areas of Bellevue have long been developed for their magnificent views of Mount Rainier, the Cascade and Olympic Mountains, and Puget Sound. Homes with vistas of the Olympic Mountains provide sunsets that are breathe taking – and expose a risk of land movement damages to property build on poor soils.

Homes built above, on, or below bluffs or slopes. Homes built on bluffs or other slopes apply addition weight to a slope and increase the likelihood of slope failure. Homes built below bluffs have also been destroyed by slope failure. Transportation corridors, including on I-90 and Seattle-Everett BNSF rail line. Transportation routes are often cut through steep areas or travel through valleys with a history of landslides.

Facilities
No special impacts to health systems are expected from this hazard.

Infrastructure

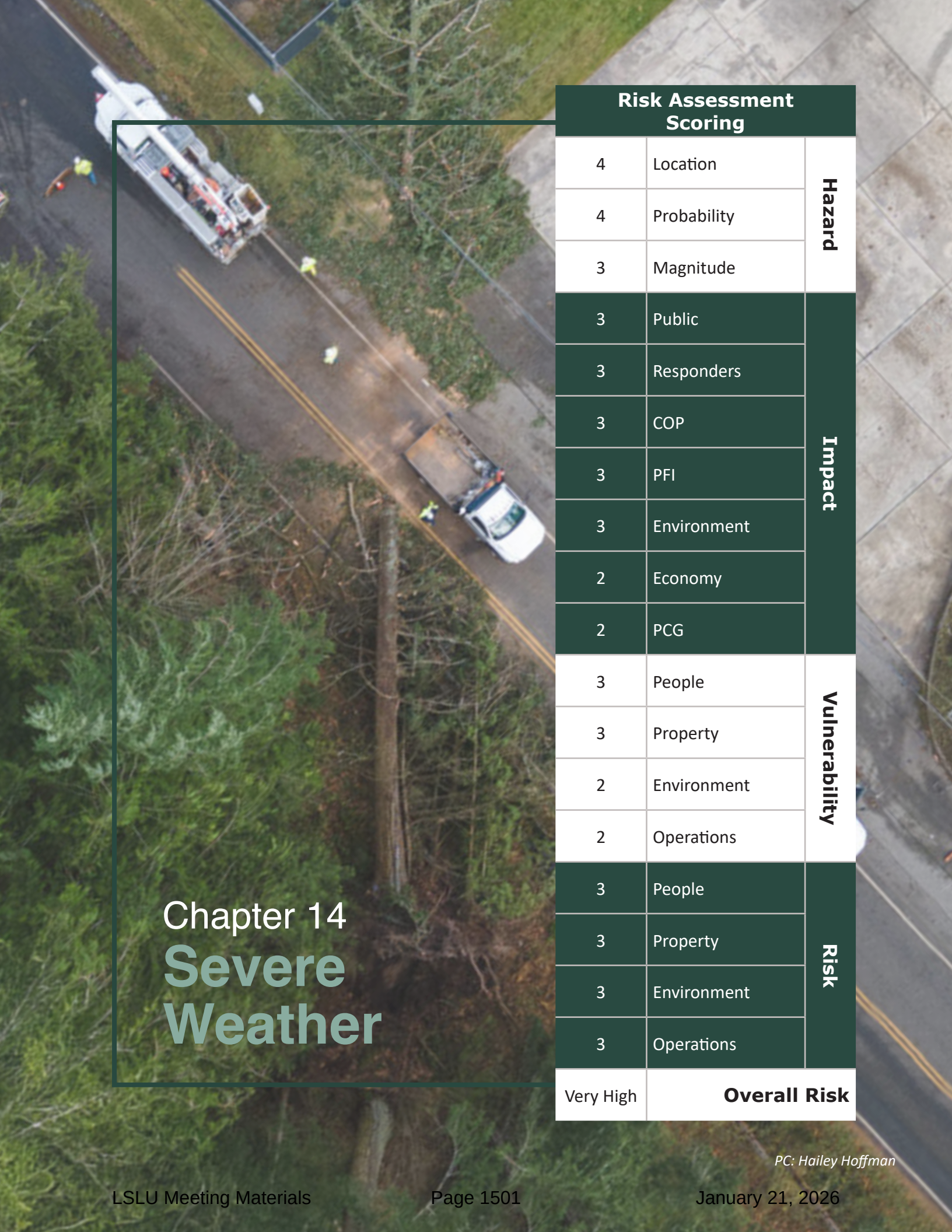
- Power: Landslides pose some risk to transmission lines that cross unstable slopes. Otherwise, landslides are not a primary concern for this sector.
- Water/Wastewater: Landslides or debris flows in and around reservoirs or waterbodies that support water systems can cause disruptions in water services and the loss of infrastructure. Water supply pipelines may cross unstable areas and be damaged by slope movement. Even if not directly impacted by earth movement, systems that pull water directly from impacted waterbodies will have to deal with increased turbidity or a loss of supply if the water is temporarily cut off by earth damming or rerouting a river. Finally, failures in water system transmission mains can actually saturate a slope and trigger landslides.
- Transportation: Transportation routes can be closed for long periods by landslides and rockslides. The following are some documented incidents. In November 2008, State Road 410 was closed as the result of a debris flow east of Enumclaw. A landslide caused damage to the Green River Bridge on State Route 169 that resulted in the bridge being closed for repairs for eight months. These incidents resulted in SBA loans to impacted businesses. In May 2005, 11 homes were isolated after a small slide on Mercer Island. That September, two lanes of I-90 west of Snoqualmie Pass were closed after a rockslide. A January 15, 1997 slide at Woodward in southern Snohomish County derailed five cars of a freight train. Passenger and cargo rail traffic was interrupted for nine days. Cargo traffic resumed first. Amtrak remained concerned for passenger safety and did not travel on this section of track for several weeks. This type incident can happen almost annually and sometime more than once each year.
- Communications: There is limited risk to communications systems as a whole from landslides. Given the redundancy in systems and proliferation of cell towers, which tend to be less vulnerable, landslides are not a primary concern.

Environment	Landslides that fall into streams may significantly impact fish and wildlife habitat, as well as affecting water quality. Hillsides that provide wildlife habitat can be lost for prolonged periods of time due to landslides. However, landslides also provide integral resources for many ecosystems. They contribute needed gravel and sediment or wood for building complex in-stream habitats, estuarine marshes, and beaches that are important for fisheries, wildlife and recreation. The Cedar River was partially dammed by slide debris from the Nisqually Earthquake in 2001. Similarly, in March of 2004, a landslide near Renton partially dammed the Cedar River again. All major rivers in King County support salmon and/or steelhead spawning populations. **Vegetation removal** Vegetation removal due to logging, land development, view clearing, or wildfire reduces the root strength that often anchors and reinforces shallow soils. Shallow landslides often increases following vegetation removal and if debris from such a slide enters a hillside swale it may transition into a debris flow that can have devastating impacts far below and distant from the initial failure. **Coseismal landsliding** This Risk Profile addresses primarily landsliding for which our region has significant collective experience. This includes of landslides triggered by weather events and human disturbance. Geologic evidence is clear that this region is subject to earthquakes from several sources larger than those that have been well documented in the historical record. Widespread landsliding is likely to be a secondary but significant and potentially catastrophic consequence of a future occurrence of such a large earthquake.
Economic	There have been direct and indirect impacts to the greater King County community from landslide activity. Residential housing in the greater Puget Sound area that have been built to enjoy the spectacular mountain of the Olympics and Cascade ranges and water views of Lake Washington, Lake Sammamish, and Puget Sound are vulnerable to land movement. Loss of transportation can also have economic impacts. In November 2008, State Road 410 was closed as the result of a debris flow east of Enumclaw. A landslide caused damage to the Green River Bridge on State Route 169 that resulted in the bridge being closed for repairs for eight months. These incidents resulted in SBA loans to impacted businesses. The SR 530 Oso landslide caused a complete reroute of the main highway between Everett and Darrington, devastating the local economy and forcing residents to commute several hours longer to work each day.
Public Confidence in Governance	The 2014 SR 530 Oso landslide demonstrated some of the major weaknesses in emergency management capabilities. It also demonstrated a lack of regulation and foresight on the part of government in the permitting of development in the area, which was a known slide area. Local critical areas ordinances do require mitigation for construction in slide hazard areas, but in the Oso slide,

	this proved to be inadequate. A failure by developers, the government, and residents to properly account for slide risk and protect people from it led to multiple lawsuits and a general lowering of public confidence in government's ability to properly regulate land development.

13.8 Vulnerability Assessment

Vulnerable Populations	People who live or travel through landslide-prone areas are at significant risk, especially those who engage in outdoor recreation. The vulnerability of recreational areas depends on the history of the trail, its maintenance, and recent weather events that could trigger instability. In King County, low-income communities, such as those near Renton along the Maple Valley Highway, are particularly at risk from larger landslides. These areas, which may lack the resources to properly mitigate landslide threats, could face substantial damage.
Property	Properties located on or below bluffs or steep slopes are particularly vulnerable to landslides. Homes built on these elevated areas contribute additional weight to the slope, which can destabilize the soil and increase the likelihood of slope failure. The added pressure from the structure, combined with factors such as heavy rainfall or seismic activity, can trigger a landslide that may lead to significant damage. Properties built below bluffs are also at risk, as the downward movement of the slope can result in devastating consequences, including the destruction of homes and infrastructure.
Environment	Landslides create lasting damage to both terrestrial and aquatic habitats. The loss of vegetation and the influx of debris into streams can disrupt ecosystems, displacing wildlife and degrading water quality. The recovery process is slow, often taking years for vegetation to return and stream habitats to stabilize. In the meantime, affected species face significant challenges, and the overall health of the ecosystem may be compromised for an extended period.
Operations	Roads, bridges, and transit systems are highly susceptible to landslides. Major transportation routes, including I90, and Seattle-Everett BNSF rail line go through steep valleys with historic landslides can be blocked or damaged during a landslide, disrupting the daily flow of traffic and emergency services.



Chapter 14
Severe Weather

Risk Assessment Scoring		
4	Location	Hazard
4	Probability	
3	Magnitude	
3	Public	Impact
3	Responders	
3	COP	
3	PFI	
3	Environment	
2	Economy	
2	PCG	
3	People	Vulnerability
3	Property	
2	Environment	
2	Operations	
3	People	Risk
3	Property	
3	Environment	
3	Operations	
Very High	**Overall Risk**	

PC: Hailey Hoffman

Chapter 14: Severe Weather

14.1 Hazard Description

King County experiences a large variation of severe weather events that has the potential to impact the entire region. Severe weather can include extreme heat events, winter storms, heavy rainfall, and strong winds. These weather events are categorized as follows:

- **Extreme heat,** including heatwaves, are periods of high heat and humidity with temperatures above 90 degrees Fahrenheit for at least two to three days.
- **Drought** is defined by Washington state statute as below 75% of normal water supply for a given area.
- **Extreme cold**, also classified as a winter storm, is a storm having significant snowfall, ice, and/or freezing rain; the quantity of precipitation varies by elevation.
- **Heavy precipitation** refers to instances during which the amount of rain or snow experienced in a location substantially exceeds what is normal.
- **High wind** is a storm sustaining wind speeds greater than 39 miles per hour. Southwesterly winds are associated with strong storms moving onto the coast from the Pacific Ocean. Southern winds parallel to the coastal mountains are the strongest and most destructive winds.
- **Tornados** are violently rotating columns of air touching the ground, usually attached to the base of a thunderstorm. Wind speeds start at 65 miles per hour and can reach 300 miles per hour. It is not unusual to have funnel clouds spotted during the winter season.

Severe weather events can lead to secondary hazards and cascading impacts. For instance, heavy precipitation can cause flooding and landslides, resulting in road closures and property damage. In rural or suburban areas, high winds can knock down trees and powerlines, leading to extended power outages and road blockages. In urban areas, extreme heat or cold may disproportionately affect the unsheltered population and families with limited resources, particularly those without access to heating or cooling systems.

As the climate continues to change, many but not all of these events are expected to become more frequent, intense, and prolonged, increasing the risk of widespread impacts across the county.

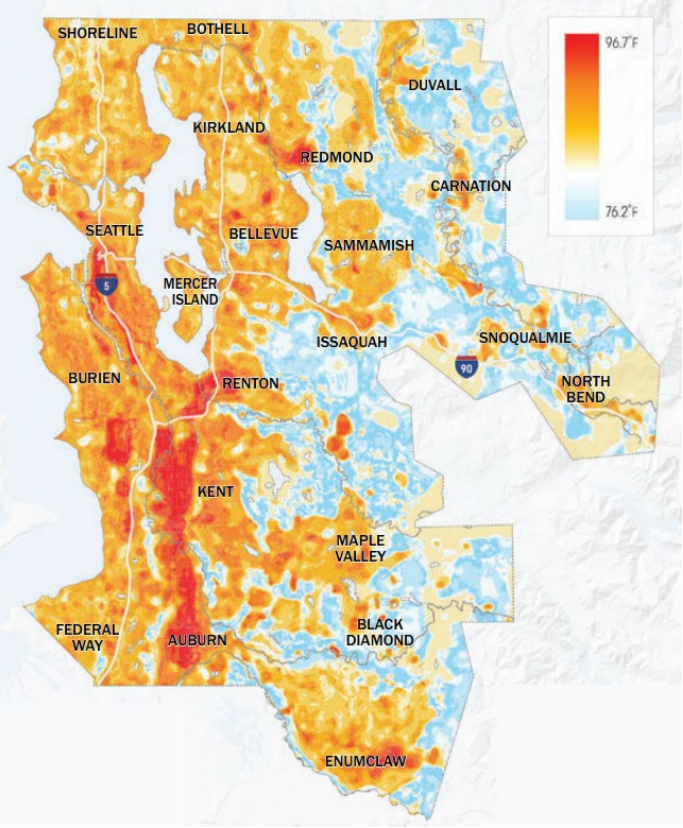
14.2 Location

King County's geographic location, bordered by Puget Sound and the Pacific Ocean to the west and the Cascade Range to the east, plays a key role in shaping its climate. The region is heavily

influenced by maritime atmospheric conditions, with the mountains acting as natural barriers that trap-in in moisture. As moist air is forced upward by the Cascades, it cools and condenses, leading to heavy precipitation on the windward side of the mountains. In addition to its natural climate influences, the region is home to numerous urban centers and transportation networks that feature impermeable surfaces, which contribute to the urban heat island effect.

Extreme Heat

Figure 14-1 King County Heat Island Map[1]



Hotter summer temperatures affect everyone in King County. However, the impacts of that heat are not felt equally. Figure 14-1 shows the county's surface temperatures with red and orange indicating hot areas and blue indicating cool. These elevated surface temperatures are a result of the "urban heat island" effect, where there is a concentration of pavement and heat retaining material that result in higher surface temperatures compared to their surrounding areas.

Drought

Washington State approaches drought emergencies from the perspective of water supply, which can affect the entire county. This includes residents and businesses who depend on local water resources and well as farmers and landowners who use water resources for irrigation. A key factor contributing to drought in this region is reduced snowpack in the Cascades. The snowpack acts as a critical source of runoff that feeds our watersheds and replenishes reservoirs. While there is a slight projected increase in winter precipitation, the main driver of declining snowpack is that more of this precipitation is falling as rain rather than snow due

[1] King County Executive Climate Office (ECO), "King County Extreme Heat Mitigation Strategy" (July 2024): p. 6, https://cdn.kingcounty.gov/-/media/king-county/depts/executive/climate-office/documents/c2-240802_13570m_kc-extreme-heat-strategy_prnt.pdf?rev=2cceaee431a14df29323d98bd817cfe5&hash=2C0B0D0227F7100C58DF612DB2351820

to rising temperatures. This shift, combined with hotter, drier summers, reduces the amount of snowmelt available in spring and summer, ultimately exacerbating drought risk.

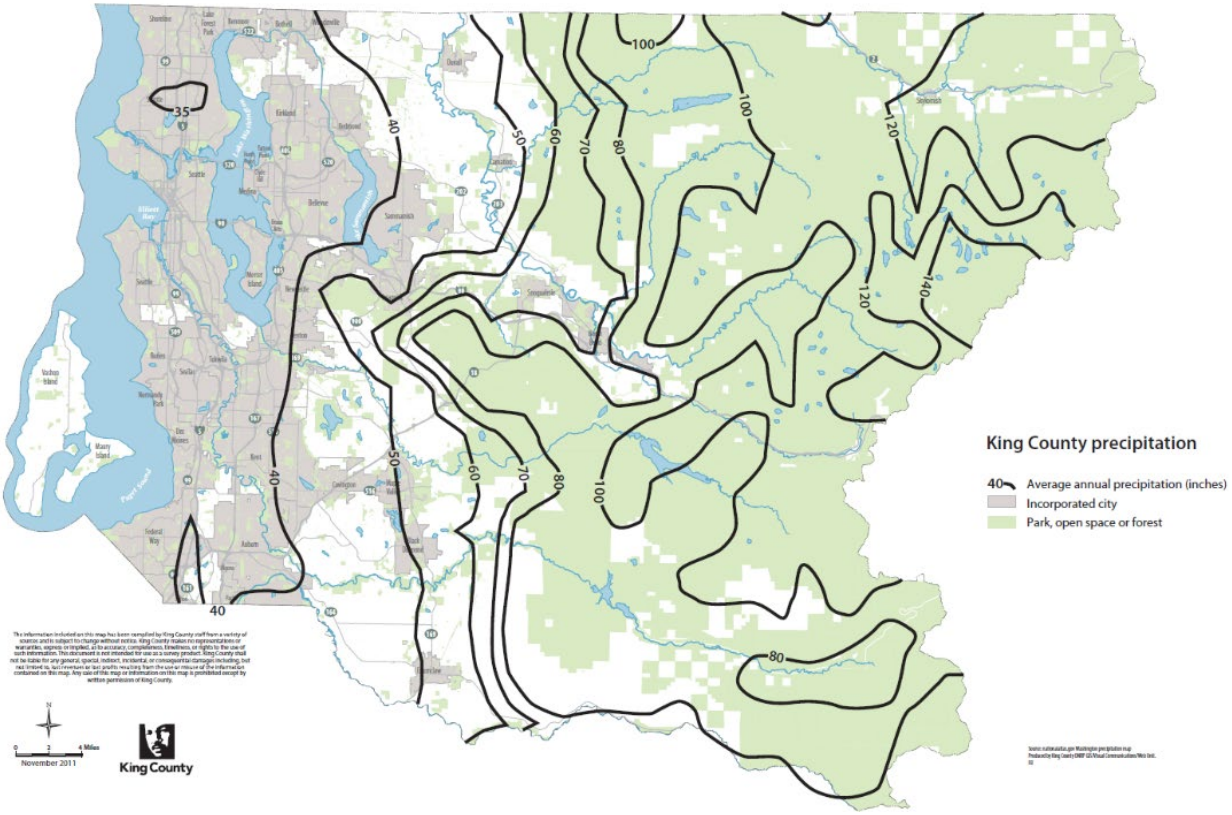
Winter Weather

King County's marine climate, that maintains relatively mild temperatures, results in very few extreme cold weather events. Snow accumulation at elevations below 2,000 feet is considered rare, and when snowstorms do occur, they usually last less than two days. However, since 1990, King County has experienced an increasing frequency of prolonged cold spells. These events, which generally last 10 to 14 consecutive days, typically occur in January or February each winter. The heavy snowfalls and accompanying cold conditions often lead to power outages, disruptions to transportation systems, school closures, and significant economic impacts on the region.

Heavy Precipitation

Though known for being wet, the Seattle metro area has around the same average annual precipitation as Dallas, Texas, and much less than New York City, Houston, Atlanta, or New Orleans. Higher amounts of rainfall occur as you move closer to the Cascades. King County owes its mild climate to the influence of Puget Sound and the Pacific Ocean, which moderate the climate, and to the protective barrier of the Cascade Mountain range, which blocks cold air from the interior.

Figure 14-2 King County Precipitation Map



Rainfall in King County varies widely from city to city and area to area. The City of Seattle has an average of 37 inches annually, while Enumclaw has an annual average of 57.9 inches and Snoqualmie/North Bend has 61+ inches of precipitation. The majority of this precipitation occurs as rain in the lowlands between October and early May with substantial snowpack in the Cascades during the same time frames. Precipitation on Snoqualmie Pass in the unincorporated community of Hyak (2800 feet) average 410 inches of snowfall from October to May.

High Wind and Tornados

High wind events are common in King County, especially during winter, with gusts frequently reaching 40-45 mph and severe winds surpassing 90 mph. Certain areas of the county are more prone to these events due to their geography and location relative to wind patterns.

The north Puget Sound region, particularly areas along the Strait of Juan de Fuca, regularly experiences high winds during the winter. In certain conditions, the Strait acts as a wind funnel, accelerating winds as they move eastward toward the interior of the region. Areas closer to the water, such as Edmonds, Mukilteo, and Everett, are often more affected by these powerful gusts.

The build-up of high pressure east of the Cascades can trigger strong windstorms that surge through lower passes in the Cascades, including Stampede Pass. These winds often impact communities located to the east of the mountains, such as Enumclaw, which routinely experiences strong winds due to its proximity to these wind corridors. The Enumclaw area, with its elevated position on the foothills of the Cascades, is especially susceptible to wind gusts that can reach up to 70-80 mph.

Other parts of King County, such as the higher-elevation areas in Snoqualmie Pass and parts of the foothills surrounding the Cascades, can also experience gusty winds, particularly when a low-pressure system interacts with the mountainous terrain. During these systems, southerly winds are often funneled between the Olympic and Cascade Mountains, creating a wind tunnel effect that can intensify gusts in the lowlands. Additionally, south of Seattle, areas like Federal Way and Fife can experience localized wind events as gusts push through the lower valleys.

14.3 Magnitude

Severe weather events in King County have the potential to cause significant disruptions, posing both immediate and long-term risks to infrastructure, the economy, and public safety. High winds, which can exceed 100 mph during certain storms, are a frequent cause of power outages, road closures, and structural damage. The region also experiences intense heat, with temperatures occasionally surpassing 110°F, and extreme cold, with lows dipping below -40°F, although these cold extremes are rarer.

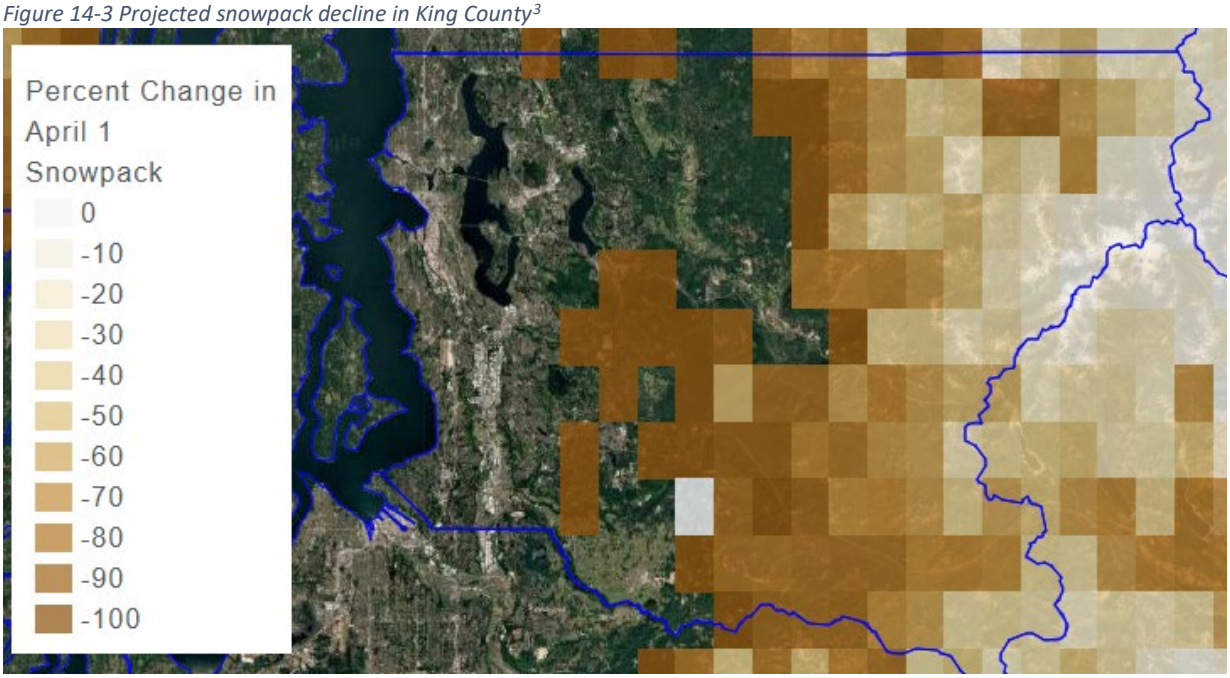
Extreme Heat

Extreme heat is the number one cause of weather-related fatalities nationally. Current annual losses in Washington State due to heat-related illness and heat-associated traumatic injury, death, and productivity losses are calculated to be between $111 to $153 million annually. By 2030, heat-related losses in labor productivity alone are projected to reach around $100 billion annually nationally. A major factor that contributes to heat-related impacts is the fact that many residents lack efficient cooling systems in their homes or businesses. A 2015 American Housing Survey data shows that only 33.7% of Seattle area homes have air conditioning. For those aged 65 and older, the percentage only jumps slightly, to 37%.[2]

Drought

Figure 14-3 shows the model median for projected percent change in April 1st snowpack over a 30-year period compared to the 1980-2009 average. April 1st snowpack is an important indicator of water stored in snow that will be available during the melt season. The brown areas on the map indicate where snowpack is expected to decrease, with the most significant decline projected for lower elevations in the Cascade Mountains.

Figure 14-3 Projected snowpack decline in King County[3]



[2] Seattle Office of Emergency Management (OEM), "Excessive Heat Events" City of Seattle CEMP – SHIVA (n.d.): p 9-6, https://www.seattle.gov/documents/Departments/Emergency/PlansOEM/SHIVA/SHIVAv7.0-Heat.pdf
[3] UW Climate Impacts Group (CIG), "Climate Mapping for a Resilient Washington" *University of Washington* (n.d.): https://data.cig.uw.edu/climatemapping/

In the event of drought, the combined effect of reduced snowpack and warmer temperatures can lead to severe water shortages, impacting agriculture, communities, and wildlife, including fish and salmon. King County's dependence on hydroelectric dams further complicates this issue, as drought could affect the availability and cost of electricity, potentially leading to planned power outages (brownouts) during severe conditions. These changes can have serious consequences, including higher mortality rates for salmon and steelhead due to elevated water temperatures and low river flows, negative impacts on local crops and livestock, and increased health risks, such as heat stress-related emergency room visits. As drought becomes more common in the Northwest, driven by variable rainfall patterns and rising temperatures, the risk of wildfires also increases, further exacerbating the challenges for King County.

Winter Weather

King County is also vulnerable to extreme winter conditions, with heavy snowfalls and ice storms disrupting transportation, power, and emergency services. While the region typically receives moderate snow, events like the 2008 winter storm can paralyze the area for extended periods, particularly in hilly communities such as Skyway, where limited resources exacerbate the effects of severe weather. Given the rarity of extreme snow events, King County maintains a relatively low budget for snow removal services. When major incidents do occur, vehicles and drivers can be stranded almost anywhere in the county. Transportation impacts to buses, trains, roads, bridges include snow routes, shelter needs, and power outages. The December 26, 1996 storm lasted 11 days. Multiple consecutive freezing days can threaten the lives of unsheltered and lower-income individuals, requiring the opening of additional shelter beds or more heating assistance funding.

Heavy Precipitation

Intense precipitation is the primary cause of both river and urban flooding in King County. Areas such as Snoqualmie, Auburn, and White River are particularly vulnerable to frequent flooding following rain events. The larger, more destructive floods are often driven by **atmospheric rivers**—narrow bands of concentrated water vapor in the atmosphere that can bring significant rainfall and snow. The Pineapple Express, a type of atmospheric river, is a common source of severe weather, where moisture picked up from warm areas of the Pacific Ocean near Hawaii is carried by the jet stream and releases as intense precipitation when it rises over the Olympic and Cascade Mountains. These atmospheric river events are major contributors to river flooding in King County.

Heavy rainstorms also lead to urban flooding, stressing the stormwater infrastructure and affecting ground-floor structures and basements. This can cause widespread damage and pose a risk to public safety, particularly in areas ill-equipped to manage such intense rainfall.

High Wind

High wind events are common in King County, especially during winter, with gusts often reaching 40-45 mph and severe winds surpassing 90 mph. From the north Puget Sound region during the winter season, the Strait of Juan de Fuca can also act as a wind funnel in the right conditions. High pressure build-up in east of the Cascades can also cause strong windstorms that surge through areas like Stampede Pass and the area immediately below it, Enumclaw.

These intense wind events often lead to widespread power outages, road and bridge closures, tree damage, airport disruptions, and risks such as carbon monoxide poisoning and injuries to utility workers, first responders, and the public. Notable examples of such events include the Inaugural Day Windstorm on January 19, 1993, which saw winds exceed 90 mph in downtown Seattle, and the Hanukkah Eve Windstorm on December 15, 2006, which caused significant damage to the Seattle area power grid, leaving hundreds of thousands without power for weeks.



November 20, 2024 bomb cyclone aftermath

A particularly severe event occurred on November 19, 2024, when Washington's Puget Sound region was struck by an unprecedented severe windstorm, colloquially referred to as a "Bomb Cyclone." This event was the result of rapidly intensified storm that experienced a dramatic drop in atmospheric pressure by 64 millibars in just 24 hours. This storm generated powerful east to southeast winds, with wind gusts in the Seattle Metropolitan Area reaching 50–60 mph, while mountain areas saw gusts surpassing 70 mph. This intense storm caused widespread destruction across King County, uprooting trees, downing powerlines, and leaving approximately 520,000 customers without power. King County was the most severely affected jurisdiction, with preliminary damage assessments estimating total losses at $17 million. The storm also prompted a tornado warning and led to the sighting of a waterspout along the southwest coast of Washington.

Tornado activity is relatively rare in the Pacific Northwest, but it has been recorded in the region, including an EF1 tornado in Enumclaw in September 2009. Despite wind speeds reaching up to 110 mph, the most significant damage was caused by uprooted trees and roof damage, largely due to

the preceding storm. Tornadoes are uncommon in the Puget Lowlands, though several have been recorded. The Enhanced Fujita (EF) scale, which rates tornadoes from EF0 to EF5 based on wind speed and damage, has noted tornadoes as strong as EF3 in the Puget Sound area.

14.4 Previous Occurrences

The majority of disaster declarations in King County are from severe weather events. Disasters are usually declared for a combination of winter storms, mudslides, heavy rains, and straight-line winds. The primary impacts and costs triggering these declarations include emergency protective measures for, and damage to, utilities, roads, and bridges, and for costs associated with debris removal. A recent example is the June 2021 Pacific Northwest Heat Dome, an event made 150 times more likely because of climate change. The 2021 Heat Dome currently stands as the single most deadly climate disaster event in Washington State with more than 125 reported heat related deaths statewide, including 34 deaths in King County.

Table 14-1 Major Weather Disaster Declarations including King County

Date	Hazard	Description
November 2006	Rain Storm	This event saw unusually intense rainfall in a short period, leading to rapid runoff and increased flooding risks across King County. The heavy rains overwhelmed the region's stormwater systems, causing localized flooding in urban areas and exacerbating existing river flood conditions.
December 2006	Windstorm	Hannukah Eve - Unusually intense levels of rainfall in a very short period of time were immediately followed by very heavy winds up to 69 miles per hour that felled power poles and large, mature, healthy trees. The storm overwhelmed Seattle City Light when 49% of its customers lost power. 95% of customers were restored within two days, but full restoration took a week
July 2009	Excessive Heat	On July 29, 2009, the temperature reached 103åt SeaTac airport, an all-time record. Two people in Western Washington died. The most brutal temperatures lasted three days.[4]
August 2015	Windstorm	The strongest August windstorm on record hit Western Washington, with winds of 50-60 mph (46 mph at

[4] Seattle Office of Emergency Management (OEM), "Excessive Heat Events" *City of Seattle CEMP – SHIVA* (n.d.): p 9-4, https://www.seattle.gov/documents/Departments/Emergency/PlansOEM/SHIVA/SHIVAv7.0-Heat.pdf

		SeaTac). Almost half a million people lost power, two people died from falling trees, two people died from carbon monoxide poisoning, and four people were injured.
August 2015	Excessive Heat	Seattle's hottest summer on record. The average high temperature was 80.2 degrees Fahrenheit. July had 10 days with high temperatures in the 90s.
January 2019	Winter Storm	The hefty snowfall (a daily record) bumped the city's monthly snowfall total to 20.2 inches, making February 2019 Seattle's snowiest month in a half-century.
June 2021	Excessive Heat	Between June 26 and July 2, 2021, an extreme heat event caused by a "heat dome" descended upon the Pacific Northwest, setting 128 all-time high temperature records across Washington state and killing 126 Washingtonians due to heat-related causes according to official estimates.[5] This includes 34 deaths in King County.[6]
December 2023	Rain Storm	An atmospheric river event brought intense rainfall to King County, significantly impacting local rivers, streams, and urban drainage systems. This atmospheric river caused widespread flooding and river overflow, leading to property damage, transportation disruptions, and power outages.
November 2024	Windstorm	A bomb cyclone struck King County in November 2024, causing widespread damage. This intense storm system rapidly intensified, resulting in high winds, heavy rainfall, and flooding. It caused power outages for over 520,000 customers and left an estimated $17 million in damages.

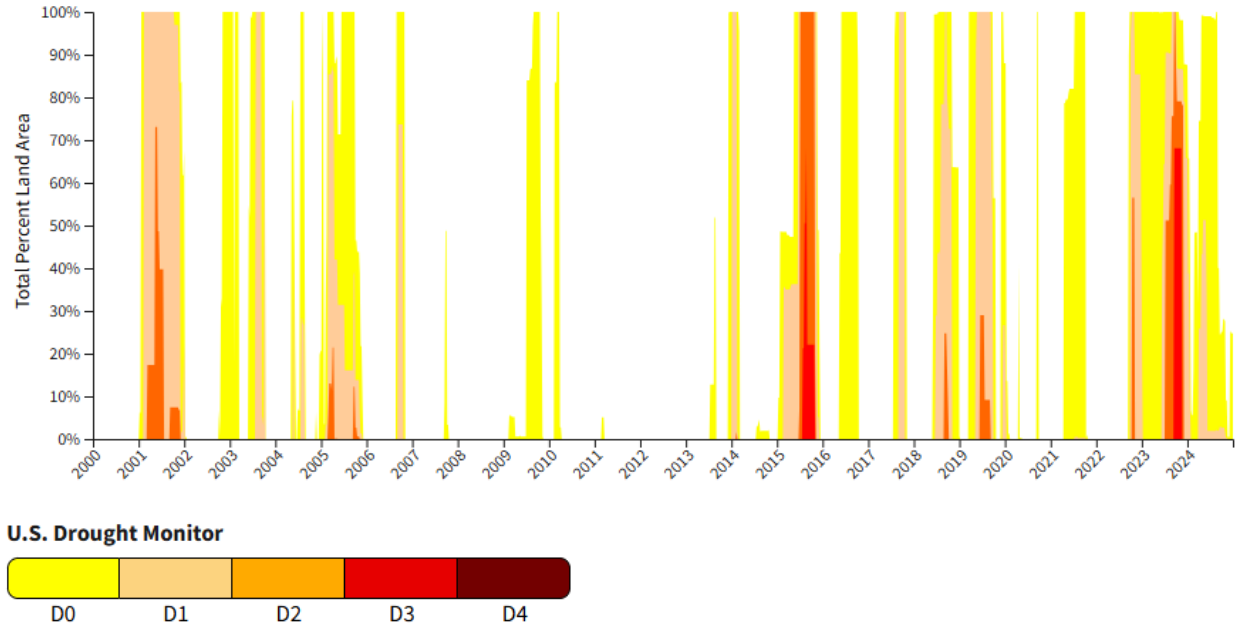
According to the US Drought Monitor, King County has experienced an increasing frequency of moderate to extreme drought conditions over the past two decades. These conditions have become

[5] UW Climate Impact Group (CIG), "In the Hot Seat: Saving Lives from Extreme Heat in Washington State" *University of Washington* (2023): p. 1, https://cig.uw.edu/wp-content/uploads/sites/2/2023/06/CIG-Report-Heat-202-pages.pdf

[6] King County Executive Climate Office (ECO), "King County Extreme Heat Mitigation Strategy" (July 2024): p. 5, https://cdn.kingcounty.gov/-/media/king-county/depts/executive/climate-office/documents/c2-240802_13570m_kc-extreme-heat-strategy_prnt.pdf?rev=2cceaee431a14df29323d98bd817cfe5&hash=2C0B0D0227F7100C58DF612DB2351820

more pronounced in recent years, with significant spikes in extreme drought levels observed in 2015, 2019, and 2023. These periods of drought have been driven by a combination of low snowpack, reduced rainfall, and higher-than-average temperatures, which have led to decreased water availability in streams, rivers, and reservoirs.

Figure 14-4 Historic drought conditions for King County[7]

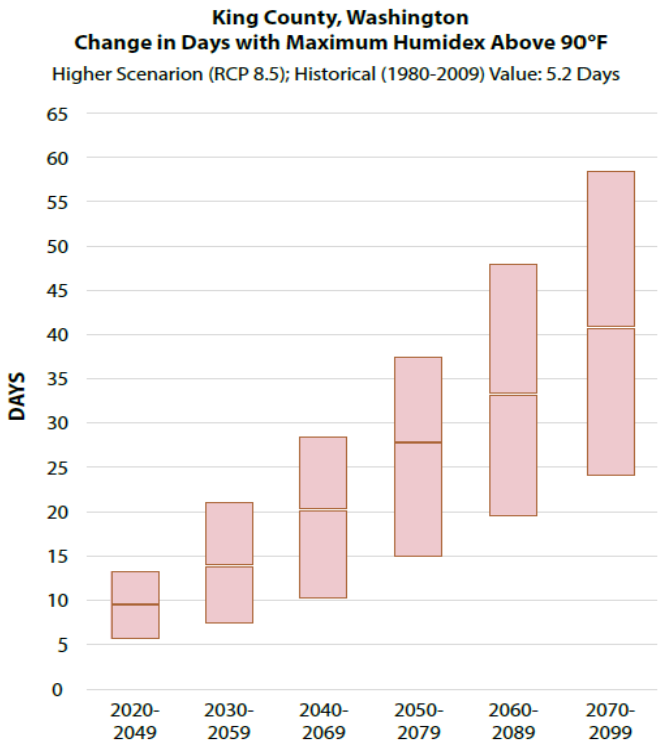


14.5 Probability of Future Occurrences

King County is projected to experience significant changes in weather patterns due to climate change, particularly with regard to extreme heat and precipitation. All climate scenarios predict hotter summers in the region. By the 2080s, the average maximum summer temperature is expected to increase by 10.5°F (with a range of 7.4°F to 13.0°F). The number of days above 90°F will also rise substantially, with projections indicating a median of 41 days per summer by the 2080s. Additionally, nighttime temperatures are expected to increase, which is concerning from a public health perspective. Nights with a humidex above 65°F are projected to occur 45 more nights (with a range of 18-71 days), which can exacerbate heat-related health risks.

[7] NIDIS, NOAA, "Drought Conditions for King County" *The U.S. Drought Monitor* (2024): https://www.drought.gov/states/washington/county/King

Figure 14-5 Projected change in frequency of extreme heat events in King County[8]



In addition to extreme heat, King County is likely to experience a decrease in summer precipitation, intensifying drought conditions. While projections for rainfall are more uncertain due to the natural variability of weather patterns in the Northwest, the projections points to wetter winters and drier summers in the future. This shift in seasonal precipitation could increase the risk of landslides, as more rain in the winter may lead to greater soil saturation. Furthermore, heavy precipitation events are expected to become more intense, with a projected 14% increase in intensity by the 2050s and up to 30% by the 2080s. This is driven by warmer air, which can hold more moisture, resulting in the potential for more intense rainfall events. These changes in temperature and precipitation highlight the need for adaptive strategies to address the increased risks of extreme weather events in the coming decades.

14.6 Climate Change Considerations

Climate change is a significant concern for King County, as it is expected to alter the frequency, intensity, and severity of extreme weather events in the region. These changes are projected to result in hotter, drier summers and an increase in heavy rainfall events, which could lead to a range of hazardous consequences, including floods, landslides, avalanches, droughts, and wildfires. The economic impacts of these events could be severe, as communities are often unprepared for such extreme weather.

In addition to the economic consequences, extreme weather events also pose a threat to public health. For example, if global temperatures rise by 5.4 degrees Fahrenheit over pre-industrial levels, some climate scenarios suggest that extreme heat events could result in hundreds of deaths in the

[8] UW Climate Impacts Group (CIG), "Climate Mapping for a Resilient Washington" *University of Washington* (n.d.): https://data.cig.uw.edu/climatemapping/

Seattle area alone.[9] Public health sensitivity to heat events is especially high in the Puget Sound region due to the lack of widespread air conditioning. In response, Public Health Seattle-King County has plans to activate cooling centers and issue public messaging during multiple days of heat in the mid-80s. While global trends show a decrease in the number of cold events since 1950, some areas in the Northern Hemisphere, including parts of the U.S., have experienced an increase in extreme cold since 1990, potentially linked to changes in the polar vortex.

14.7 Impact Assessment

Below offers an overview on the impacts from severe weather events. Additional details on impacts for each type of severe weather event are provided under 14.3 Magnitude.

Public	Anyone present in King County at the time of a weather incident is subject to the potential impacts of severe weather incidents. While the likelihood of a winter weather incident is high, the likely of direct and significant impacts is Moderate. Impacts to residents may include personal property damages, interruption of sports and recreation, extension of the daily business commute, impacts to daycare and school closures, injuries, and sheltering needs from power outages. Avalanche control may be needed to reduce the impact to alpine and cross-country skiing enterprises. Injuries and deaths do occur from avalanche impacts to recreational skiers. Impacts from drought take time to materialize as water shortage cause restrictions to water usage and issue of burn bans to reduce the threat of wildfires, especially in suburban areas. Only the most severe weather incidents have an impact on local employment.
Responders	Portions of the population may be stranded or isolated from the results of severe weather, like roads blocked by trees and power lines, snow- and ice-covered roads, water or slides over roadways. Closure of the mountain passes for heavy snow conditions or avalanche control is a fairly common occurrence.

[9] Evan Bush, "Seattle unprepared for deadly heat waves made worse by global warming, researchers say" *The Seattle Times.* (June 14, 2019): https://www.seattletimes.com/seattle-news/environment/heat-waves-could-kill-hundreds-more-in-seattle-as-globe-warms-researchers-say/.

	Excessive heat that extends over days or weeks or cold conditions for similar timeframes may result in the need for cooling or warming shelters. These especially impact the poor, elderly, young, and infirmed. First responders will be impacted by limited road access, impacts of heat and cold on operations. Conditions will require monitoring efforts during incident response.
Continuity of Operations	During the February 2019 snowstorm, King County took the unprecedented step of closing many government offices to protect employee safety. After two days, due to the growing amount of snow and the need to resume services, offices were reopened. Even with the reopening, many employees chose to telework due to safety concerns. An earlier activation of the EOC for the 1996 snow/ice storm saw activations for 11 days – 2 shifts per day when 16 inches of snow came and stayed for weeks. During that time frame, buses were on snow routes, up to 40% of the employees for King County government were either unable to get to work or arrived very late. A major improvement from 1996 to 2019 is that it is now much easier to telework, meaning that non-public-facing positions can work remotely for days. Hospitals, courts, detention facilities, businesses, law enforcement, fire and emergency medical services were all severely impacted. Search and Rescue volunteers transported medical personnel, emergency management staff, and other essential employees to work and between hospitals for the duration of the incident. During the February 2019 snowstorm, busses were on the most restrictive service routes ever seen. These routes were established in response to previous snow events. Similar impacts were observed for the January 2011 snow storm that impaired King County government operations for 8 days. Some damages were experienced at crucial facilities around the county. See FEMA Disasters 1079 and 1817 above. The recent February 2019 snowstorm did not receive a disaster declaration. During that time frame, most regional public services were impacted by absenteeism, access restrictions to critical facilities, and damage to vehicles like buses, police cruisers, and aid units. Busses and other vehicles that use tire chains are especially vulnerable to breaking down, which can delay a return to full service, even once the snow has melted.
Property, Facilities, and Infrastructure	**Property** All structures in the county are subject to the direct impacts of severe weather incidents. These same structures are subject to flood impacts

where they may be in the flood plain. Structures along the coastline (seawalls) may be eroded. Local urban flooding also occurs from storm debris clogged sewers.

High winds that accompany winter weather fronts often cause infrastructure damages, power outages, and communications interruptions. Rain saturated soils may cause mudslides that close roadways, damage bridges, and buried rail service interruptions

Private property damages to homes and vehicles from floods, trees downed from wind and saturated soils are regular occurrences. Private property experiencing repeated flood damages may require elevation of the structure or offers of buy outs (mitigation efforts).

High winds, snow, and icy conditions can close airports or cause flight delays and rerouting. Mountain pass conditions may be so severe that they are closed to all traffic for days at a time. The floating bridges over Lake Washington (I-90 and SR 520) experience closures for sustained winds over 45 miles per hour. These closures extend the business commute with increased traffic on surface streets and routes around Lake Washington.

Impacts to emergency medical services from impacts to the roadways of the county can delay response times, restrict emergency room staff and supplies, and result in under staffing EMS and hospitals during severe weather emergencies.

Facilities

Severe weather disrupts the regular schedule of patient visits and regularly-scheduled appointments for chronic care. Severe weather also can cause more demand on the health system as people are injured or are unable to leave the hospital to return home. Any disruptions to electricity and water supply also can be a threat, though hospitals generally maintain backup generators.

During severe cold or warm spells, public health may be required to provide additional patient transport services and to canvass for homeless populations that may be in need of shelter. During the February 2019 snowstorm, hospitals suffered major staffing shortages as doctors and nurses were unable to get to work. Staff had to work longer than normal hours and potentially stay temporarily at or near the hospital.

Although both requiring the expansion of sheltering services, heat and cold differ because older and less health populations are especially at risk to hot temperatures. One of the most famous examples is the 1995 Chicago heat wave, during with 739 people lost their lives, with the city unprepared to provide support to residents who may be home bound or offer sufficient cooling centers to support residents. In Seattle, where few residents have air conditioners, deaths from heat events are a growing threat.

Infrastructure

- Power: Downed trees caused by high winds and rain saturated soils can damage transmission lines and cause power outages in local areas for hours to days when multiple occurrences are experienced. Utility crews from Puget Sound Energy, Bonneville Power and Seattle City Light work around the clock to restore services. The Inaugural Day Windstorm left 750,000 customers without power. The Hanukkah Eve Windstorm winds and subsequent heavy rains cut electricity to more than 1.8 million customers, hundreds of thousand remained without power for days. Downed power lines pose an electrocution hazard to motorists, pedestrians and any unsuspecting by-standers. During extremely hot temperatures, demands on the power system can increase, especially as more residents install air conditioning. As a winter-peaking system, however, this power demand will still likely be lower than current winter demand.
- Water/Wastewater: Water and wastewater systems are vulnerable to a multi-day loss of power as well as to serious flooding. In February 2017, as a result of heavy rains, high tides, and other severe weather, an equipment failure at King County's West Point Wastewater Treatment Plan led to the dumping of over 235 million gallons of untreated wastewater into Puget Sound. Drought can also impact water systems as water levels in reservoirs and groundwater wells drop.
- Transportation: Events that impact transportation can include severe snow, ice, wind, and rain. Storms may cause downed trees and snow or ice that temporarily blocks roadways or can cause large floods that can wash out or undermine roads and bridges. For many parts of the state and county, such as around the town of Skykomish, the loss of a single route due flooding can completely cut the community off from the rest of the county. This is especially a problem in the eastern parts of the

	county that are more rural and have fewer transportation route options. • Communications: Systems can be knocked out by high winds or loss of power transmission. While the move to cell phones has reduced the vulnerability of telephone lines to outage caused by trees, a multi-day loss of power can still shut down a cell transmission site. Furthermore, high winds can damage or destroy critical equipment on cell towers. Most equipment is built to withstand inclement weather; however, especially severe conditions could still lead to outages.
Environment	Severe weather can have impacts to the environment through flooding and floodplain damages to salmon and steelhead habitat, wetland impacts to amphibians and reptiles, and bird sanctuaries. This can occur from both too much water (flooding or dam failure) or too little snowpack and resulting drought conditions. Hillside destabilization can occur where soil geology and saturation of soils occur. The moisture content of vegetation drops throughout the summer. Dry conditions can result in an increase in the threat of wildfires from lightning strikes, unattended campfires, fireworks, sparks from automobiles, cigarettes thrown from cars on roadways and other heat sources. One dilemma of drought conditions is the balance between human water needs and the protection of the environment including plants, wildlife, and fish that require minimum stream flows to support their annual spawning migrations. Dry conditions also contribute to higher water temperatures, which causes increased salmon mortality.
Economy	There are several local ski areas important to King County: Crystal Mountain (Chinook Pass); Alpental, Hyak, and Ski Acres (Snoqualmie Pass); and Steven's Pass (Steven's Pass). Ski area closures can occur from both large snowfalls and where snow is too light or melts off. This can impact seasonal employment at the ski areas. Also associated with the passes, as outlined in the avalanche chapter, a WSDOT study claimed that a four-day closure at Snoqualmie Pass in the winter of 2007/2008 cost the state $27.9M in economic output, 170 jobs, and $1.42M in state revenue (2008 dollars). Businesses can be severely impacted when weather events impede mobility during high seasons, such as around the holidays. Since a large percentage of annual personal spending is spent during the November-

	December season, negative weather limits access to stores and can cause stores to close. Drought conditions can impact the regional agricultural output of fruits, vegetables, and flowers grown in all the major river basin areas of King County. Regional drought conditions can impact generation of hydroelectric power and drive up electric rates as well as increase usage during hot summers. The most serious and longest-lasting impacts may be to low-income individuals and families who may lose jobs or days of wages due to snow closures. Debt traps caused by missed bills due to lost wages can damage a family for months or years.
Public Confidence in Governance	The 2008 and 2011 snowstorms highlighted the shortage of snowplows and the management of the general response to the snow incident in the City of Seattle. The February 2019 event can be regarded by many as much more successful on the public perception front. Successful coordination of a regional call center in the Emergency Operations Center (EOC) to support other county departments and take snow plowing requests helped ensure the public always had someone to call. The county also maintained substantial engagement with media outlets. The County Executive was fully involved as well, helping to boost awareness and public perception that county government was engaged in the storm recovery effort.

14.8 Vulnerability Assessment

Below offers an overview on vulnerability from severe weather events. Additional details on vulnerability for each type of severe weather event is provided under 14.3 Magnitude.

Vulnerable Populations	Severe weather events, while usually concentrating impacts on infrastructure and agriculture, can seriously threaten the lives of vulnerable people. Cold and hot weather events can lead to an increase in fatalities among the elderly and homeless populations. Immigrant and low-income populations also have been known to succumb by carbon monoxide poisoning that can occur when generators or grills are lit indoors and without proper ventilation. Snow can trap people

indoors for days, something especially threatening for people with food insecurity or chronic health conditions that require access to medical services. Any disruption to the economy is also especially threatening to those who are low-income or who work in hourly work or in the service sector. When those jobs are not open, they frequently do not pay wages, which can threaten the entire livelihood of a low-income family.

Unsheltered populations

Populations needing shelter are especially exposed during heat and cold events. Since King County has a moderate climate, many of these populations are unprepared. Cold events may require opening additional shelter spaces and canvassing areas to offer shelter services.

Immigrant populations and those with limited English proficiency

Populations with limited English proficiency or who are inexperienced with Northwestern climate are more likely to take risky actions, like operating a generator or grill indoors for heat. These populations are also less likely to receive information and warnings about weather systems and to know where to go for help.

Low-income and minimum-wage populations

Populations working in low-wage professions such as extractive industries and service industries can be severely impacted from multi-day weather events that impact transportation systems. These events can trigger a long-term decline in living standards or even homelessness in these populations.

People dependent on public transportation

Public transit moved to the most restrictive routes ever recorded during the February 2019 snowstorm. These cutbacks had apparent disproportionate impacts on underserved areas, including some areas with populations dependent on transit. When transit services are cut, it can be impossible for these populations to get to work or appointments.

People with chronic medical conditions

People requiring regular care from doctors are negatively impacted by severe weather events. During heatwaves, people with chronic

	illnesses, especially heart and respiratory conditions, are also disproportionately impacted. **Residents down private roads** Private roads are not eligible to be cleared by public snow removal services. Many homeowner's associations contract with the same set of snow removal companies. These companies may become overwhelmed during long-running events. **Service industry during peak periods** Many service businesses, especially retail, are heavily dependent on income earned during certain months of the year. A major event around the Christmas holidays, for example, can threaten the viability of many businesses. **All residents during multi-day events** Although it is recommend having two weeks of food and supplies available during these severe weather events, few residents follow this guidance, regardless of income. After more than a few days, many residents will run out of food for themselves and any pets.
Property	**Buildings on slopes of greater than 40% grade** Landslides are a major secondary hazard of severe precipitation events. Buildings on or near slopes of greater than 40% grade are most at-risk.
Environment	Severe weather events can have significant impacts on ecosystems, disrupting habitats and threatening biodiversity in various ways. For example, strong winds can lead to tree falls, habitat destruction, and loss of vegetation, while heavy precipitation can cause soil erosion and degradation, disrupting both wildlife and aquatic habitats. This damage to soil and vegetation can also increase the risk of landslides, further destabilizing the environment. During extreme heat events, prolonged heat stress can reduce plant productivity, heighten susceptibility to diseases, and lead to higher mortality rates for trees and other vegetation. Drought conditions further exacerbate these issues by reducing stream and river flows, which negatively impacts aquatic species, particularly those that rely on specific water flow and temperature conditions, like salmon. As vegetation dies off or becomes desiccated, ecosystems become more vulnerable to wildfires, compounding the environmental disruption.

Operations

Power

Power transmission systems, especially power lines, are frequently damaged during storms with high winds by falling trees. During major wind events, it is not uncommon to have hundreds of thousands of residents without power.

Water/Wastewater

Damage to water and wastewater facilities can occur due to a secondary hazard, flooding and tidal surge. These facilities are often built in low-lying areas. The severe damage and release of untreated water that occurred at King County's West Point Treatment Plan occurred during a severe weather event.

Waste Management

Garbage pickup can be delayed for weeks. This causes significant public frustration.

Transportation

Rural transportation routes are lower priority and may not even be cleared at all during a snow event.

Airports and Travelers

Airport facilities are frequently impacted by severe weather events, but often have plans and procedures to contain disruption. During multi-day events, however, passengers can be stranded and there can be a shortage of hotel rooms since many airlines contract with the same hotels.

Chapter 15
Terrorism

Risk Assessment Scoring		
1	Location	Hazard
2	Probability	
3	Magnitude	
2	Public	Impact
2	Responders	
2	COP	
2	PFI	
2	Economy	
2	Environment	
2	PCG	
2	People	Vulnerability
2	Property	
2	Environment	
2	Operations	
2	People	Risk
2	Property	
2	Environment	
2	Operations	
Moderate	**Overall Risk**	

PC: King County Sheriff's Office

Chapter 15: Terrorism

15.1 Hazard Description

Terrorism, as defined under Title 18 of the United States Code, is categorized into two primary types: international terrorism and domestic terrorism. Both forms involve acts of violence or danger to human life that violate U.S. criminal laws but differ in their geographic focus and intent.

International terrorism: means activities that—violent acts or acts dangerous to human life that are a violation of the criminal laws of the United States or of any State, or that would be a criminal violation if committed within the jurisdiction of the United States or of any State; appear to be intended—(i) to intimidate or coerce a civilian population; (ii) to influence the policy of a government by intimidation or coercion; or (iii) to affect the conduct of a government by mass destruction, assassination, or kidnapping. [These acts] occur primarily outside the territorial jurisdiction of the United States […].

Domestic terrorism: means activities that—involve acts dangerous to human life that are a violation of the criminal laws of the United States or of any State; appear to be intended—(i) to intimidate or coerce a civilian population; (ii) to influence the policy of a government by intimidation or coercion; or (iii) to affect the conduct of a government by mass destruction, assassination, or kidnapping. [This] occur primarily within the territorial jurisdiction of the United States.[1]

The Federal Bureau of Investigation (FBI) designates terrorism as its top investigative priority, further defines these two primary types as:

- **International terrorism:** Perpetrated by individuals and/or groups inspired by or associated with designated foreign terrorist organizations or nations (state-sponsored).
- **Domestic terrorism:** Perpetrated by individuals and/or groups inspired by or associated with primarily U.S.-based movements that espouse extremist ideologies of a political, religious, social, racial, or environmental nature.

Domestic terrorism represents a complex and multifaceted threat to communities across the United States. The motivations behind domestic terrorist activities are diverse, and the consequences—both direct and indirect—are far-reaching. Understanding the nature of domestic terrorism and its potential impacts is essential for crafting effective mitigation strategies, enhancing preparedness, and ensuring a coordinated response to protect public safety and critical infrastructure.

[1] Definitions. 2015. 18 USC §2331. https://uscode.house.gov/view.xhtml?path=/prelim@title18/part1/chapter113B&edition=prelim.

Domestic terrorism in the United States can be driven by various extremist ideologies, all of which fall under the definition of **Domestically Violent Extremists (DVE)**. DVEs Listed in Table 15-1, these groups and individuals often have distinct motivations and methods of operation:

Table 15-1 US Domestically Violent Extremists (DVE) defined by FBI and DHS[2]

Group Name	Description
Animal Rights/Environmental Violent Extremists (AREVEs)	Groups or individuals who facilitate or engage in the unlawful use or threat of force or violence or intent to intimidate or coerce, in furtherance of political and/or social agendas by those seeking to end or mitigate perceived cruelty, harm, or exploitation of animals or perceived exploitation or destruction of natural resources and the environment.
Anti-Government or Anti-Authority Violent Extremism	The potentially unlawful use or threat of force or violence in furtherance of ideological agendas, derived from anti-government or anti-authority sentiment, including opposition to perceived economic, social, or racial hierarchies, or perceived government overreach, negligence, or illegitimacy.
Homegrown Violent Extremists (HVEs)	A person of any citizenship who has lived and/or operated primarily in the United States or its territories who advocates, is engaged in, or is preparing to engage in ideologically motivated terrorist activities (including providing support to terrorism) in furtherance of political or social objectives promoted by a foreign terrorist organization but is acting independently of direction by a foreign terrorist organization.
Racially (or Ethically) Motivated Violent Extremists (RMVE)	Groups or individuals who facilitate or engage in the potentially unlawful use or threat of force or violence with intent to intimidate or coerce, in furtherance of political and/or social agendas, which are deemed to derive from bias, often related to race or ethnicity, held by the actor against others, including a given population or group.

In addition to organized groups, domestic terrorism can also involve lone actors—individuals who commit violent acts independently, often motivated by personal grievances or a desire to retaliate against perceived injustices. These individuals, sometimes referred to as "lone wolves," may have no formal affiliation with extremist groups but are driven by personal ideologies or emotional distress. A common example of this type of terrorism is school shootings, where individuals, often with a history of social isolation or personal trauma, resort to violence to express their anger,

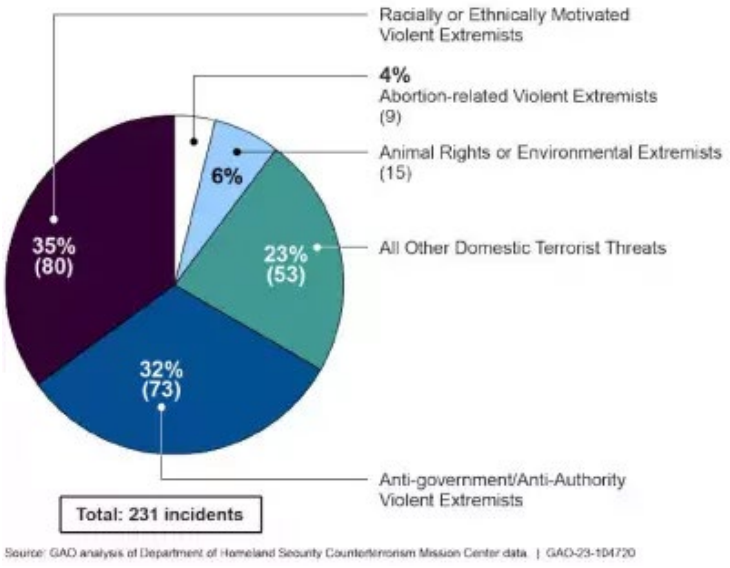
[2] https://www.fbi.gov/file-repository/fbi-dhs-domestic-terrorism-definitions-terminology-methodology.pdf/view

frustration, or desire for retribution. Another to consider is violent attacks against LGBTQ gathering spaces and other protected classes of people.

15.2 Location

King County plays a prominent role as a major economic, governmental, and transportation hub in Washington State. It is the state's largest county, with a population exceeding 2.2 million residents. It is geographically diverse, featuring a mix of high-density urban areas along the shores of Puget Sound, suburban communities to the east, and rural areas to the southeast. Seattle, the county's largest city, is home to the eighth-largest port and the eleventh-busiest airport in the United States, with Seattle-Tacoma International Airport serving as a primary entry point for international travelers, particularly from the Pacific. King County also boasts the state's largest labor market, with a range of key economic sectors. These include government operations centered in Seattle, technology hubs in Bellevue and Redmond, manufacturing in South King County, research facilities associated with institutions like the University of Washington, and agricultural activities in the Snoqualmie Valley. All which could be at risk of being targeted by various extremist groups, each seeking to disrupt specific sectors or make a political statement through acts of violence or intimidation.

Figure 15-1 Domestic Terrorism-Related Incidents by Category, from 2010 through 2021[3]



Each domestic terrorist group has distinct goals and motivations, and the locations they target for attacks reflect their ideological intentions and desired impact.

- Animal Rights/Environmental Violent Extremists (AREVEs), who are concerned with the well-being of animals or environmental degradation, often target research laboratories conducting animal testing, agricultural facilities such as farms or slaughterhouses, and environmental impact areas like logging or mining sites. They may also focus on corporate headquarters with large environmental footprints or government buildings involved in the regulation of environmental issues. Washington is the 4th highest state in the U.S. for individuals radicalized with AREVE.

[3] https://www.gao.gov/blog/rising-threat-domestic-terrorism-u.s.-and-federal-efforts-combat-it

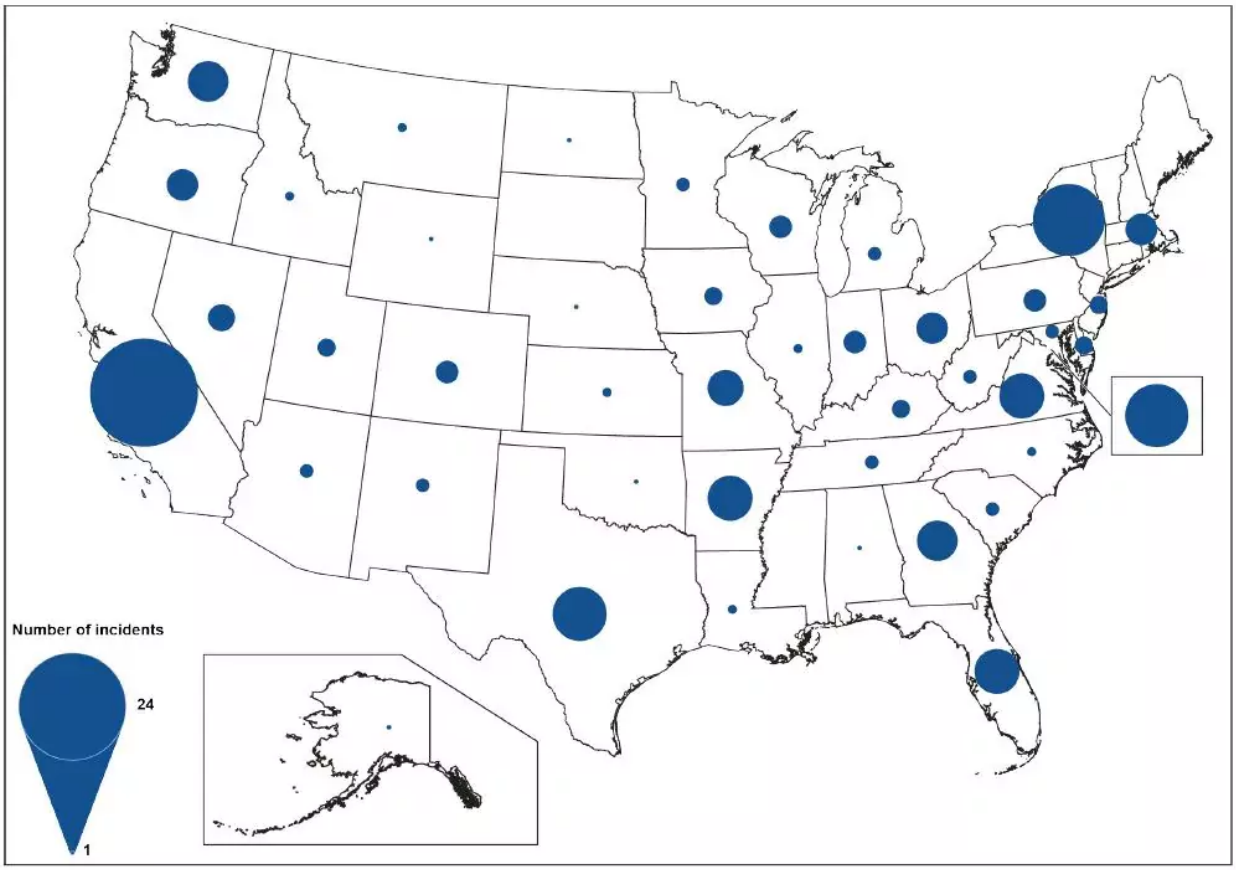
- Anti-Government or Anti-Authority Violent Extremists primarily target government institutions and operations, including law enforcement and military facilities. Their focus also extends to critical infrastructure—such as power grids or water systems—political institutions like capitol buildings, and public areas of symbolic significance, such as monuments or government offices, to disrupt the legitimacy of state authority.
- Homegrown Violent Extremists (HVEs), inspired by foreign terrorist ideologies but acting independently, are inclined to target U.S. government buildings, military and law enforcement facilities, transportation hubs like airports and bus terminals, and public venues or events, where their attacks can gain maximum visibility and cause widespread disruption.
- Racially (or Ethnically) Motivated Violent Extremists (RMVEs) often focus on areas that serve minority communities. These may include minority neighborhoods, schools with diverse student bodies, religious institutions such as churches, synagogues, or mosques, and civic organizations advocating for racial equity and social justice. In the Washington State 2022, Domestic Terrorism Study, participants from the Jewish, Muslim, immigrant, and Asian American and Pacific Islander communities expressed significant level of fear over potential use of violence against their community.[4]
- Lone Wolves, individuals who are motivated by personal grievances or emotional distress, typically target schools, workplaces, places of worship, night clubs, and public spaces with high visibility, aiming for maximum casualties or media attention. They may also target government buildings or institutions they believe have wronged them in some way, acting without the support or coordination of larger extremist groups.

15.3 Magnitude

Terrorism is designed to instill fear in its intended audience, disrupting daily life and making ordinary activities feel dangerous. It creates an environment where people are afraid to attend events, send their children to school, or even gather in places of worship. The scope of domestic terrorism has expanded significantly in recent years. The number of FBI investigations into domestic terrorism has more than doubled since 2020, with open investigations skyrocketing from 1,981 in Fiscal Year 2013 to 9,049 in FY 2021. Over the past decade, investigations into domestic terrorism have surged by 357%. This increase is most pronounced in states with major metropolitan areas, such as Seattle, Washington.

[4] https://agportal-s3bucket.s3.amazonaws.com/2022%20Domestic%20Terrorism%20Study.pdf

Figure 15-2 Domestic Terrorism Incidents by State, 2010 through 2021[5]



Source: GAO analysis of Department of Homeland Security Counterterrorism Mission Center data. | GAO-23-104720

Domestic terrorism threats continue to evolve rapidly, and combating them requires close coordination between the FBI, the Department of Homeland Security (DHS), and other federal, state, and local agencies. In Washington State, the Washington State Fusion Center serves as the coordination hub for federal, local, and private sector partners involved in preventing, responding to, and recovering from emergencies, including terrorist threats. The Fusion Center also tracks over 800 large gatherings annually in King County, encompassing events like parades, festivals, and sporting events that draw large crowds.

Mass gatherings, particularly open-access events, remain a primary target for domestic terrorists. These events, such as marathons, parades, protests, rallies, and festivals, are attractive to extremists due to their public accessibility, the availability of detailed schedules, and the generally unrestricted entry. Terrorists may also target gatherings near high-security events, such as tailgates adjacent to major sporting events. Based on previous attacks, extremists are likely to continue targeting civilian locations at such gatherings, exploiting perceived security vulnerabilities.

[5] https://www.gao.gov/blog/rising-threat-domestic-terrorism-u.s.-and-federal-efforts-combat-it

Terrorist attacks differ significantly from other types of man-made hazards, and their unique characteristics often result in both immediate and long-term impacts on communities. For example, incidents involving hazardous materials like chemical, biological, or radioactive agents are particularly challenging because the presence of the threat may not be immediately identifiable, complicating response efforts and posing serious risks to public health and safety. In addition to physical dangers, terrorist attacks cause substantial emotional and psychological distress, evoking intense reactions such as fear, anxiety, and anger, which can hinder recovery and affect first responders. Furthermore, the economic toll of terrorism is often much greater than the direct cost of the attack. Even failed terrorist attempts can result in significant financial losses, particularly in sectors like critical infrastructure and government operations, as the long-term costs of heightened security measures and the recovery process can far exceed the cost of the attack itself.

15.4 Previous Occurrences

Prior to the attacks on September 11, 2001, there were less than a dozen major terrorist events in Washington State. Since then, violent extremism has become commonplace, on a global and national scale, and the number of local terrorism and violent extremism cases continue to rise.[6] Some of the most notorious terror cases in Washington State include the arrest of Ahmed Ressam, the "Millennium Bomber," in December 1999, the Earth Liberation Front (ELF) firebombing of University of Washington's (UW) horticulture center in May 2001, and the foiled Seattle Military Entrance Processing Station attack plot in 2011.

Table 15-2 Past terrorist occurrences in Washington state and King County

Date	Description
January 17, 2011	Kevin Harpham, an admitted white supremacist, placed a remote-controlled backpack improvised explosive device (IED), with rat-poison coated shrapnel, at a park bench near the marching route on the morning of the Martin Luther King Jr. Day Parade in Spokane, WA. Prosecutors said the device was "constructed with a clear, lethal purpose," and Harpham said it was intended to protest social concepts, such as unity and multiculturalism.[7]
May 11, 2011	Joseph Brice of Clarkston WA was arrested for assembling, practicing, and detonating explosive devices after an incident that occurred on April 18,

[6] United Nations Development Programme. 2016. Prevent Violent Extremism Through Promoting Inclusive Development, Tolerance and Respect for Diversity. Accessed online on 8/26/19 from https://www.undp.org/content/dam/norway/undp-ogc/documents/Discussion%20Paper%20-%20Preventing%20Violent%20Extremism%20by%20Promoting%20Inclusive%20%20Development.pdf.
[7] Clouse, Thomas. December 20, 2011. MLK bomb maker gets 32 years in prison. *The Spokane Spokesman-Review.* Accessed online on 8/26/19 from https://www.spokesman.com/stories/2011/dec/20/mlk-parade-bomber-seeks-guilty-plea-withdrawal/.

	2010, when an explosive device he made prematurely ignited, causing him significant injuries. He had a YouTube channel called "Strength of Allah," where he posted the videos in an attempt to support terrorism.[8]
June 22, 2011	Abu Khalid Abdul-Latif and Walli Mujahidh were arrested for planning to attack the Military Entrance Processing Station (MEPS) in Seattle with machine guns and grenades after previously planning, but discounting, an attack at Joint Base Lewis McChord (JBLM). According to FBI investigators, "Abdul-Latif said that 'jihad' in America should be a 'physical jihad,' and not just 'media jihad'."[9]
September 8, 2011	Michael McCright was arrested and charged with second-degree assault for a July 2011 incident where he intentionally swerved his vehicle at a government-plated vehicle occupied by two U.S. Marines in Seattle. Known on the Internet as "Mikhail Jihad," McCright had ties to Abu Khalid Abdul-Latif, a man convicted of plotting to kill federal employees and military recruits in Seattle, WA.[10]
October 27, 2012	Abdisalan Hussein Ali, a 22-year old born in Somalia but raised in Seattle and Minnesota, was the third American killed as an al-Shabaab suicide bomber in Mogadishu. Ali was reportedly one of two bombers in an attack that killed "scores of African Union peacekeepers." He arrived in Seattle in 2000 and moved to Minneapolis before being recruited into al-Shabaab and travelling to Somalia in 2008.[11]
July 18, 2014	Ali Muhammad Brown was arrested after killing four people in WA and a college student in NJ, as part of a personal vengeance against the U.S. government for its actions in the Middle East. In 2004, he was arrested and prosecuted for his role in a bank fraud scheme to finance fighters traveling abroad, and had known links to a disrupted terror cell in Seattle, WA and Bly, OR in 1999.[12]

[8] Pignolet, Jennifer. Wednesday, June 12, 2013. Clarkston man convicted of trying to aid terrorists *The Spokane Spokesman-Review.* Accessed online on 8/26/19 from https://www.spokesman.com/stories/2013/jun/12/bomb-maker-sentenced/.

[9] The Associated Press. June 5, 2012. Seattle terror suspect wants evidence tossed. *Fox News.* Accessed online on 8/26/19 from https://www.foxnews.com/us/seattle-terror-suspect-wants-evidence-tossed#ixzz28jz1MkOE.

[10] Carter, Mike. May 29, 2012. Felon admits he tried to run Marines off I-5. *The Seattle Times.* Accessed online on 8/26/19 from https://www.seattletimes.com/seattle-news/felon-admits-he-tried-to-run-marines-off-i-5/.

[11] Kron, Josh. October 30, 2011. American Identified as Bomber in Attack on African Union in Somalia. *The New York Times.* Accessed online on 8/26/19 from https://www.nytimes.com/2011/10/31/world/africa/shabab-identify-american-as-bomber-in-somalia-attack.html?_r=0.

[12] Collins, Laura. September 18, 2014. Revealed, one man's terrifying 'jihad' on U.S. soil: Extremist 'executed four in revenge for American attacks in the Middle East and carried out bank fraud for the Cause'. *Daily Mail Online.* Accessed online on 8/26/19 from https://www.dailymail.co.uk/news/article-2759901/Revealed-terrifying-one-man-jihad-U-S-soil-Extremist-executed-four-revenge-American-attacks-Middle-East-carried-bank-fraud-Cause.html.

January 1, 2014	Musab Masmari attempted to set fire to a gay nightclub on Capitol Hill in Seattle, WA by spilling gasoline down a set of stairs and lighting it, while 750 people packed the club's New Year's Eve event. According to investigative documents, Masmari told a friend that "homosexuals should be exterminated." In July 2014, he was sentenced to ten years in federal prison for arson.[13]
August 25, 2017	Melvin Neifert from Selah was arrested and charged with receiving incendiary explosive device materials—specifically, potassium nitrate and other materials to make a potassium nitrate-sugar bomb—that were to be used in connection with the 2016 May Day events. Federal authorities seized evidence and questioned Neifert on May 1, the same day anti-capitalist demonstrations took place in Seattle.[14]
March 31, 2017	Muna Osman Jama of Reston VA and Hinda Osman Dhirane of Kent WA were sentenced to 12 years and 11 years respectively, after being found guilty of conspiracy to provide material support to al-Shabaab. The two reportedly organized an all-female fundraising group, called the "Group of Fifteen," who provided monthly payments to al-Shabaab; facilitating and tracking money sent through conduits in Kenya and Somalia.[15]
March 26, 2018	Thanh Cong Phan from Everett was arrested after mailing at least 11 suspicious packages to multiple military and government facilities in the Washington, D.C. metropolitan area, which contained potential destructive devices. He was charged with shipping of explosive materials, after the packages were found to contain small amounts of black explosive powder.[16]

[13] Carter, Mike. July 31, 2014. Man who set fire in Capitol Hill nightclub sentenced to 10 years. *The Seattle Times.* Accessed online on 8/26/19 from https://www.seattletimes.com/seattle-news/man-who-set-fire-in-capitol-hill-nightclub-sentenced-to-10-years/.

[14] Meyers, Donald W. August 31, 2016. Bail decision delayed in Selah explosives case. *The Seattle Times*. Accessed online on 8/26/19 from https://www.seattletimes.com/seattle-news/crime/bail-decision-delayed-in-selah-explosives-case/.

[15] Department of Justice. Friday, March 31, 2017. Two Women Sentenced for Providing Material Support to Terrorists. Accessed online on 8/26/19 from https://www.justice.gov/opa/pr/two-women-sentenced-providing-material-support-terrorists.

[16] Shayanian, Sara. March 28, 2018. Man charged with sending explosives to D.C. military sites. *United Press Internationa.* Accessed online on 8/26/19 from https://www.upi.com/Top_News/US/2018/03/28/Man-charged-with-sending-explosives-to-DC-military-sites/5591522255789/.

15.5 Probability of Future Occurrences

The probability of domestic terrorist risks in King County, Washington, is a complex and evolving concern, influenced by a range of factors including current security measures, historical incidents, and future events such as the 2026 World Cup, which will be hosted in Seattle. Domestic terrorist attacks are inherently difficult to predict and prevent due to their unpredictable nature and the tendency of perpetrators to blend into society undetected by law enforcement. These attacks are often carried out without warning, complicating efforts to identify potential threats in advance.

King County, being a major urban center and home to Seattle—one of the host cities for the 2026 World Cup—faces an increased risk of domestic terrorism, particularly in the lead-up to this international event. Large-scale events like the World Cup attract global attention and a significant influx of visitors, making them prime targets for domestic and international terrorists aiming to cause disruption or gain media attention.

15.6 Impact Assessment

Public	Certain groups within King County are more vulnerable to targeted attacks by Domestic Violent Extremists (DVEs), but the broader population is susceptible to the impacts of terrorism as a whole. The county's population as a whole remains vulnerable to the broader consequences of terrorism. Public gatherings such as marathons, protests, or festivals, as well as everyday locations like schools and workplaces, are potential sites of attack, exposing civilians across the county to direct harm. Additionally, the emotional and psychological toll of terrorist attacks—fear, anxiety, and anger—will affect not only those directly targeted but also the wider community, potentially altering everyday behaviors and impacting mental health. The economic consequences of such attacks, including disruptions to business and public services, further affect the county's residents at large.
Responders	First responders—including law enforcement, firefighters, emergency medical services (EMS), and disaster recovery teams—face immediate risks when responding to terrorism-related incidents, especially when dealing with hazardous materials, active shooter situations, or explosive devices. The physical danger posed by these incidents places responders at risk of injury or death.
Continuity of Operations	Government facilities and employees are a common target for anti-government extremists, and attacks on these facilities can severely disrupt daily operations for extended periods. These disruptions can range from temporary shutdowns to long-term closures, requiring significant recovery efforts. Essential services such as public health, social services, and law enforcement could be delayed or interrupted, affecting the county's ability to serve its residents effectively.

Property, Facilities, and Infrastructure	**Property** Property, including commercial buildings, venues, vehicles, places of worship, or other areas are often damaged or destroyed during terror incidents. Trauma from the incident can prevent the rebuilding of the facility in the same place. **Facilities** When facilities are targeted, the immediate impact is often physical destruction or damage to the structure, systems, and equipment within. Employees and existing patients could become injured or killed. Even in the event they are not targeted, facilities could still become overwhelmed with patients in the aftermath of attacks. **Infrastructure** • Energy: Energy facilities, including fuel pipelines, are common targets for terrorists and saboteurs around the world. Many power facilities, such as neighborhood substations, are relatively unguarded and, if lost, can have immediate impacts on people and property in an area. Cyber-attacks are one area where a large-scale attack on the energy system could cause widespread disruption. • Water/Wastewater: Water systems are considered a high-impact potential target. A chemical attack on a water system, if not immediately detected, could harm or kill thousands, depending on the size of the water-system targeted. • Transportation: transportation systems, especially public transit, have been targets around the world, such as in the Madrid Train Bombings or the London Subway Bombings. Attacks on busses are also common. These incidents can cause a loss in public confidence in the transit system. Furthermore, an attack on a tunnel, such as the I-90 tunnel across Lake Washington, can impede mobility in our region over the long-term. • Communications: Communications infrastructure, such as cell towers, are relatively redundant and so somewhat less vulnerable to terrorist attacks. There is a huge vulnerability, however, to cyber-terrorism, which can take multiple facilities offline quickly.
Environment	A major attack can pollute the environment and poison water and food sources. This can have far-reaching, long-term consequences and damage animal and plant life as well as people.
Economy	In addition to the economic costs of stepped-up security, attacks can have a huge impact on a region's economy. Places seen as less safe are less attractive to investors or visitors. Often, terrorist attacks attempt to destroy part of the economy by killing tourists or destroying an important piece of infrastructure.

Public Confidence in Governance	A failure to protect the public from a terrorist attack, even one that is thwarted at the last moment, can cause a total failure in public confidence in government. As seen after 9/11/2001 or after attacks by white supremacists against African-American or Jewish congregations, groups begin to feel isolated, threatened, and isolated from the community. This is especially true in cases where government fails to quickly reassure impacted communities and support them morally and with security resources.

15.7 Vulnerability Assessment

Vulnerable Populations	Certain groups, particularly those from protected classes, are particularly vulnerable to attacks by domestic terrorists. These individuals or communities may be specifically targeted due to their race, religion, ethnicity, gender identity, sexual orientation, or other protected characteristics. Vulnerability arises because these groups are often seen as symbols of the values or causes that extremists oppose, making them more likely to be victims of violence, discrimination, or intimidation. Terrorist attacks and attempted attacks in the northwest have been motivated by white supremacy (targeting non-white populations), xenophobia (targeting immigrants), homophobia/transphobia (targeting gathering places of gay, lesbian, and transgendered people), and anti-religious attacks against Muslims, Jews, Christians, or other religious groups. Individuals in positions of power—such as government officials and those involved in corporations perceived as targets of domestic extremist groups—are also particularly vulnerable to attacks by domestic terrorists. Terrorists have increasingly targeted mass-gatherings in densely populated or high profile areas. Consequently, any major urban area in Washington State could be considered at-risk as well as any crowded or high profile critical infrastructure. The specific motivations of terrorists will largely dictate target selection.
Property	Infrastructure systems such as dams, water systems, bridges, and public buildings are high-value targets to terrorists that both stand for government order and, when lost, can cause significant regional harm to people, property, and the economy.

Environment	Extremist can often exploit a range of environmental vulnerabilities through attacks such as contaminating the city's water supply, using hazardous chemicals that could seep into the various ecosystems .
Operations	A new challenge that is emerging is the increasing use of terror tactics by non-terrorists. A number of evolved weapons, tactics, and targets have emerged through the sheer volume of attacks within the last decade. This normalization of violence has been further exacerbated by extensive media coverage and the ease by which detailed instruction manuals, 'how-to' videos, and online forums dedicated to weapons, explosives, and tactics. It is "essentially shared community content, easily accessible for extremists of all stripes to consume and put into action" including those with no affiliation to foreign or domestic extremism ideologies.[17] Lessons learned from past attempts continue to shape the means by which attackers develop plots—the push for using small arms, edged-weapons and vehicle ramming against soft targets—instead of the often-failed large-scale attacks.

[17] Johnson, Bridget. March 21, 2018. The Austin bomber and our new age of open-source terrorism: How Mark Anthony Conditt likely benefited from Al Qaeda tutorials. *The New York Daily News.* Accessed online on 8/26/19 from http://www.nydailynews.com/opinion/austin-bomber-new-age-open-source-terrorism-article-1.3888244.

Chapter 16
Tsunami

Risk Assessment Scoring		
2	Location	Hazard
2	Probability	
3	Magnitude	
2	Public	Impact
2	Responders	
1	COP	
1	PFI	
2	Economy	
1	Environment	
1	PCG	
2	People	Vulnerability
1	Property	
2	Environment	
1	Operations	
2	People	Risk
2	Property	
2	Environment	
2	Operations	
Moderate	**Overall Risk**	

PC: Duwamish River Community Coalition

Chapter 16: Tsunami

16.1 Hazard Description

A **tsunami** is a series of fast, powerful, and highly destructive waves that radiate outward in all directions from their point of origin. Tsunamis are typically triggered by the displacement of the ocean floor, often due to an earthquake, or by the collapse of an underwater or aerial landmass. Once generated, a tsunami can travel across entire oceans in less than a day, impacting coastal areas far from its source.

In contrast, a **seiches** is a type of wave that forms in enclosed or semi-enclosed bodies of water—such as lakes, bays, and rivers—due to wind, atmospheric pressure changes, or seismic activity. Seiche waves can also affect harbors, canals, and other water systems with limited flow.

Causation

In King County, there are four main triggers for tsunami; distant earthquakes, localized earthquakes, Cascadia subduction zone, and landslides. The most significant tsunami threat comes from seismic activity along the Seattle Fault or other geological events within the Puget Sound Lowlands, such as large underwater landslides or local fault movements. Additionally, smaller tsunamis can pose maritime risks along the western coastlines of the United States.

- **Distant earthquakes:** Tsunamis generated by distant earthquakes or underwater landslides can travel across vast stretches of ocean.[1] Powerful tsunamis originating in the Pacific Ocean can reach the Puget Sound, where they may cause damage to boats, docks, piers, and navigation aids such as lighthouses and channel markers. Vessels, both moored and underway, could also be impacted. A notable example of this is the Alaskan-Aleutian subduction zone earthquake.
- **Localized earthquakes:** Local seismic events, particularly those along the Seattle Fault, can trigger tsunamis in nearby large bodies of water. These localized tsunamis could cause significant damage to port infrastructure and navigational terminals, especially in areas like the Seattle waterfront.
- **Cascadia subduction zone:** A massive earthquake (magnitude 8-9) off the coast of Washington, Oregon, or British Columbia could generate a catastrophic tsunami.
- **Landslides**: Underwater or coastal landslides—such as the one that occurred at Tacoma Narrows—can displace enough water to create dangerous tsunami waves.

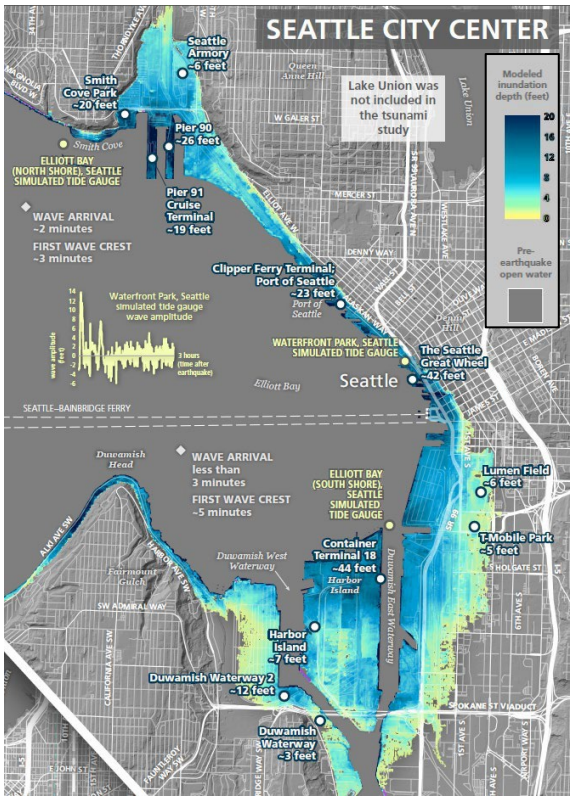
[1] Washington State Department of Natural Resources (DNR), "Tsunamis" (n.d.): https://www.dnr.wa.gov/programs-and-services/geology/geologic-hazards/Tsunamis#understanding-tsunamis.1

16.2 Location

King County is home to the deep-water Port of Seattle and several cities along the Puget Sound, including Shoreline, Seattle, Burien, Des Moines, and Federal Way. Together with Vashon Island, unincorporated King County includes a great deal of industry, import/export activity, and commercial and residential real estate that border bodies of water. These waterfront areas are particularly vulnerable to the impacts of tsunamis or seiches, which can be triggered by earthquakes occurring hundreds, if not thousands, of miles away from King County. There are four likely triggers for a tsunami in King County. These include an earthquake on the Seattle Fault, Cascadia Subduction Zone, and Alaska-Aleutian Subduction Zone, as well as a tsunami caused by a major landslide into Puget Sound or another major body of water.

Seattle Fault Tsunami

Figure 16-1 Seattle fault scenario detailed tsunami inundation



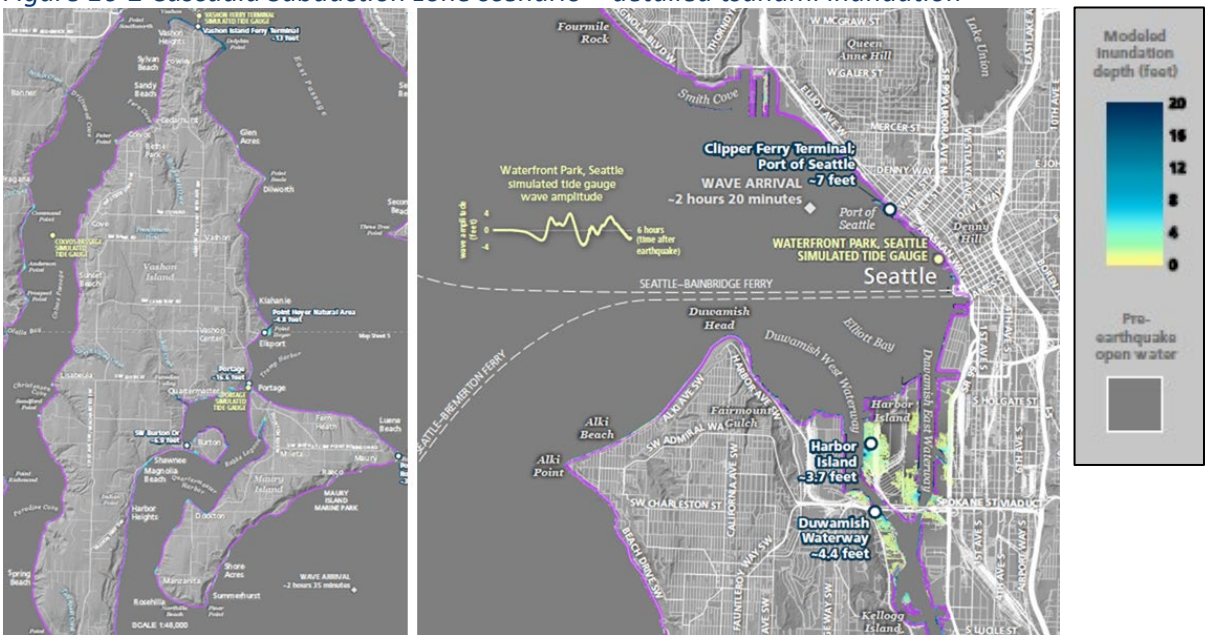
The first wave of a tsunami caused by an earthquake along the Seattle Fault would arrive to King County shores within minutes. The worst flooding is expected around Seattle, but especially the port and industrial facilities around the Port of Seattle and Magnolia. Harbor Island is expected to be completely flooded because they are at sea level, with inundation averaging 9–13 feet (3–4 meters). Areas near Elliott Bay, like SoDo and Smith Cove, could see flooding more than 20 feet (6 meters) deep. Other places, like Magnolia Bluff and Alki Beach, could see flooding up to 20 feet (6 meters) deep, but it wouldn't spread far because of steep cliffs. The tsunami would also cause flooding along rivers, including the Duwamish River. The first wave of the tsunami will hit the northern shore of Elliott Bay within minutes of the earthquake. The waves will continue to affect the shorelines for at least 3 hours, and strong currents could last much longer. The earthquake could also change the land's height, either lowering some areas or raising others.[2]

[2] Dolcimascolo, Alexander; Eungard, D. W.; Allen, Corina; LeVeque, R. J.; Adams, L. M.; Arcas, Diego; Titov, V. V.; González, F. I.; Moore, Christopher, 2022, Tsunami inundation, current speeds, and arrival times simulated from a

Cascadia Subduction Zone Tsunami

A Cascadia Subduction Zone tsunami in a Cascadia event, the first wave will arrive in approximately 2 hours and 20 minutes. It would devastate the outer coast and seriously impact low-lying areas around Everett and the San Juan Islands. The islands and the strait of Juan de Fuca protect King County from the worst flooding impacts. Modeling suggests that little inundation would occur along the coastline of south King County, though some flooding may be expected in areas of Seattle SODO and Port. For example, Harbor Island in Seattle could see up to 3.7 feet of flooding, with water speeds also between 0-3 knots (very low speed). at the Vashon Island Ferry Terminal, the modeled flooding could reach up to 13 feet, with water moving at speeds of 0-3 knots. The Duwamish Waterway would be among the most impacted areas with waves reaching 4 feet (1.2 meters) above Mean High Water. The worst flooding is expected to occur at Portage Bay with estimated wave amplitudes up to 13 feet (4 meters) above Mean High Water. Strong currents are also estimated at Portage Bay near spits of land and in the narrows, which can be hazardous to the maritime community. The first wave is expected to reach Seattle at approximately 2 hours and 20 minutes.[3]

Figure 16-2 Cascadia Subduction zone scenario – detailed tsunami inundation



large Seattle Fault earthquake scenario for Puget Sound and other parts of the Salish Sea: Washington Geological Survey Map Series 2022-03, 16 sheets, scale 1:48,000, 51 p. text. [https://fortress.wa.gov/dnr/geologydata/tsunami_hazard_maps/ger_ms2022-03_tsunami_hazard_seattle_fault.zip]

[3] Dolcimascolo, Alexander; Eungard, D. W.; Allen, Corina; LeVeque, R. J.; Adams, L. M.; Arcas, Diego; Titov, V. V.; González, F. I.; Moore, Christopher; Garrison-Laney, C. E.; Walsh, T. J., 2021, Tsunami hazard maps of the Puget Sound and adjacent waters—Model results from an extended L1 Mw 9.0 Cascadia subduction zone megathrust earthquake scenario: Washington Geological Survey Map Series 2021-01, originally published 2021, 16 sheets, scale 1:48,000, 49 p. text. [https://fortress.wa.gov/dnr/geologydata/tsunami_hazard_maps/ger_ms2021-01_tsunami_hazard_puget_sound.zip]

Alaska-Aleutian Distant Source Tsunami

An earthquake along the Alaskan-Aleutian subduction zone could reach up to magnitude 9.2, similar to the one that occurred in 1964. A tsunami generated by such an earthquake would be a distant-sourced tsunami for Washington state. Preliminary modeling for a worst-case scenario of a magnitude 9.2 earthquake in Alaska suggests that the resulting tsunami in King County would be somewhat comparable to the Cascadia Subduction Zone event, but with roughly half the strength. The highest wave amplitudes are estimated to reach up to 7 feet (2 meters), primarily affecting Portage Bay, though they are not expected to overtop the northern spit. Unsafe currents may also pose a risk to maritime operations, especially in Portage Bay. The first wave is predicted to reach Seattle's coastline approximately 6 hours after the earthquake.

Landslide Tsunami

In the last 200 years, landslides, not earthquakes, have caused all historical tsunamis in the Puget Sound/Salish Sea. Since the 1800s, no seismic activity along the Seattle Fault has been recorded. These locally generated tsunamis include 1820s Hat Island, 1894 Commencement Bay, and 1949 Tacoma Narrows. The 1949 Tacoma Narrows landslide, for example, was triggered by an earthquake, but the tsunami was caused by the landslide itself. However, historical and oral accounts, including those of the Salish peoples, describe numerous tsunamis, including a significant Seattle Fault earthquake around 1,100 years ago (~900–930 CE). This study models that event for planning purposes, aiding tsunami hazard preparedness in Puget Sound and the Salish Sea. Verbal accounts among the Snohomish Tribe describe a great landslide-induced wave caused by the collapse of Camano Head at the south end of Camano Island around the 1820s. The slide itself is said to have buried a small village, and the resulting tsunami drowned people who were clamming on Hat (Gedney) Island, 2 miles to the south. Bathymetry between Camano Head and Hat Island could have contributed to the size and destructive power of the wave.[4] In 1894 a large submarine landslide occurred on the Puyallup River delta in Commencement Bay, resulting in two deaths and the destruction of the Northern Pacific freight docks and other port facilities. It also destroyed 300 feet of the North Pacific docks and created at least a ten-foot wave in the Old Town section of Tacoma. It washed over homes on the tide flats and resulted in one fatality.[5] While no landslide generated tsunamis are known to have impacted King County there is potential that a subaerial or subaqueous slide may do so in the future.

[4] Koshimura, Shunichi and Harold O. Mofjeld. 2001. Inundation modeling of local tsunamis in Puget Sound, Washington due to potential earthquakes. ITS 2001 Proceedings, Session 7, Number 7-18. Accessed online on 6/11/19 from https://www.pmel.noaa.gov/pubs/docs/ITS2001/7-18_Koshimura.pdf.
[5] Pierce County Natural Hazard Mitigation Plan, 2004-2009 Edition, Tacoma, Washington, Sub-Section 4.6, Pierce County Tsunami Hazard, http://www.co.pierce.wa.us/xml/abtus/ourorg/dem/EMDiv/MP/PC%20Tsunami.pdf

16.3 Magnitude

Tsunamis that could impact King County vary significantly in strength depending on their origin and the type of event triggering them. The speed of a tsunami depends on the depth of the water it's traveling through. The deeper the water, the faster the tsunami. In the deep ocean, tsunamis are barely noticeable, but they can move as fast as a jet plane, more than 500 mph. As they enter shallow water near land, they slow to approximately 20 or 30 mph, which is still faster than a person can run.[6]

Distant earthquakes, like those along the Pacific Rim, can create tsunamis that take hours to reach the region. Despite traveling across vast distances, these tsunamis often lose much of their destructive power by the time they reach the shallow waters of Puget Sound. For example, the 2011 magnitude 9.0 earthquake in Japan and the 1964 magnitude 9.2 earthquake in Alaska generated tsunamis that reached King County, but the highest recorded wave heights were only around 0.04 meters (~2 inches) and 0.12 meters (~5 inches), respectively. While these distant tsunamis pose little immediate threat, studies show that tsunami inundation from large distant earthquakes can still affect inland waters.[7]

In contrast, tsunamis generated by localized earthquakes, such as those occurring along the Seattle Fault, would reach King County within minutes, causing more immediate danger. The Cascadia subduction zone, a major fault off the Pacific Northwest coast, is capable of producing significant tsunamis, with waves potentially reaching the region in tens of minutes. A tsunami generated by such an earthquake would bring faster and more intense wave energy, making it a higher-risk scenario. Similarly, landslides occurring within or near the Puget Sound region could also generate tsunamis, with these events typically causing waves to strike within minutes, depending on the location of the slide. The value and density of property along the waterfront suggests a potential for moderate impacts from such an event.

16.4 Previous Occurrences

This paleo-seismic evidence and tree ring dating of landslides around the region suggests the last tsunami occurred in King County was 923-924 AD when the local Seattle fault raised some landmasses around the Puget Sound shoreline by as much as 26 feet.[8] A scientific study focused on seismic activity on the Seattle fault within the last 7,500 years found evidence for 6 additional

[6] Washington State Department of Natural Resources (DNR), "Tsunamis" (n.d.): https://www.dnr.wa.gov/programs-and-services/geology/geologic-hazards/Tsunamis#understanding-tsunamis.1
[7] Washington State Military Department, Emergency Management Division, "Tsunami Maritime Response and Mitigation Strategy - Port of Bellingham" (April 2021): https://mil.wa.gov/asset/60ad926bdefd6
[8] B.A. Black, et al., "A multifault earthquake threat for the Seattle metropolitan region revealed by mass tree mortality" *Science Advances*, v. 9, no. 39 (2023) p. 9 [https://doi.org/10.1126/sciadv.adh4973]

earthquakes, however none of these are known to be tsunamigenic.[9] This suggests a low probability of a large earthquake to occur on the Seattle fault as the recurrence interval could be thousands of years. Since 923 AD, tsunami waves in King County have been less than 18 inches in height and caused little damage to boats and shoreline property.[10] Multiple seiches have been generated in King County from various local and distant seismic events.

Table 16-1 Past tsunami and seiche occurrences in the Puget Sound region

Date	Type	Location	Trigger	Description
923 - 924	Tsunami	Seattle, WA	Earthquake	Caused by the Seattle Fault raising land by 26 feet.
1820s	Tsunami	Hat Island	Landslide	Large landslide at Camano Head triggered a tsunami that flooded an entire village. Additional verbal accounts among the Snohomish Tribe reported by Colin Tweddell in 1953 described a great landslide-induced wave caused by the collapse of Camano Head at the south end of Camano Island around the 1820s.[11]
1891	Seiche	Lake Washington	Earthquake	Two earthquakes near Port Angeles caused water in the Puget Sound to surge onto beaches two feet above the high-water mark and an eight-foot seiche in Lake Washington.
1894	Tsunami	Commence Bay	Landslide	Submarine landslide-triggered tsunami, which cased 2 fatalities.
1906	Seiche	Lake Washington	Earthquake	Mw 7.9 San Francisco earthquake caused agitated wave activity on the west shore of Lake Washington "so violently that house boats, floats and bathhouses were

[9] T.L. Pratt, et al., "Kinematics of shallow backthrusts in the Seattle Fault zone" *Washington State: Geosphere,* v. 11, no. 6 (2015): p. 1948–1974, https://doi.org/10.1130/GES01179.1
[10] NOAA, "Global Historical Tsunami Database. *National Geophysical Data Center / World Data Service (NGDC/WDS)* (n.d.) doi:10.7289/V5PN93H7
[11] Shunichi Koshimura, Harold O. Mofjeld, "Inundation modeling of local tsunamis in Puget Sound, Washington due to potential earthquakes." *ITS 2001 Proceedings*, Session 7, Number 7-18. (2001): https://www.pmel.noaa.gov/pubs/docs/ITS2001/7-18_Koshimura.pdf.

				jammed and tossed about like leaves on the water," reported by the Seattle Post-Intelligencer (4/19/1906).
1949	Seiche	Lake Union, Lake Washington	Earthquake	A magnitude-7.1 deep earthquake occurred in Olympia that caused seiches within Lake Union and Lake Washington, but no damages were reported.
April 16, 1949	Tsunami	Tacoma Narrows	Landslide	A 6-8 foot tall tsunami cased by a landslide at after the Mw 6.8 Olympic Earthquake
1964	Seiche	Lake Union	Earthquake	The magnitude 9.2 Great Alaska earthquake of 1964 created global seiches, including in Lake Union that damaged houseboats, buckled moorings, and broke water and sewer lines.
1965	Seiche	Green Lake	Earthquake	Magnitude 6.5 deep earthquake occurred in the Puget Sound which caused a seiche where water "sloshing back and forth like soup in a shallow bowl" was observed at Green Lake, North Seattle (reported by the Seattle Times, 4/30/1965).
2002	Seiche	Lake Union	Earthquake	Magnitude 7.9 Denali earthquake caused seiches in Lake Union that damaged houseboats, buckled moorings, and broke water and sewer lines.

16.5 Probability of Future Occurrences

As stated in the earthquake risk assessment, there is a high probability that a high magnitude earthquake will occur in King County which will likely be accompanied by a tsunami. However, when that event will happen is still uncertain. The increasing population and development in tsunami-prone areas mean that more people and critical assets are now exposed to these hazards. As population growth continues, especially in areas around the Puget Sound and Pacific Coast regions, the vulnerability to tsunamis increases.

By 2050, an estimated 268,000 people will reside in coastal tsunami inundation zones in Washington, representing a 3% increase from 2020. The development of coastal areas, coupled with higher exposure to tsunami hazards, will further elevate the challenges in mitigating the impacts of future events. As the state grows, this increased vulnerability highlights the need for continued resilience efforts.

While inland landslide-driven tsunamis, often associated with human-made reservoirs, have decreased in frequency since the 1950s, the threat of tsunamis generated by large subduction zone earthquakes remains a serious concern. Despite the low probability of such catastrophic events, the growing population and infrastructure in tsunami zones necessitate ongoing preparedness and mitigation measures to reduce future risks.

16.6 Impact Assessment

Public	While it would take a rather sizable tsunami along the shoreline of King County, precautionary evacuations from houseboats, live aboard pleasure craft, cruise ships, and property immediately adjacent to waterfronts of Puget Sound and lakes Washington, Sammamish, and lake Union may be recommended.
Responders	Along the shoreline of King County, precautionary evacuations from houseboats, live aboard pleasure crafts, cruise ships, and property immediately adjacent to waterfronts of Puget Sound and lakes Washington, Sammamish, and Lake Union would cause impacts to the public. The volume of search and rescue efforts along waterfronts affected from the tsunami may pose potential issues to first responders (police, fire, EMS). There are only small number of scenarios where this is a likely issue.
Continuity of Operations	It is possible that Sounder traffic between Everett and Seattle or Tacoma and Seattle could be impacted by any large tsunami in Puget Sound. Otherwise, it is unlikely that King County governmental operations would be directly impacted by a tsunami or seiche.
Property, Facilities, and Infrastructure	**Property** Tsunami and seiche threats were not defined until recently. Most of the early 19th and 20th century structures located near the water were probably not engineered to withstand impacts from a tsunami, seiche, or earthquake. The properties along the entire Seattle Waterfront and those in Shoreline, Des Moines, Federal Way, and Vashon Island are at risk from tsunami activity. **Facilities** There are no major health centers located in the mapped tsunami inundation areas. **Infrastructure** • Power: Little to no impact directly from tsunami is expected.

- Water/Wastewater: Tsunami may impact the West Point treatment plant. The damage would depend on the height of the tsunami and a significant event would be required. If such an event were to occur, the plant would be rendered inoperable.
- Transportation: damage to port facilities are the primary threat to infrastructure from a tsunami. Even relatively small tsunami surges, such as the aforementioned example from Crescent City, have caused tens of millions of dollars. Damage to low-lying rail and roads is also likely, but less of a concern since it would not impact primary transportation routes. Notably, Washington State Ferries have been conducting infrastructure enhancements to the terminals to make them tsunami resilient, that should be noted here.
- Communications: There is limited risk to communications systems as a whole from tsunami.

Environment	It is possible for a tsunami or seiche to have an impact on the natural environment immediately adjacent to Puget Sound through the release of fuels and hazardous materials or their storage facilities around the waterfront. This may include fish habitat or natural and farmed shellfish beds, wetlands, estuaries, and marsh areas.
Economy	A tsunami or seiche that impacts port facilities, such as one triggered by the Seattle Fault would have any sizable impact on the economy of the region. Damage would run potentially in the billions and have far-reaching consequences for Washington's export-based economy.
Public Confidence in Governance	Coverage from major news outlets, including the Seattle Times and the New Yorker magazine, have argued that Washington is highly underprepared for a major seismic event large enough to generate a tsunami. Both media coverage and reports from state emergency management has led Washington's governor to convene a Resilient Washington Subcommittee to look into mitigation actions out of concern for the apparent low-level of public confidence in state and local ability to manage major disasters. Data is available from Japan and New Zealand that clearly demonstrate that policy level decisions and direct communication to the public will greatly influence the public confidence in King County government.

16.7 Vulnerability Assessment

Vulnerable populations	There are no additional anticipated direct impacts from tsunami to vulnerable populations. As always, any disruption to services, the economy, and infrastructure would cause more harm to lower-income and marginalized communities.
Property	**Low lying homes** Homes and businesses along the many waterfronts would be damaged or destroyed by a mid-sized tsunami and devastated by a local crustal earthquake and tsunami. **Port/harbor facilities** Tsunamis are expected to devastate near-shore port infrastructure, boats, and piers. This is the largest economic consequence of a tsunami.
Environment	Several areas in Central and South Seattle current hold and or are impacted by the release of hazardous materials such as the Duwamish River, Harbor Island and the SODO district. They also lie within the tsunami inundation zone. The quantity and speed of a tsunami would quickly spread these contaminants into adjacent aquatic ecosystems and soil.
Operations	**Wastewater treatment facilities** West Point treatment plan is in the inundation zone for a Seattle Fault tsunami. Historical records also suggest tsunamis have impacted this area before.

Chapter 17
Volcano

Risk Assessment Scoring		
1	Location	Hazard
2	Probability	
3	Magnitude	
2	Public	Impact
2	Responders	
1	COP	
1	PFI	
2	Environment	
2	Economy	
2	PCG	
3	People	Vulnerability
1	Property	
2	Environment	
2	Operations	
2	People	Risk
2	Property	
2	Environment	
2	Operations	
Moderate	**Overall Risk**	

PC: Richard Bowen

Chapter 17: Volcano

17.1 Hazard Description



May 18, 1980 Mount St. Helens eruption taken by Richard Lasher

Volcanic eruptions are the result of geological activity beneath the earth's surface, often resulting in the release of lava, rock fragments, gases, and ash from a vent on the surface. Deposits of rock, lava, and ash create the structures we call volcanoes. Washington State has five active volcanoes, each posing varying levels of risk to King County. Mt Adams is classified by U.S. Geological Survey as a "high" threat, while the remaining four—Mount Baker, Glacier Peak, Mount Rainier, and Mount St. Helens—are classified as "very high" threat due to their proximity to developed areas.[1] The regions primary hazards associated with volcanoes include lahars and volcanic ashfall.

Lahars, also called volcanic mudflows or debris flows, can have the consistency of wet cement and are historically one of the most damaging elements of an eruption. When enough water mixes with loose volcanic ash and rock on the side of a volcano, the mixture flows downhill and forms a lahar. These mudflows can travel more than 50 miles from the volcano, and commonly at speeds of 40 miles per hour.[2] These flows pick up debris like trees and boulders, and if sufficiently large and powerful, also houses, cars and anything else in their paths. They slow down once they reach flatter gradients typical of distant river channels but are still an unstoppable mass

[1] Washington Emergency Management Division (EMD), "Volcano" *Washington State Enhanced Hazard Mitigation Plan* (2023): p. 71, https://mil.wa.gov/asset/651ec296d76a9/2023_WA_SEHMP_final_20231004.pdf
[2] Washington Geological Survey, "Vocanic Hazards in Washington State" (n.d.): p. 4, https://www.dnr.wa.gov/publications/ger_volcano_hazards_brochure.pdf

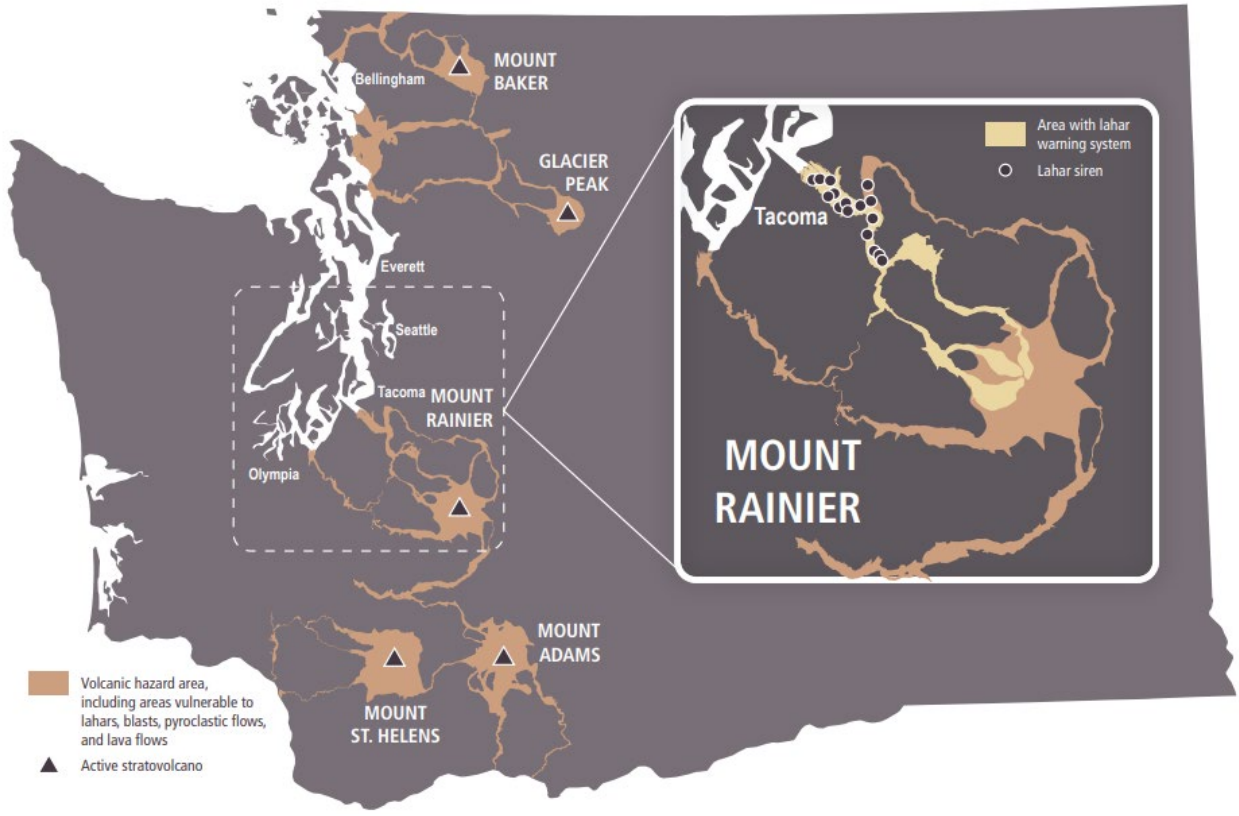
of mud and debris, often pushing a flow of water ahead of them. The only personal protective action available to avoid a lahar is evacuation to higher ground.

Ashfall is made up of tiny particles of broken rock, glass, and minerals. The fine particles may travel hundreds of miles or more downwind. Even in tiny quantities, volcanic ash can be very disruptive, as it lowers air quality, poses potential health hazards if ingested, especially to those with pulmonary conditions, makes roads slippery to drive on, is abrasive, poses risks to aircraft, motor vehicles and electronics, and is extremely difficult to clean up.

17.2 Location

Washington's five volanoes are scattered along the Cascade Range. Mount Baker and Glacier Peak are located in the north, Mount St Helens and Mount Adams are located in the south, and Mount Rainier is central.

Figure 17-1 Washington State Volanoes[3]



[3] Washington Geological Survey, "Vocanic Hazards in Washington State" (n.d.): p. 2, https://www.dnr.wa.gov/publications/ger_volcano_hazards_brochure.pdf

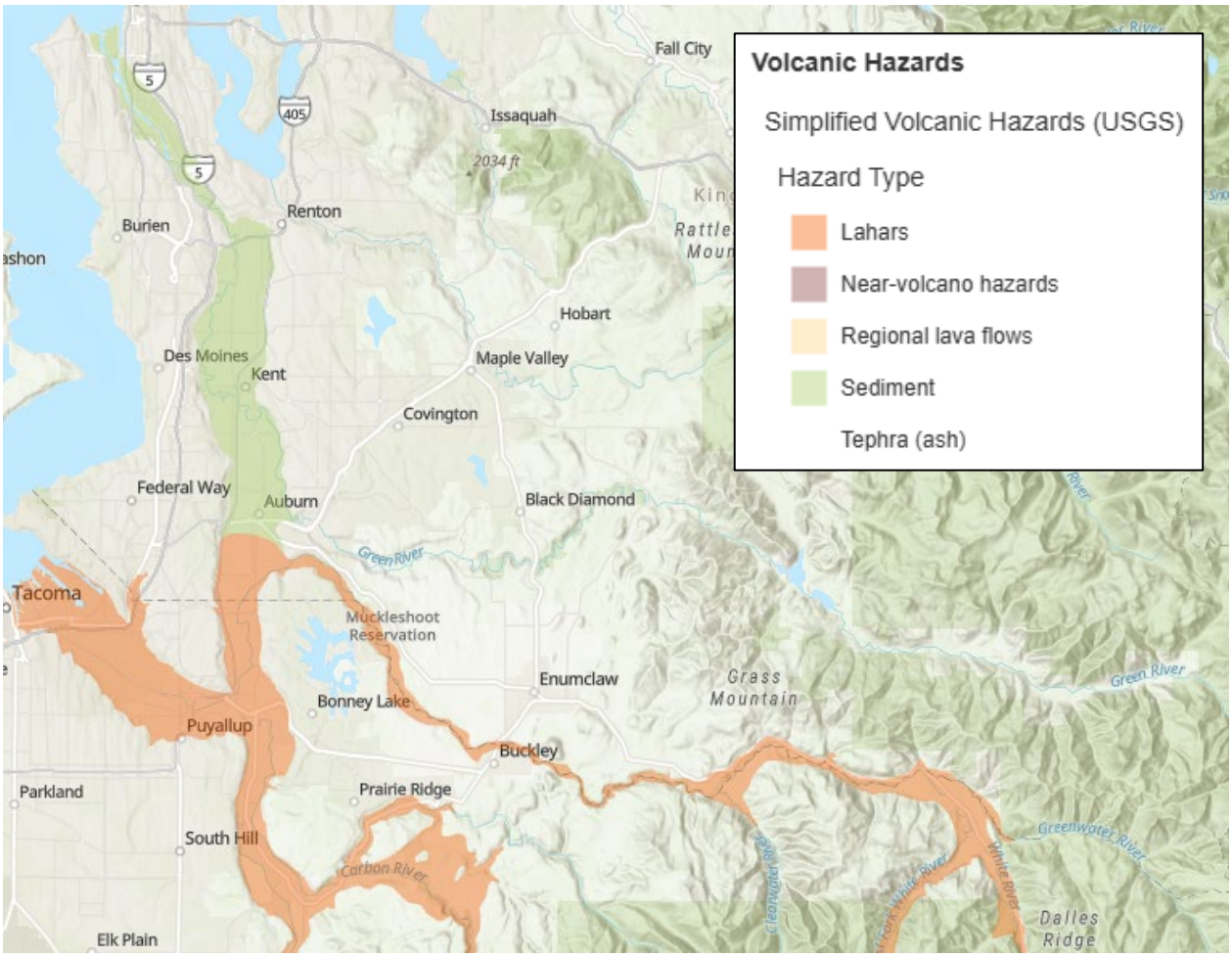
Hazards from eruptions are typically divided into near-volcano hazards, those which impact areas immediately on the slopes of the volcano, and distant hazards, which can put areas miles away from the volcano at risk. Near-volcano hazards include pyroclastic flows (hot avalanches of gas, ash, and rock fragments), lava flows, rock (tephra), debris flows, and landslides. Distant hazards, include lahars, and volcanic ash. Lahars may travel tens of miles down river valleys, picking up debris and inundating floodplains, and leave a cement-like deposit of sediment where they stop. For King County, all Washington Volcano's are distant hazards.

Mount St. Helens and Glacier Peak are the more highly explosive volcanoes in the Cascade Range. If they were to erupt, prevailing winds could carry the ashfall into King County. Such ashfall could prompt airport closure, disrupt communications system, and wreak general havoc.

Mount Rainer is also a distant hazard but with the additional threat of lahar. Figure 17-2 highlights the communities at risk from a potential eruption and subsequent lahar, including Algona, Pacific, Auburn, and the Muckleshoot Tribal Nation. Lahars along the White River would carry a mixture of mud, ash, rocks, and debris, leaving behind thick layers of sediment, potentially tens of feet deep. These flows could travel downstream into the Puget Sound via the Green and Duwamish Rivers.

The aftermath would likely result in widespread regional impacts. Excess sediment erosion and transport down river valleys could disrupt transportation networks, including major highways like I-5, and damage critical infrastructure such as the Port of Tacoma. The map also highlights areas at risk of "post-lahar sedimentation" (shown in green), where sediment would fill riverbeds, create new floodplains, and exacerbate local flooding. This sediment would continue to accumulate in river systems for years, due to the unstable mountainous terrain. While Mount Rainier is not as explosively active as volcanoes like Mount St. Helens or Glacier Peak, the threat of ashfall in King County is relatively low. However, the potential for lahars and the long-term impacts of sediment deposition are serious concerns for the region.

Figure 17-2 Mount Rainier



17.3 Magnitude

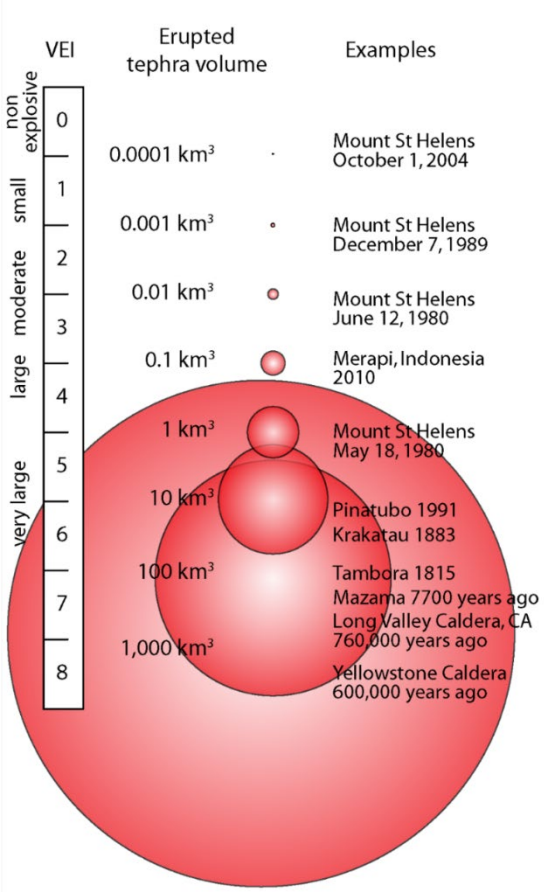
The Volcanic Explosivity Index (VEI), shown in Figure 17-3, is a scale used to measure the size of explosive volcanic eruptions. Ranging from 0 to 8, the VEI is a logarithmic scale, comparable to the to the way magnitude of earthquakes is measured. For instance, the 1980 Mt St Helens eruption followed a 5.1 magnitude earthquake and the amount of ash (1 Cubic Kilometer of dense rock equivalent) scored a 5 on VEI.[4]

Each increment on the VEI represents a ten-fold increase in eruption size. The scale considers factors such as the volume of magma erupted and the height of the eruption column. The 1980 eruption of Mount St. Helens, for instance, produced an eruption column that reached approximately 15 miles in height. For Mount Rainier, the VEI of a major explosive eruption that

[4] USGS, "1980 Cataclysmic Eruption" *Mount St. Helens* (November 2023): https://www.usgs.gov/volcanoes/mount-st.-helens/science/1980-cataclysmic-eruption

occurred between 30,000 and 100,000 years ago is tentatively estimated to be between 4 and 5. This suggests that Mount Rainier is capable of eruptions ranging from moderate to very large in scale.[5]

Figure 17-3 Volcanic Explosivity Index[6]



Given it has been approximately 200 years since Mount Rainier has last erupted, the measurement of magnitude and extent has been based of the evaluation of soil. For instance, the Osceola Mud Flow 5,600 years ago went 31 miles downstream and the deposit of lahar was 26 feet thick.

Unlike Mount St. Helens, Mount Rainier is only a moderate producer of ash (tephra) fall. Even so, tephra fallout in populated areas is a health hazard, will damage property, and may require Temporary Flight Restrictions (TFRs) of airways over affected areas. Further, Lahars can flow many tens of miles from Mount Rainier and represent the greatest volcanic threat to populated areas. They are capable of burying and destroying anything in their path.

A lahar should not be seen as a singular event, but rather as a mass movement of sediment requiring significant time to recover from. Deposition of feet to tens of feet of sediment along a river valley and its floodplain creates long-term changes to the river environment. Lahars from the 1980 eruption of Mt. St. Helens themselves destroyed 27 bridges, and over 200 homes, and over 185 miles of roads. In addition to this damage, it caused ongoing sediment deposition for years, that caused the need for dredging the Columbia River multiple times, and for the Army Corps of Engineers to spend over a million dollars building a sediment retention structure to mitigate this added hazard of lahars.[7]

After a lahar, mitigation measures may be necessary to prevent hazards from continued sedimentation over the decades following the eruption. One such mitigation measure at Mount St.

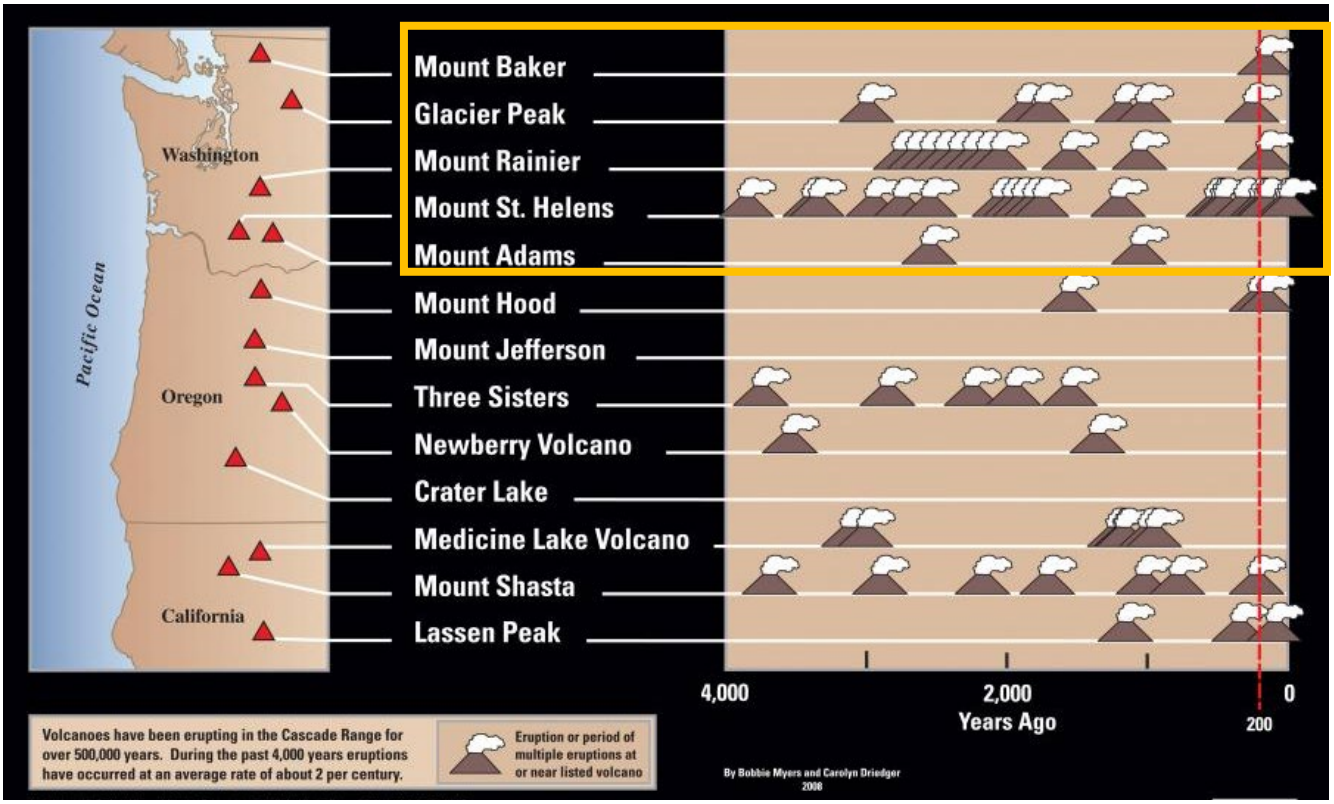
[5] National Research Council, "Mount Rainier: Active Cascade Volcano" The National Academies Press. (1994): https://doi.org/10.17226/4546
[6] National Park Service, "Volcanic Explosivity Index (VEI)" *Volcanoes, Craters & Lava Flows* (August 2022): https://www.nps.gov/subjects/volcanoes/volcanic-explosivity-index.htm
[7] USGS, "Lahar Hazards at Mount St. Helens" *Mount St. Helens*, (November 2023): https://www.usgs.gov/volcanoes/mount-st.-helens/science/lahar-hazards-mount-st-helens

Helens, a sediment retention structure built on the North Fork Toutle River, is intended to prevent too much sand from reaching distant channel reaches and exacerbating flood potential. Dredging is an option to remove sediment deposited in distant channel reaches, but it is expensive, must be repeated, and requires substantial areas to deposit dredge spoil. Deposition of a large amount of sediment on a floodplain may change floodplain character and can entomb structures built on the floodplain.

17.4 Previous Occurrences

The Cascade Range has a long history of volcanic activity, evidenced both by geological deposits that shape the landscape and in the oral histories of the Salish and Coast Salish tribes, passed down through generations. Although the volcanoes in the Cascades remain active, their eruptions are generally infrequent, with geological records indicating an eruption roughly a few times per century. Figure 17-3 illustrates the number of eruptions along the Cascade Range over the past 4,000 years. Some volcanoes, such as Mount Baker and Mount Adams, experience relatively rare eruptions, while others, including Glacier Peak, Mount Rainier, and Mount St. Helens, have shown patterns of clustered eruptions.

Figure 17-4 USGS, Eruptions in Cascade Range in the Past 4,000 Years



In recent years, Mount St. Helens has been intermittent activity from 1980 to 1986 and continuous activity from late 2004 to early 2008.

- **May 1980** eruption of Mount St Helens is the best examples of potential local damages from volcanic activity. This eruption produced significant ash-fall over eastern Washington, Oregon, Idaho, and Montana, with trace amounts falling over the Dakotas, Wyoming, Nebraska, Colorado, Oklahoma, and Minnesota as well as Canadian provinces. Lahars associated with the eruption damaged or destroyed over 200 homes, ruined 27 bridges, and buried 185 miles of roadway. Community water supplies and sewer systems were disabled and reservoirs partly filled with debris.

Mount Rainier began erupting 500,000 years ago and has had numerous eruptions and shed numerous lahars since then. It is estimated that Mount Rainier has generated about 60 of these lahars in the last 10,000 years, with about 10 large enough to reach the Puget Sound. Many communities, including Orting, Puyallup, and Auburn, between Mount Rainier and the Puget Sound are built on top of these deposits.

- **5,600 years ago (approx.)**, an eruption created a massive debris avalanche that transformed into a very large lahar, called the Osceola Mudflow. That lahar traveled down the White River valley and into the Puget Sound. It filled valleys of the White River system to depths of more than 350 feet and moved at speeds of 40 to 50 miles an hour. Following the Osceola Mudflow, many other eruptions and lahars occurred.
- **500 years ago (approx.),** a large landslide-generated lahar originated on the west flank of the volcano called the Electron Mudflow. That lahar traveled down the Puyallup River valley through Orting and into Sumner and Puyallup. However, there is no evidence that this event was triggered by a volcanic eruption.

17.5 Probability of Future Occurrences

According to the Washington State Enhanced Hazard Mitigation Plan, there is a 2.5% chance each year that a volcanic disaster could lead to a formal disaster declaration.[8] While this statistic highlights the potential risk, it's important to note that volcanic eruptions, particularly in the Cascades, can be unpredictable. Volcanoes like Mount Rainier and others in the region can lie dormant for hundreds or even thousands of years between eruptions, making it difficult to foresee exactly when an eruption might occur. Despite this uncertainty, scientists do know that future eruptions are likely.

Furthermore, the population of the Pacific Northwest continues to grow, the risk associated with volcanic events is also increasing. Since the 1980 eruption of Mount St. Helens, there has been a significant rise in both the number of people living in at-risk areas and the infrastructure exposed to volcanic hazards. Advance warning of unrest and potential implications of unrest are critical to

[8] Washington Emergency Management Division (EMD), "Volcano" *Washington State Enhanced Hazard Mitigation Plan* (2023): p. 71, https://mil.wa.gov/asset/651ec296d76a9/2023_WA_SEHMP_final_20231004.pdf

communities downstream from the volcanoes, because even a relatively small eruption could scour and melt snow and glacier ice and produce lahars that could reach heavily populated areas.

17.6 Climate Change Considerations

Volcanic eruptions can influence climate, primarily through the release of gases, aerosols, and ash into the atmosphere. While volcanic ash, which is injected into the stratosphere during major explosive eruptions, typically falls back to Earth within days or weeks and has little lasting impact on climate, the gases released can have significant effects.

For instance, sulfur dioxide (SO_2) can form aerosols that reflect sunlight, leading to temporary global cooling. In contrast, carbon dioxide (CO_2), a greenhouse gas, can contribute to global warming by trapping heat in the atmosphere. However, despite the release of CO_2 during contemporary volcanic eruptions, it has not been shown to cause detectable global warming on a large scale.[9]

17.7 Impact Assessment

Public	The estimated King County population that might be impacted from Mount Rainier by a Case 1 lahar is 17,920, Case 2 is 3,527 and 49,486 in a post-lahar sedimentation zone. The distance from Mount Rainier makes direct impact of eruption from a pyroclastic event unlikely. Prevailing winds make ash fall in the county a relatively low probability event. Lava flows and landslide activity would impact the National Park and possibly part of Pierce County but are unlikely to reach any portion of inhabited King County. Indirect impacts from a major eruption might include a cooling climate from atmospheric suspended ash clouds but this too is unlikely. Fine ash may cause regional health impacts – especially respiratory for the duration of ash fall or during any ash resuspension by strong winds. Impacts to vehicles and air handling systems in homes and workplaces may have an employment impact to the King County population. However, it is also worth noting many Pierce County residents commute to jobs in King County, so disruptions in Pierce could have economic ripple effects throughout the region.
Responders	Responder vehicles need regular air filter changes during ashfall. Air filters in the quantity required are likely not available. Responders will also be taxed by high numbers of calls and dangerous roads caused by slick ash.
Continuity of Operations	Potential impacts to county delivery of services from a Mount Rainier eruption would be the result of damages to infrastructure, equipment including machinery and vehicles, inaccessibility to service areas, impedance

[9] USGS, "Volcanoes Can Affect Climate" *Volcano Hazards Program* (n.d.): https://www.usgs.gov/programs/VHP/volcanoes-can-affect-climate

	to transportation routes used by the county workforce, and health impacts to residents and the workforce. County services that might be interrupted might include: Medic One response, King County Sheriff's Office services like 9-1-1 dispatch, search and rescue and marine or aviation unit response, adult detention, solid waste and waste water services. Services provided by other government agencies and basic service providers might include interruption of: power, phone and cell phone service, emergency medical service, fire and law enforcement, water systems, and health/medical facilities.
Property, Facilities, and Infrastructure	**Property** The cities of Algona and Pacific are the most at risk from a Mount Rainier lahar event, with over 90 percent of their structures exposed to the lahar. While the percentage of structures is not as high, the City of Auburn has the highest potential dollar-value losses. Other damages would include the loss of HVAC and air filtration systems, and electrical systems shorting out. Furthermore, following rains, ash hardens to a concrete-like consistency, which can clog gutters and drains and cause them to fail or collapse. Businesses that operate electronic systems will require decontamination rooms to prevent ash from getting inside and damaging electrical equipment. **Facilities** Health systems would be impacted by an expected dramatic rise in demand for services as ash causes people to seek care for respiratory distress and lahars can cause serious injuries. Health systems would also be hindered by transportation system impacts. First responder vehicles should have air filters changed a frequent as every 30 minutes during volcanic ash events and there are not enough air filters on hand to meet this requirement. **Infrastructure** • Power: Ash can short out electrical systems and cause widespread power failure. Ash accumulation may also cause issues with power generation dams. Generation facilities may be shut down to prevent damage to sensitive components. • Water/Wastewater: Water systems, including reservoirs, could quickly clog with ash, potentially polluting water supply. • Transportation: volcanic ash is very slick and roadways would become treacherous. Vehicles would need regular air filter replacements and there are not sufficient air filters in the region to offset the need. Airports in the region may require Temporary Flight Restrictions (TFRs) of airways over affected areas. Any lahar could potentially destroy major transportation routes, including I-5.

- Communications: Electrical and communication impact can be severely impacted during ashfall. Ash getting into electrical systems can cause systems to short out.

Environment	Any significant volcanic activity at Mount Rainier would have an impact to the environment. Tephra (ash) fall, pyroclastic flows, large landslides, and lahar activity would directly impact birds, fish, mammals, reptiles, amphibians, trees, and vegetation. Sediment deposition would impact rivers that support salmon and steelhead spawning. Large landslides and lahars may change the course of rivers entirely. Lahars may cause hazardous material releases that harm birds, fish and other wildlife. Recreational use of ski areas and hiking trails would also be impacted. After four decades, timber and wildlife at Mount St. Helens have not yet fully returned to pre-1980 levels.
Economy	Many of the impacts to humans and the environment from a Mount Rainier eruption would also impact the economy of King County. Aviation interruption would likely occur from airborne ash. A lahar event would impact rail and port service from direct damages to infrastructure like bridges, rails, and roadways, or from inaccessibility to ports. Post-eruption excess sedimentation would affect areas father downstream and exacerbate flooding. Ash would cause interruption of all internal combustion engines or vehicles that require filters would impact the workforce and movement of food and supplies as well as repair crews. Abrasion from fine ash on all mechanical parts would cause longer term damages to industrial operations and the ports. Health and respiratory issues would make both indoor and outdoor professions difficult. Medical facilities and the patients that rely on them would have difficulty operating. The cost of debris removal following a lahar or substantial ash fall would be enormous, even similar to efforts from a major earthquake. Volcanic ash can also have major impacts on agriculture if feed and water sources are not taken care of properly. Farm animals can inadvertently grind down their teeth while grazing on grasses that include volcanic ash over time, and may suffer from stomach or intestinal injuries from drinking ashy water.[10]

[10] USGS, "Agriculture – Plants & Animals" *Volcanic Ashfall Impacts Working Group*, (December 2015): https://volcanoes.usgs.gov/volcanic_ash/agriculture.html

Public Confidence in Governance	The public's knowledge on volcanic eruption and evacuation protocols are limited due to the infrequent eruptions in this region of the Cascades. The last large eruption was Mount St. Helens in 1980. At the time, US scientists had no direct experience with monitoring and forecasting eruptions of explosive volcanoes, thus Mount St. Helens eruption didn't come with early warning. There was even confusion on the possibility that the volcano could erupt sideways. This could give the impression that government isn't well prepared for another eruption. However, since that time, investments in research, volcano monitoring, and public outreach have increased the ability of the USGS to detect early signs of unrest and with local emergency management to communicate factual, reliable, and actionable information to government authorities and the public.

17.8 Vulnerability Assessment

Vulnerable Populations	Impacts to individuals with access and functional needs will be extremely serious. Transportation will be impacted, resulting in difficulty accessing appointments. Individuals with chronic respiratory vulnerabilities will be most negatively impacted by ash. While there are limited numbers of King County residents in the path of the lahar, the communities that are most impacted have higher rates of disability and poverty than the statewide average. Communities downstream of the direct lahar impact area will likely experience post-lahar excess river sedimentation which can exacerbate flooding. Communities in the path of lahar hazards Communities in the vicinity of Mount Rainier, including the King County communities of Algona, Pacific, and Auburn, are most vulnerable to a large lahar generated by an eruption of Mount Rainier. Communities further down valley are vulnerable to excessive river sedimentation in the aftermath of an eruption and lahar. Populations vulnerable to respiratory distress brought on by ash Ash from any volcanic eruption can lead to disruption of daily life and is a major threat to people with medical vulnerabilities. Populations in the immediate vicinity of a volcano Populations that use Mount Rainier National Park or work in the area around the mountain are most susceptible to multiple near-volcano hazards that can affect the immediate surroundings within minutes.

	Although advanced notice of a potential eruption is likely, it will be impossible to predict the exact moment of eruption. Residents from the town of Orting have approximately 45-minutes to evacuate following onset of a large lahar in the Puyallup valley.
Property	Property damage from lahars can include complete inundation and destruction of any property in the lahar's path. Furthermore, property damage that can occur from ash fall include obstructed filters in HVAC systems, clogged drainage systems in gutters, and corrosion on metal roofs.
Environment	Lahars along the White River, with post sedimentation in the Green and Duwamish River can drastically alter the riverbed and changing water flow dynamics. The added sediment can increase erosion downstream and significantly impact aquatic life, leading to long-term ecological disruption. Changes to floodplains can also create new areas of vulnerability, potentially exposing hazardous materials and increasing erosion risks during future flood events.
Operations	**Energy** Electrical systems may short out due to ashfall and power generation can be curtailed as generation systems are shut off to protect sensitive components. **Communication** Communications equipment has the same vulnerability as general electrical systems and is subject to failure due to ash damage. **Air Travel** Airports may be closed for the duration of major ash dispersal including ash remobilization due to wind. **Roads** Traffic signals may short out during ashfall. Ash can create a very slippery driving surface. Ash can damage vehicle engines and scratch windshields when wipers are being used. Driving is not recommended during heavy ashfall.

Chapter 18

Wildfire



Risk Assessment Scoring		
2	Location	Hazard
3	Probability	
3	Magnitude	
3	Public	Impact
3	Responders	
1	COP	
3	PFI	
2	Environment	
3	Economy	
3	PCG	
2	People	Vulnerability
2	Property	
2	Environment	
1	Operations	
3	People	Risk
3	Property	
3	Environment	
2	Operations	
High	**Overall Risk**	

PC: Inciweb

Chapter 18: Wildfire

18.1 Hazard Description



2022 Bolt Creek Fire

A wildfire is an unplanned, unwanted fire burning in a natural area such as a forest, grassland, or prairie**.** Wildfire is a historically natural phenomenon that has played a role in reshaping and regenerating our ecosystems since time immemorial. However, the dangers wildfires can pose to the public and first responders are significant. Wildfires can damage natural resources, destroy homes and structures, and threaten the safety of the public and first responders. While King County and Western Washington have historically been viewed as having a relatively low fire risk, the dense vegetation in our forests can serve as an ample source of wildfire fuel if conditions are right for them to burn. In the last decade, the region has been experiencing drier summers and longer fire seasons, with approximately 30-40% of wildfire starts in Washington occurring on the west side of the Cascade Crest.[1] Meanwhile, more and more people are moving into the wooded areas of King County with a higher likelihood of exposure to fire. Of particular concern is a wildfire that spreads from the wildlands to the urban environment.

While wildfires do start naturally through lightning strikes, 85% of wildfires in Washington are started by human activity.[2] Human-caused ignitions include arson but starts are more often the result of a range of unintentional and avoidable causes such as sparks from vehicles dragging

[1] Courtney Flatt, "Washington's 2022 fire season has been the mildest in a decade" *OPB* (October 2022): https://www.opb.org/article/2022/10/09/washington-wildfire-season-bolt-creek-fire-goat-rocks-fire-oregon-wildfires/

[2] Washington Department of Natural Resources (DNR), "Wildfire Resources" *Wildland Fire Management Division* (n.d.): https://www.dnr.wa.gov/programs-and-services/wildfire-resources

materials, fallen utility lines, negligent backyard debris burning, or pyrotechnics and recreational fires that get out of control. Wildfires can spread rapidly when fueled by dense, dry, uninterrupted vegetation, especially in areas with steep slopes, ridges, and during windy conditions with high temperatures and low humidity.

To compound the situation, an area burned by an intense wildfire is more likely to experience additional hazards such as flooding and landslides. Wildfire smoke is also a significant threat to public health, and smoke annually impacts King County even when the source fires are well outside of county boundaries. Wildfire smoke is made up of fine particulate matter (PM2.5) which can cause a range of negative health impacts, especially for vulnerable populations including people with chronic health conditions, children, pregnant women, and first responders who are exposed to large amounts of PM2.5 through their work.

The wildland fire season in Washington generally starts in May and continues through October.[3] Conditions such as drought, low snowpack, and local weather conditions can impact the length of the fire season. In King County, the window of vulnerability to wildfire is from late August to October. The most recent significant fire in King County, the 2022 Bolt Creek Fire, ignited in September and burned through the end of October. The National Weather Service issues Red Flag Warnings when warm temperatures, very low humidities, and stronger winds are expected to combine to produce an increased risk of fire danger; August and September were the months when the most Red Flag Warnings were issued from 2006-2022.[4]

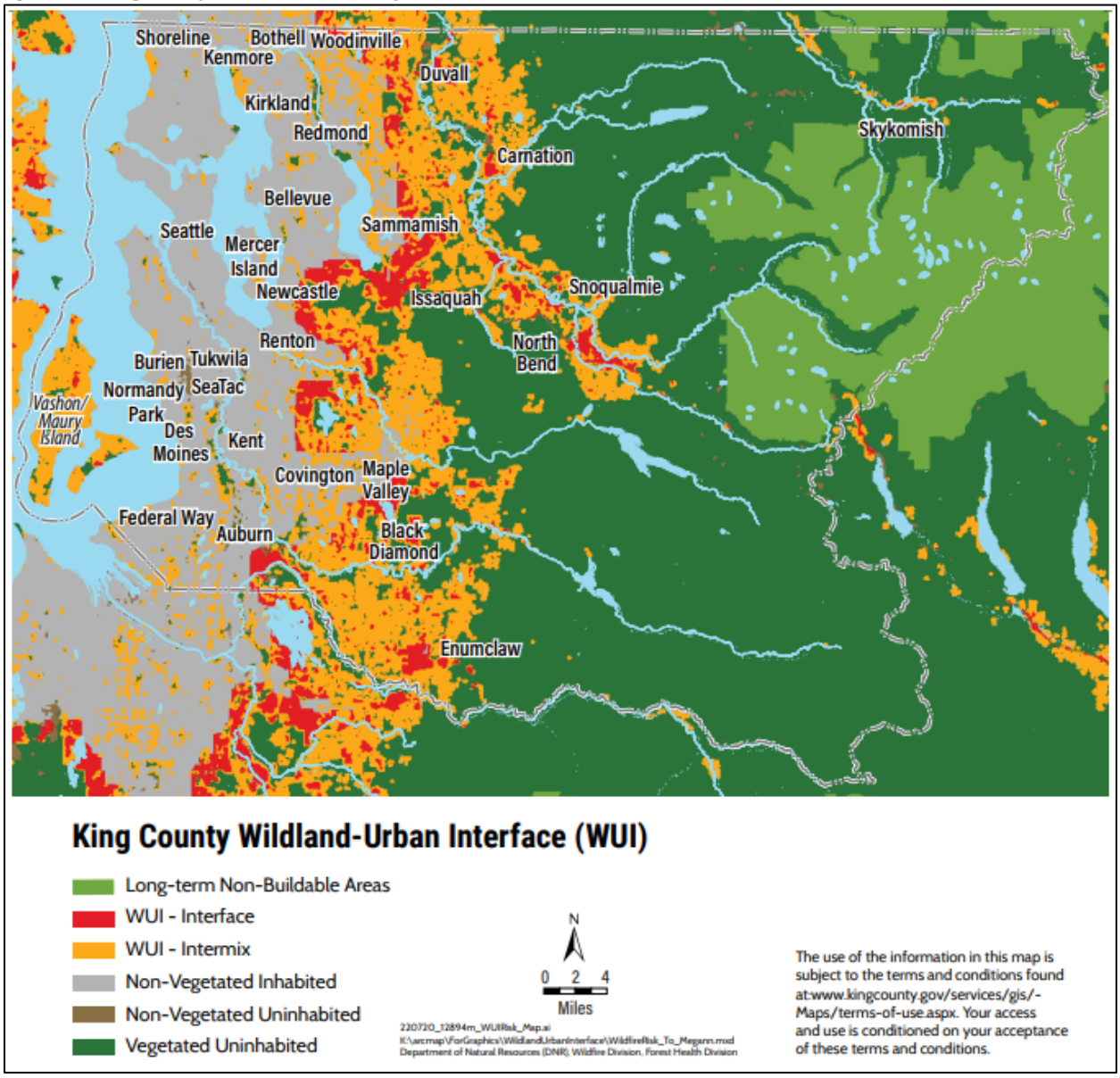
To address concerns related to wildfire, King County will be publishing a countywide Community Wildfire Protection Plan (CWPP) in 2025 that expands upon items listed in this chapter and describes concerns, risk factors, and effective wildfire mitigation actions. Actions or mitigation plans listed in the King County CWPP will be considered a part of the King County Regional Hazard Mitigation Plan, regardless of the adoption date, and will be incorporated into this plan at the next scheduled update.

[3] Western Fire Chiefs Associate, "Washington Fire Season: In-Depth Guide" (April 2024): https://wfca.com/wildfire-articles/washington-fire-season-in-depth-guide/

[4] National Oceanic and Atmospheric Administration (NOAA), "Red Flag Warning" *National Weather Service (NWS)* (n.d.): https://www.weather.gov/mqt/redflagtips#:~:text=A%20Red%20Flag%20Warning%20means,increased%20risk%20of%20fire%20danger.

18.2 Location

Figure 18-1 King County Wildland Urban Interface (WUI)[5]



Wildland-Urban Interface

The **wildland-urban interface (WUI),** or the zone of transition between structures and human development and undeveloped land or vegetative fuels, is of particular importance for wildfire mitigation. Figure 18-2 displays the current King County WUI map.

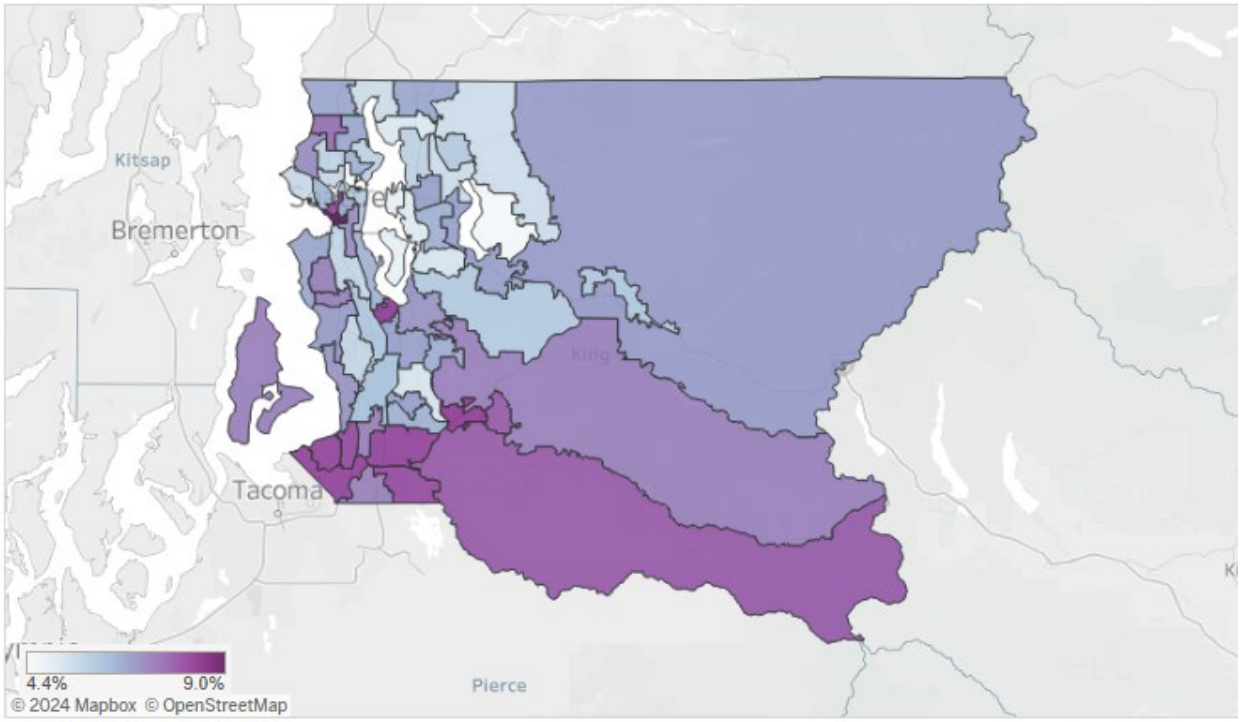
[5] King County, "Wildfire Risk Reduction Strategy" *Office of Emergency Management* (July 2022): https://your.kingcounty.gov/dnrp/climate/documents/king-county-wildfire-strategy-report.pdf

- **Interface** areas are those in which development and structures are bordered by wildlands on at least one side.
- **Intermix** areas are defined as a development or structure that is surrounded on two or more sides by wildlands.

The WUI map above is not a wildfire risk map and simply demarcates where the wildlands and urban areas meet and overlap; however, communities in the WUI have a higher likelihood of exposure to wildland fires so it is an important area to consider for wildfire mitigation work.

Wildfire Smoke

Figure 18-2 Asthma Diagnosis Medicaid Members (All Ages), King County 2023[6]



Wildfires in neighboring regions, including Eastern Washington, Oregon, and British Columbia, frequently bring wildfire smoke into King County, leading to hazardous air quality conditions. Recent studies on wildfire smoke exposure in Washington have revealed a significant link between exposure to PM2.5 from wildfire smoke and increased visits to emergency rooms and outpatient clinics.[7] Vulnerable groups, particularly children with asthma and those experiencing childhood respiratory or chest symptoms, are disproportionately affected. Chronic Obstructive Pulmonary

[6] King County, "Asthma data dashboards - Asthma diagnosis among Medicaid members" *Public Health – Seattle & King County (PHSKC)* (October 2024): https://kingcounty.gov/en/dept/dph/about-king-county/about-public-health/data-reports/climate/asthma
[7] https://deohs.washington.edu/hsm-blog/wildfire-smoke-tied-increased-risk-er-visits

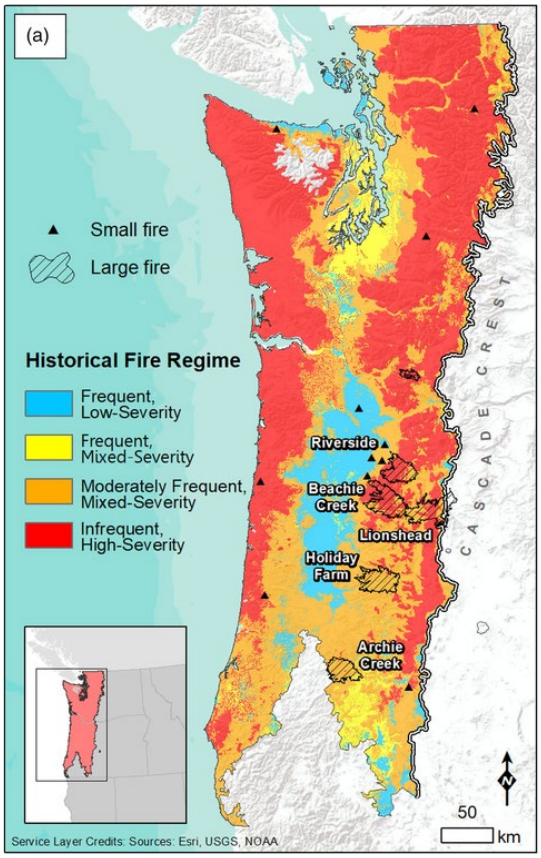
Disease (COPD) patients across all age groups also face heightened risks, as do individuals with other respiratory conditions.

In 2021, The Puget Sound Clean Air Agency reported that the region's unprecedented wildfire smoke events resulted in the highest amounts of particulate matter in the air since air quality monitoring for PM2.5 began in 1980.[8] As climate change increases the likelihood of larger and more severe wildfires, the number of days with poor air quality from smoke increases as well.

18.3 Magnitude

Wildfire Regime

Figure 18-3 Western Cascadia wildfire regime[9]



To understand the magnitude and frequency of wildfires, it is essential to understand the norms and patterns of wildfires in our area over time, which is known as the **wildfire regime**.[10] King County has two predominant wildfire regimes, demonstrated in Figure 18-3. Parts of King County experience frequent to moderately frequent and lower- to moderate-severity wildfires. These fires are often relatively small (<50,000 acres) and are more easily limited by external factors such as weather, available fuel, topography, and standard firefighting techniques.

The other type of fire in our wildfire regime is **infrequent and high-severity wildfire**. The most likely scenario for a such a fire to occur is during a major east-wind event when vegetative fuels are dry and primed for burning; such fires can be massive (100,000 to >1,00,000 acres), are incredibly difficult to contain, and often burn at a severity that kills entire sections of forest (what is known as a "stand-

[8] Puget Sound Clean Air Agency, "2021 Data Summary" (2022): https://www.pscleanair.gov/673/2021-Data-Summary
[9] Matthew J. Reilly, et. al, "Cascadia Burning: The historic, but not historically unprecedented, 2020 wildfires in the Pacific Northwest, USA" *ESA* (June 2022): https://esajournals.onlinelibrary.wiley.com/doi/10.1002/ecs2.4070
[10] Emily Fales, Daniel Donato, "Key Insights for Wildfire Management in Western Washington: Fire Regime and Forest Structure" *Forest Stewardship Notes* (February 2024): https://foreststewardshipnotes.wordpress.com/2024/02/06/key-insights-for-wildfire-management-in-western-washington-fire-regime-and-forest-structure/

replacing" fire). Because the majority of the wildlands in King County are east of the populous areas of the county, strong wind from the east could push a wildfire directly into the urban areas of King County, a situation which would be dangerous and even deadly.

The challenge of the low-frequency, high-severity fire regime is that many of the major stand-replacing wildfires that have impacted the region are out of living memory. The average return interval between such wildfires is anywhere from 100-500 years. Because major westside fires rarely occur, people in areas of higher risk may not realize just how vulnerable they are to a major wildfire. Lack of awareness can lead to lack of preparedness, low interest in mitigation, and inadequate precaution with potential ignition sources. Maps of fire risk in the United States – such as the FEMA Risk Index map – show King County as "relatively low" risk, but this is because these maps are calculated using annualized frequency fires.[11] Such calculations convey the low frequency of our wildfire regime but does not accurately capture the danger of a major fire if conditions are right. Furthermore, the impacts of climate change are rapidly increasing the risk factors for wildfire. We must not only plan for our historic fire regime but consider the likely worsening wildfire scenarios of the future.

Severity of Wildfire

While a fire is actively burning, its impact can be measured several ways. The size of a fire is often typically communicated to the public by the number of acres burned. Within the first responder community, wildfires are categorized by the complexity of a response using Incident Command System (ICS) typing. Table 18-2 describes the factors of a wildfire response that delineate incident type, with Type 1 is the most resource-intensive.

Table 18-1 Incident Command System (ICS) for wildfire response

Type 5:	Type 4:	Type 3:	Type 2:	Type 1:
Very small wildland fire only Short duration Few resources assigned (generally less than 6 people) Little complexity	Initial attack or first response to an incident Few resources are used (several individuals or a single strike team) Normally limited to one operational period	Extended initial attack on wildland fires Resources may vary from several single resources to several task forces or strike teams May extend into another operational period (12 hours), and require an IAP	Large number of resources utilized Incident extends into multiple operational periods Significant logistical support is required	Multi-agency and national resources Large number of personnel and equipment are assigned to the incident It is a large, complex incident

[11] FEMA, "Wildfire" *National Risk Index* (n.d.): https://hazards.fema.gov/nri/wildfire

Wildfire intensity is the amount of energy or heat given off by a forest fire at a specific point in time.

- **Low Intensity:** Flames are low, staying close to the ground making the fire spread slowly. Not much heat is produced which makes it more manageable.
- **Moderate Intensity:** Flames are a bit higher but only by a few inches so the fire spreads at moderate speed with moderate heat produced.
- **High Intensity:** Flames are high and can be tough to control. The fire moves considerably faster and can be a challenge. The heat coming from the fire has noticeably increased in temperature.
- **Extreme Intensity:** Flames are extremely high, towering above everything. The fire spreads extremely fast and is hard to predict. The substantial heat generated poses a significant threat to people and nature.



The intensity of a wildfire is a key indicator of the fire's severity, or the measure of a fire's impact on the area burned. A low intensity fire may burn low-level vegetation but leave trees intact, so forests can quickly rebound. Conversely, a high or extreme intensity fire can destroy the flora of an entire area, leaving a lengthy road to recovery.

AQI for PM2.5 – Smoke

According to the Washington Department of Ecology, wildfire smoke is the largest source of particle pollution in Washington.[12] The effects of smoke exposure range from eye and respiratory tract irritation to more serious health problems including reduced lung function, bronchitis, asthma exacerbation, heart failure, and premature death. People with existing heart and lung diseases, older adults, children and pregnant women are especially at risk of smoke-related health problems. The Puget Sound Clean Air Agency monitors air quality and communicates the level of unhealthiness with the Air Quality Index, which tracks concentrations of several pollutants including PM2.5.[13] In 2017, and especially 2018, smoke from wildfires inundated Seattle, causing unhealthy air quality. This was due to wind patterns that blew smoke from fires in British Columbia, Oregon,

[12] WA Department of Ecology, "Wildfire smoke information" (n.d.): https://ecology.wa.gov/air-climate/air-quality/smoke-fire/wildfire-smoke
[13] US Environmental Protection Agency (EPA),"Technical Assistance Document for the Reporting of Daily Air Quality – the Air Quality Index (AQI)" (May 2024): https://document.airnow.gov/technical-assistance-document-for-the-reporting-of-daily-air-quailty.pdf

and Eastern Washington into the region. Warmer summers will increase the number of fires and with more fires, more smoky days are likely.[14]

Table 18-2 Sensitive Groups and the Air Quality Index

Sensitive Groups and the Air Quality Index

Index Value	Level of Health Concern	What it Means
301 - 500	Hazardous	Health warnings of emergency conditions. The entire population is more likely to be affected.
201 - 300	Very Unhealthy	Health alert: everyone may experience more serious health effects.
151 - 200	Unhealthy	Everyone may begin to experience health effects; members of sensitive groups may experience more serious health effects.
101 - 150	Unhealthy for Sensitive Groups	Members of sensitive groups may experience health effects. The general public is not likely to be affected.
51 - 100	Moderate	Air quality is acceptable; however, for some pollutants there may be a moderate health concern for a very small number of people who are unusually sensitive to air pollution.
0 - 50	Good	Air quality is considered satisfactory, and air pollution poses little or no risk.

According to the Washington Department of Ecology, wildfire smoke is the largest source of particle pollution in Washington.[15] The effects of smoke exposure range from eye and respiratory tract irritation to more serious health problems including reduced lung function, bronchitis, asthma exacerbation, heart failure, and premature death. People with existing heart and lung diseases, older adults, children and pregnant women are especially at risk of smoke-related health problems. The Puget Sound Clean Air Agency monitors air quality and communicates the level of unhealthiness with the Air Quality Index, which tracks concentrations of several pollutants including PM2.5.[16] In 2022, smoke from the Bolt Creek Fire and other area fires reduced air quality in the region to the worst in the world for multiple days.[17] According to a health impact assessment by University of Washington researchers, a similar smoke episode in 2020 contributed to an estimated 92 excess deaths, several of which could have been prevented with reduced exposure to $PM_{2.5}$.[18] Wildfire smoke is particularly dangerous when a wildfire burns through the WUI, because the smoke contains fine particular matter along with toxins released

[14] Greg Gilbert, "Smoky Seattle summers: expect more of them, scientists say" *The Seattle Times* (August 2018): https://www.seattletimes.com/seattle-news/smoky-seattle-summers-expect-more-of-them-scientists-say/.
[15] WA Department of Ecology, "Wildfire smoke information" (n.d.): https://ecology.wa.gov/air-climate/air-quality/smoke-fire/wildfire-smoke
[16] US Environmental Protection Agency (EPA),"Technical Assistance Document for the Reporting of Daily Air Quality – the Air Quality Index (AQI)" (May 2024): https://document.airnow.gov/technical-assistance-document-for-the-reporting-of-daily-air-quailty.pdf
[17] Michelle Baruchman, "Seattle air quality among worst in world" *Seattle Times* (October 2022): https://www.seattletimes.com/seattle-news/environment/seattle-air-quality-among-worst-in-world/
[18] A. Doubleday, A, et. al., "Mortality associated with wildfire smoke exposure in Washington state, 2006-2017: A case-crossover study" *Environmental Health*, 19(1) (2022): https://pmc.ncbi.nlm.nih.gov/articles/PMC8101535/#gh2228-bib-0012

from burning household hazardous materials, vehicles, and structures.[19] Warmer summers will increase the number of fires and with more fires, more smoky days are likely.[20]

Cascading Impacts

Post-wildfire flooding, landslides, and mudslides are deadly cascading impacts that result from extreme wildfires in areas with steep slopes and are a serious threat to King County. Soils in areas burned by fire not only lose their stabilizing vegetation but can also become hydrophobic (water repelling), leading to massive water runoff that carries debris down slopes and into nearby waterways. This can lead to large debris flows and mudslides when heavy rains occur that damage infrastructure and communities downstream for several years after a fire. A fire in one of the foothills communities could cause major mudflows and devastating flooding in communities in the watershed impacted by the fire and through which rivers and creeks pass. Communities with existing flood risk, such as along the Snoqualmie River, are especially vulnerable. Following a wildfire, experts from the US Geological Survey and/or Washington DNR can conduct assessments on burned areas to determine the likelihood of major debris flows from a burned area.[21]

18.4 Previous Occurrences

Modern recordkeeping on wildfires did not begin until the 20th century, so occurrences of major fires before then in King County are not well documented. However, several high-intensity fires similar to those anticipated here have been recorded on the west side of the Cascades. Table 18-4 notes past wildfires in King County that have burned at least 100 acres of timber.

Table 18-3 Previous large wildfire events in King County, 1893 - 2024

Date	Event Name	Description
September 1, 1893	n/a	Several large, human-caused wildfires sparked during windy conditions and burned from Snoqualmie Pass to Skykomish. No acreage burned recorded.[22]

[19] https://phys.org/news/2023-06-toxic-emissions-wildland-urban-interface.html
[20] Gilbert, Greg. "Smoky Seattle summers: expect more of them, scientists say" *The Seattle Times* (August 2018): https://www.seattletimes.com/seattle-news/smoky-seattle-summers-expect-more-of-them-scientists-say/.
[21] US Geological Survey (USGS), "Miriam Fire Preliminary Hazard Assessment" (2018): https://landslides.usgs.gov/hazards/postfire_debrisflow/detail.php?objectid=224.
[22] Living Snoqualmie, Honoring Our Valley History: Past Fires of the Snoqualmie Valley" *Snoqualmie Valley Info* (October 2022): https://prod.livingsnoqualmie.com/honoring-our-valley-history-past-fires-of-the-snoqualmie-valley/

May 31, 1922	n/a	A human-caused wildfire started during a windy day in eastern King County and destroyed half the town of Cedar Falls. No acreage burned recorded.[23]
September 1, 2009	Lemah Fire	A fire sparked in the Alpine Lakes Wilderness and burned approximately 600 acres.[24]
August 11, 2017	Quarry Fire	A wildfire started 30 miles northwest of North Bend and burned 243 acres.[25] The response cost $1,089,194.
September 4, 2017	Sawmill Creek Fire	A fire started in the Green River Watershed burned 1,061 acres.[26] The response cost $4,500,000.
***September 7, 2020**	Labor Day Fires	This series of fires was preceded by dry conditions and a synoptic east-wind event, and the fires that sparked burned approximately 840,160 acres in two weeks.[27] The fires prompted evacuation orders to 90,000 people and resulted in millions of dollars in damage.[28]
September 8, 2020	Fish Fire	A fire southeast of Enumclaw burned approximately 150 acres during the Norse Creek Fire.
August 18, 2022	Murphy Lake Fire	A fire sparked by a lightning strike on August 18th grew to 170 acres, temporarily closing a section of the Pacific Crest Trail.[29]

[23] Washington Forest Protection Association (WFPA), "A Chronology of the First 100 Years of the Washington Forest Protection Association 1908-2008" *History Link* (n.d.): https://www.wfpa.org/wp-content/uploads/2022/11/100-Year-Chronology-small-file.pdf
[24] The Associated Press, "Fire closes part of Pacific Crest Trail in central Cascades" *Seattle Times* (September 2009): https://www.seattletimes.com/life/outdoors/fire-closes-part-of-pacific-crest-trail-in-central-cascades/
[25] Northwest Interagency Coordinator Center (NWCC), "Northwest Annual Fire Report" (2017): https://gacc.nifc.gov/nwcc/content/pdfs/archives/2017_NWCC_Annual_Fire_Report_FINAL.pdf
[26] USDA, "Sawmill Creek Fire Update" *USFS* (September 2017): https://www.fs.usda.gov/detail/mbs/news-events/?cid=FSEPRD558196
[27] Matthew J. Reilly, et al., "Cascadia Burning: The historic, but not historically unprecedented, 2020 wildfires in the Pacific Northwest, USA" *Ecosphere* (2022): https://www.fs.usda.gov/pnw/pubs/journals/pnw_2022_reilly001.pdf
[28] Emily Fales, Daniel Donato, "Key Insights for Wildfire Management in Western Washington: Fire Regime and Forest Structure" *Forest Stewardship Notes* (February 2024): https://foreststewardshipnotes.wordpress.com/2024/02/06/key-insights-for-wildfire-management-in-western-washington-fire-regime-and-forest-structure/
[29] Northwest Interagency Coordinator Center (NWCC), "Northwest Annual Fire Report" (2017): https://gacc.nifc.gov/nwcc/content/pdfs/archives/2017_NWCC_Annual_Fire_Report_FINAL.pdf

September 9, 2022	Bolt Creek Fire	September 9, the fire started 1.5 miles north of Skykomish, prompted evacuations, and burned approximately 14,766 acres in the Mt. Baker-Snoqualmie National Forest.[30]
October 16, 2022	Loch Katrine Fire	A wildfire spread during a Red Flag Warning 35 miles east of Seattle and burned 2,000 acres.[31]

18.5 Probability of Future Occurrences

As the climate changes, there is a greater likelihood that high temperature and dry conditions will be present along with the already-existing topographic, wind, and fuel conditions necessary to support a large fire. Development is also expected to densify in the wildland-urban interface. The building patterns in these areas are not in accordance with Fire Wise principles and many communities have limited ingress and egress routes.

18.6 Climate Change Considerations

As the climate changes, it is expected to lengthen the fire season and increase the likelihood of more wildfire in Western Washington.[32] Prolonged summer heat, combined with high density forests and areas of poor forest health, is increasing fire risk. Hotter and drier conditions are two of the three factors that influence fire behavior and make a wildfire significantly more likely to occur in King County. If emissions continue at their current rate, the annual average amount of acres burned in the Pacific Northwest is expected to more than triple by the 2040s.[33]

18.7 Impact Assessment

Public	Approximately 6% of King County's total population (~352,000 people) who live in the Wildland Urban Interface (WUI) are more likely to be directly exposed to wildfire than the rest of the county.

[30] InciWeb, "10/2/2022 Bolt Creek Fire Update" (October 2022): https://inciweb.wildfire.gov/incident-publication/wanws-bolt-creek-fire/1022022-bolt-creek-fire-update
[31] Chris Bentley, "Loch Katrine Fire Swells to over 2,000 Acres Overnight Due to Severe Fire Weather" *USDA, USFS* (October 2022): https://www.fs.usda.gov/detail/mbs/news-events/?cid=FSEPRD1067163
[32] Alex W. Dye, et. al., " Simulated Future Shifts in Wildfire Regimes in Moist Forests of Pacific Northwest, USA" *AGU* (February 2024): https://doi.org/10.1029/2023JG007722
[33] H.A. Morgan, et. al, "Managing Western Washington Wildfire Risk in a Changing Climate" *UW Climate Impacts Group, Northwest Climate Adaptation Science Center* (2019): https://nwcasc.uw.edu/wp-content/uploads/sites/23/2019/04/Managing-Western-Washington-Wildfire-Risk-in-a-Changing-Climate-1.pdf

	This risk is growing due to climate change and new development in the WUI. It's also important to note that evacuations cannot be enforced, thus in the event of wildfire outbreak, those who remain in their homes located in or near the WUI are at higher risk. The most frequent impact of wildfires King County residents will experience is exposure to smoke. Wildfire smoke can cause respiratory issues, prevent people from taking part in outdoor activities, and increase emergency department visits.
Responders	Growing numbers of wildfires will increase risk to firefighters. With an increase in WUI fires, firefighting becomes more complex and dangerous. Also, communities without proper ingress/egress routes further increase risk to firefighters who may be called upon to attempt evacuations in such communities. As climate change exacerbates wildfires across the United States, increasing frequency and severity of fires and extending wildfire season, it increases the strain on firefighting resources. King County's window of vulnerability to wildfire is near the end of the current wildfire season when resources are waning. If federal or state land management agencies are targeted for staff reductions or significant budget cuts, it will decrease the number of trained responders assigned to protect large portions of land in King County, putting increased pressure on mutual aid.
Continuity of operations	Most King County government operations and facilities are in the more urban areas of the county and unlikely to be directly impacted by wildfires. However, a major wildfire might occupy most of the region's first responder capabilities, pulling resources from other sectors and parts of the county through mutual aid. Smoke, which is the most frequent impact of wildfires experienced by King County, can cause an increase in employee absenteeism, put a strain on the health systems, and prompt cancellations of various outdoor activities and events.
Property, facilities, and infrastructure	**Property** King County is working on a countywide wildfire risk assessment that will be published in our Community Wildfire Protection Plan (CWPP) in 2025. Likely impacts to property include smoke damage to total loss of facilities. Communities built with many homes close together and constructed of flammable materials can be completely burned in a short time, as seen in Paradise, CA, Superior, CO, and Lahaina, HI.

Facilities

Exposure to PM 2.5 is a significant health concern, because the small size of the particle allows people to inhale it deep in the lungs where the particles can directly enter the blood stream. The effects of smoke exposure range from eye and respiratory tract irritation to more serious health problems including reduced lung function, bronchitis, exacerbation of asthma and heart failure, and premature death. During extreme smoke pollution events, public health systems are likely to be burdened by populations suffering respiratory distress.

Infrastructure

- Energy: Many major transmission lines run through wildland areas. While utilities have their own wildfire mitigation plans and typically keep brush surrounding transmission lines clear, wildfires in King County could damage or destroy these systems. Rural and other interface power lines would be burned in any fire, as has been seen in numerous communities in Eastern Washington. Many utility providers in the West, including Puget Sound Energy, have implemented plans for Public Safety Power Shut-offs (PSPS) to reduce the likelihood that energized lines will start a fire during “red flag” fire conditions, affecting energy customers, especially those reliant on electricity.
- Water/Wastewater: Many of King County’s watersheds and primary water reservoirs are in forested areas and could be impacted by wildfire that could burn power supplies to pump stations or the pump stations themselves. Furthermore, post-fire runoff and flooding could damage or pollute reservoirs.
- Transportation: Fire can prompt road closures due to visibility concerns, direct contact with fires, and to keep the public away from an evacuated area. Another major risk is post-fire flooding and debris flows that can damage or destroy roads and bridges downstream or downslope from a burned area after a rain. Additionally, SeaTac Airport has had to cancel flights due to poor visibility during wildfire smoke events.
- Communications: Cellular communications sites can lose power or be damaged by wildfire. During these events, it may be necessary to deploy cellular on wheels capabilities.

The environment	While wildfires can be beneficial to the landscape, a major wildfire can be damaging in the near term. Fires can pollute water systems and destroy old growth habitat. They can burn over springs and increase evaporation. Following extreme fires, hydrophobic soils make it difficult for plants to regrow in and the runoff over these soils increases the turbidity of local streams, endangering fish and other water animal populations.
The economy	Wildfire suppression alone is incredibly expensive, with Washington spending an estimated $145.3 million for wildfire suppression in FY 2023.[34] A high-severity wildfire impacting structures could cause significant economic impact to an affected community for years. Disaster recovery is a lengthy process and a wildfire would likely result in displacement of residents and impact local housing stock and prices. Economic costs may be felt by a wildfire that does not impact structures as well. Besides suppression costs, the impacts of wildfire smoke inundation is likely to be limited and temporary. For a wildfire he largest impacts on the economy are likely to be indirect, including losses in work days because of poor air quality, interrupted access to various services, and losses in tourist income.
Public confidence in governance	Wildfire hazards have gained renewed importance in recent years. WUI wildfires are particularly destructive and deadly, and several recent such fires resulted in mistrust of responding institutions, conspiracy theories about fires' sources, and anger and blame at parties in or near the fire. Government will need to be proactive in managing this hazard, communicating clearly throughout a response, and commit to recovery in order to maintain public confidence, which is difficult to earn and easy to lose.

[34] Washington State Legislature, "Emergency Fire Suppression Report for Fiscal Year 2023, Executive Summary for November 2022" *Department of Natural* Resources (2023): https://app.leg.wa.gov/ReportsToTheLegislature/Home/GetPDF?fileName=Copy%20of%20MONTHLY%20FIRE%20SUPPRESSION%20REPORT%20FY23_FM17_November_FINAL_1.19.23_3f03aaee-f2de-4a60-ac08-c0d89ef7d331.pdf

18.8 Vulnerability Assessment

Vulnerable populations	Populations suffering from respiratory ailments are at the greatest risk from wildfire since smoke from fire. People with existing heart and lung diseases, older adults, children and pregnant women are especially at risk of smoke-related health problems. **Foothills/interface** Communities in or around areas at a higher risk of fire, such as those in the foothills of the Cascades, are more susceptible to fire. **Fire Footprints** Major wildfires leave behind an environment that is more vulnerable to flooding. When rains come, large quantities of water and debris and rush down hillsides and destroy homes and infrastructure while causing flooding in downstream communities.
Property	There are several factors that put a structure at higher risk of damage from a wildfire. Buildings in the WUI that do not have sufficient defensible space surrounding them are likely to be damaged if directly exposed to wildfire. This includes homes with flammable roofs, proximity to dense brush or timber, or tightly packed neighborhoods with space between buildings. Structures built in interface or intermix areas are more likely to be exposed to fires, including from spotting and embers ahead of a fire. Fires tend to burn up slopes and ridges, endangering structures in those areas. Buildings less than 30 feet from a slope of greater than 30% grade are at risk. Buildings more than five miles away from fire services and with limited pressurized fire hydrant access are more vulnerable.

Environment	A wildfire that burns homes can significantly damage the environment due to numerous quantities of household hazardous materials that burn and release toxins into the air, ash, and soil. Wildfires can harm riparian environments and other critical habitats, and ashfall can decrease water quality. Wildfires are also major carbon emitters. For example, 2023 wildfires in North America released 640 million metric tons of carbon, an amount comparable to annual emissions of a large, industrialized nation.[35] Those areas eventually recover the ability to capture and store carbon as they recover. This can take years, however, because mature forests have the greatest carbon storage potential.[36]
Operations	**Ingress/Egress** Communities with a single route in or out of the area are much more difficult to evacuate. Roads that are less than 24 feet wide, especially those less than 20 feet wide, and those driveways without a turnaround are highest risk.

[35] NASA, "New NASA Study Tallies Carbon Emissions from Massive Canadian Fires" (August 2024): https://www.jpl.nasa.gov/news/new-nasa-study-tallies-carbon-emissions-from-massive-canadian-fires/
[36] NSF, "After the Fire: Studying Forest Recovery and Carbon Storage Potential" (February 2021): https://www.neonscience.org/impact/observatory-blog/after-fire-studying-forest-recovery-and-carbon-storage-potential

Chapter 19: Capabilities

King County includes 39 cities, over 129 special purpose districts, and large unincorporated areas. While each city and special purpose district is responsible for its own hazard mitigation efforts, King County supports these jurisdictions through region-wide services and planning coordination, including efforts associated with land use, emergency management, and floodplain management. County departments involved in hazard mitigation efforts include Executive Services (facilities management, emergency management), Local Services (permitting, roads), Natural Resources and Parks (wastewater, landslides, floodplain management, climate change), and the Office of the Executive (planning).

As the lead agency for hazard mitigation, the King County Office of Emergency Management (KCOEM) collaborates with a wide range of partners to advance and support mitigation efforts through its hazard mitigation program. KCOEM actively promotes Hazard Mitigation Assistance grant opportunities, offering technical support to help develop competitive applications. KCOEM also serves on interagency workgroups such as comprehensive planning, climate adaptation, and transportation as a way of promoting consistency in risk assessment and reduction priorities.

Hazard Mitigation Program

Hazard mitigation is most effective when approached through a systematic program that sets clear priorities and recognizes that building resilience requires widespread, coordinated investments. A cohesive, comprehensive strategy founded on strong partnerships is essential to the success of this program.

To support this approach, King County Emergency Management facilitates multi-agency committees, provides technical assistance for federal mitigation grants, aids partners in planning and executing mitigation projects, and continually updates the King County Regional Hazard Mitigation Plan to ensure it reflects the evolving needs and priorities of the region.

The focus of the KCOEM's hazard mitigation program is integration across plans, programs, and departments and jurisdictions. Plan integration ensures that all partners utilize the best available data and align their efforts to support a resilient future. Program integration connects partners with funding sources and resources beyond their individual departments or programs. Departmental and jurisdictional integration builds on the county's role through the Emergency Operations Center (EOC), mobilizing resources to prioritize and implement the most effective hazard mitigation strategies.

A crucial component of this integration is the capabilities assessment, which evaluates the community's capacity to reduce or mitigate the impacts of disasters. By conducting this assessment, KCOEM creates a comprehensive toolbox of plans, policies, ordinances, programs, and departmental resources that address identified hazards. This ensures that all partners have a clear understanding of their current capabilities and are equipped to effectively contribute to hazard mitigation efforts. The assessment also serves as a roadmap for refining and enhancing existing plans and ordinances, ensuring they are aligned with the broader hazard mitigation strategy and responsive to evolving risks and needs.

19.1 Plan, Policies, & Ordinances

In King County, numerous plans, policies, and ordinances already exist that directly address or influence the impact of hazard risks. These frameworks serve as a foundation for guiding mitigation efforts, integrating risk reduction into everyday decisions, and ensuring that communities can effectively reduce hazard vulnerabilities.

Gaps in policies for King County is National 2021 Wildlife Urban Interface (WUI) Code. Washington state parts of the 2021 code in March 2024, however, jurisdictions are waiting to adopt the code until new WUI mapping and amendments can be developed.

Table 19-1 Plans, policies, and ordinances capabilities

Plans, Policies, & Ordinances	Description	Lead Agency
30-Year Forest Plan	2021 King County 30-Year Forest Plan provide a shared county-wide vision for rural and urban forest cover and forest health.	DNRP
Building and Development Codes	Building and development codes are adopted and modified from the 2021 IBC by Washington State Building Code Council and King County. These codes help ensure that new construction and substantial improvements meet international standards, accounting for our hazard risk.	Department of Local Services (DLS) – Permitting Division
Build Code Effectiveness Grading Schedule (BCEGS)	In November 2023, the Washington Surveying and Rating Bureau (WSRB) gave King County the BCEGS rating of Class 4 for commercial properties and Class 4 for one- and two-family dwellings.	DSL

Clean Water and Health Habitat Strategic Plan	The 2020-2025 CWHH Strategic Plan seeks to establish a strategic alignment across all plans that impact clean water and healthy habitat in order to achieve "greater impact through clearer definition, smarter investment, partnerships, and innovation." This process is just starting, and it includes over 20 separate plans and programs.	Department of Natural Resources and Parks
Community Wildfire Protection Plan	The Office of Emergency Management is currently building upon the 2022 King County Wildfire Risk Reduction Strategy to develop the King County's first Wildfire Protection Plan.	KCOEM
Comprehensive Emergency Management Plan (CEMP)	The CEMP is for use by elected and appointed County officials, and King County government department directors, managers and staff in mitigating, preparing for, responding to, and recovering from disasters. (2020)	KCOEM
Comprehensive Plan	The 2024 King County Comprehensive Plan is the long-range guiding policy document for all land use and development regulations in unincorporated King County, and for regional services throughout the County including transit, sewers, parks, trails and open space. • Encourage updates to the critical areas ordinance • Provide feedback and comments on the plan	Executive's Office
Continuity of Government (COG) Plan	The King County Continuity of Government (COG) Plan addresses the continuation, resumption, and recovery of King County Government, and focuses on critical areas pertaining to government continuity: Succession of leadership Emergency authority Command and control	All KC agencies

	The COG Plan identifies how the responsibilities of King County Government, as defined by the Washington State Constitution and the King County Charter, will be preserved, maintained, or reconstructed in the event of a disaster or other event. Much of the content of the COG Plan is derived from or a direct excerpt of provisions in the King County Charter and King County Code.	
Continuity of Operations Plan (COOP)	The purpose of King County's Continuity of Operations (COOP) Plans are to provide the framework for the restoration of essential functions/processes in the event of an emergency or incident that affects operations. COOP plans identify and prioritize essential functions and processes that must continue, and include activation procedures, establishing clear lines of succession, defining who has the authority to make decisions, identifying alternate locations, and managing vital records. COOP plans help us remain resilient and capable of maintaining critical operations, even under challenging circumstances.	All KC agencies
Critical Area Ordinance	The critical areas ordinance requires the identification of geologically-hazardous and frequently-flooded areas. These areas must either be protected from development or any development in these areas must be designed to account for hazard risk. Supplemental changes to the ordinance are being incorporated into the updated 2024 King County Comprehensive Plan.	DLS
Critical Facilities Plan (Mitigation/Response/Recovery)	Capital facilities plans identify and prioritize large-scale projects. Entities involved in this include the King County Facilities Management Division and the King County Flood Control District.	Various

	• Integrate mitigation strategies from capital plans • Encourage the use of hazard information to prioritize capital improvements • Support county departments with funding gaps in accessing Hazard Mitigation Assistance to complete or expand projects that are identified as important but are unfunded or partially funded.	
Debris Removal Plan	The 2024 KC Debris Management Framework is intended to aid all of King County and its departments, including individual jurisdictions, special purpose districts, and tribes within the county. This framework will be used to support debris management activities in unincorporated King County and when individual jurisdictions, special purpose districts, and tribes within King County become overwhelmed or when there is need to coordinate resources among the various entities requesting assistance. It is intended to facilitate rapid response and recovery efforts during and after a disaster.	DNRP
Equity and Social Justice Ordinance	King County has deep and persistent inequities – especially by race and place–that in many cases are getting worse and threaten our collective prosperity. Launched by King County Executive Ron Sims in 2008 and formalized by Executive Dow Constantine and the Metropolitan King County Council via ordinance in 2010, Equity and Social Justice (ESJ) is an integrated part of the County's work and is supported by the Office of Equity and Social Justice since it was established in early 2015.	King County Executive's Office, Office of Equity and Social Justice

Equity and Social Justice Plan	The 2016-2022 Equity and Social Justice Strategic Plan is a blueprint for action and change that will guide the county's pro-equity policy direction, decision-making, planning, operations and services, and workplace practices in order to advance equity and social justice within County government and in partnership with communities. • Follow guidance in the ESJ plan for the prioritization of strategies • Develop information on populations vulnerable to hazards and share with ESJ planning teams	Executive's Office
Extreme Heat Mitigation Strategy	The 2024 Extreme Heat Mitigation Strategy focuses on reducing risks associated with extreme heat events, particularly for vulnerable populations in urban heat islands.	ECO
Flood Management Plan	The 2024 King County Flood Management Plan is a functional annex of the comprehensive plan. It outlines the County's approach to comprehensive floodplain management including land use planning, flood mitigation efforts, and flood protection facilities management. • Work with department responsible for floodplain management to write the flood risk assessment. • Work with local CRS coordinators to ensure the mitigation plan is worth the maximum number of points.	DNRP
Floodplain Ordinance	Flood hazard areas covered by King County's regulations include the floodplain, FEMA Special Flood Hazard Area, King County zero-rise flood fringe and zero-rise floodway, and channel migration zones. King County's flood hazard reduction policies, as they relate to land use and regulatory compliance, are as follows: Consistent with prerequisites for FEMA's CRS program, King County shall regulate development	DNRP

	that occurs in flood-prone areas to avoid and minimize damage to life and property and necessary public infrastructure, support other Washington State Growth Management Act (GMA) and King County Comprehensive Plan policy goals, accommodate preferred land uses outlined by the Shoreline Management Act, . King County should look for opportunities to improve, modify, or relocate existing county roads to ensure safe ingress and egress during flood events.	
Growth Management Ordinance	incorporated into the King County Comprehensive Plan. The state of Washington also has the Growth Management Act.	Executive's Office
National Pollutant Discharge Elimination System (NPDES)	The County's National Pollutant Discharge Elimination System (NPDES) municipal stormwater permit, which contains specific requirements for drainage review and inspection of development projects. In addition to the manual's standards being applied throughout the unincorporated areas, many cities throughout King County have adopted the manual and apply its standards as part of their local permitting processes.	DNRP
Post-Disaster Recovery Plan	The Office of Emergency Management is currently using the 2016 King County Recovery Framework to develop the King County Disaster Recovery Plan.	KCOEM

Public Health Plans	Public Health – Seattle & King County's 2024-2029 strategic plan describes how we will meet the most persistent and urgent health challenges facing King County, embed Racism is a Public Health Crisis into our everyday work, and strengthen our core functions to protect and promote health.	PHSKC
Sea Level Rise Risk Area Regulation	King County created a new sea level rise risk area for Vashon-Maury Island. The risk area extends inland from the edge of the existing 100-year floodplain. Under these new regulations, new homes built in the risk area must be built three feet above the 100-year base flood elevation and comply with other floodplain regulations.	DNRP
Stormwater Management Program Plan (SWMP)	The King County Stormwater Program Plan is updated annually and guides the many activities King County implements to manage stormwater. These include mapping the municipal stormwater system, coordination among county departments to eliminate barriers to compliance with stormwater requirements, controlling runoff from new development and redevelopment, updating design standards and stormwater management regulations, and operations and maintenance of the stormwater system.	DNRP
Strategic Climate Action Plan	The 2020 King County's Strategic Climate Action Plan (SCAP) is a five-year blueprint for County action to confront climate change, integrating climate change into all areas of County operations and its work in the community. The SCAP is King County's blueprint for climate action and provides a "one-stop-shop" for county decision-makers, employees, and the general public to learn about the	Executive Office

	County's climate change goals, priorities and commitments. • Inter-workgroup participation • Integrated mitigation strategies • Consistent risk assessments	
Strategic Plan for Road Services	The 2014 Road Services Strategic Plan lays out system needs and anticipated service levels and an asset management approach to road maintenance and improvement. • Integrate mitigation strategies	DLS
Surface Water Design Manual	King County's Surface Water Design Manual is a technical guide that outlines requirements for stormwater management systems in King County. It regulates proposed surface and stormwater projects through a mixture of best management practices (BMPs), performance standards, and design standards.	DNRP
Sustainable & Resilient Frontline Communities (SRFC) Framework	Sustainable & Resilient Frontline Communities (SRFC) Framework ensures that climate preparedness efforts address the disproportionate impacts of climate change on frontline communities.	ECO
Threats and Hazard Identification and Risk Assessment (THIRA)	The Threats and Hazard Identification and Risk Assessment (THIRA) is a three-year process which helps a region determine what threats and hazards the are likely to experience, provides context on those threats and hazards for planning purposes, identifies potential impacts to the region, and identifies current and desired capabilities for	KCOEM

	responding to and recovering from those threats and hazards. The THIRA uses a combination of experience and Subject Matter Expertise as well as documented capabilities and gaps, such as in After-Action Reports, to articulate the regions readiness. The gaps listed in the THIRA are often used as areas to seek additional funding to build capacity and close gaps.	

19.2 Programs

The hazard mitigation planning process has engaged participants from across these programs in order to establish a common assessment of hazards, identify potential mitigation strategies, partnerships for future projects, and to assess county capabilities to implement mitigation projects. The list below identifies King County programs that support and implement hazard mitigation and assesses the effectiveness of each.

Table 19-2 Program and special district capabilities

Programs & Special Districts	Description	Lead Agency
ALERT King County	ALERT King County is a regional emergency public information and mass notification service that uses voice, text, and email. Alerts can be sent to the public to inform them about potential hazards and threats in the area. The system is administered through CodeRed.	KCOEM
Flood Buyout Program	Any structure located in a flood-prone area of unincorporated King County may be eligible for this program. Buyouts are appropriate in areas where there is deep, fast-moving water, serious bank erosion, and significant risk of channel migration. Priority applicants for the Buyout Program are: structures located in the floodway, structures located in the channel migration zone, and FEMA Repetitive Loss Properties.	DNRP
Hazard Awareness Program	King County's Public Education & Outreach program supports emergency preparedness by integrating an all-hazards approach across	KCOEM

	prevention, response, recovery, and mitigation. It provides strategic outreach and education support to KCOEM's emergency planning and operations while engaging both government stakeholders and community members. Through initiatives such as public input processes, open houses, and the creation of educational materials, the program empowers residents to understand and manage risks.	
Hazard Mitigation	The hazard mitigation program works with partners across county departments and local jurisdictions to coordinate and promote hazard mitigation projects. The program also coordinates applications to federal Hazard Mitigation Assistance grant programs and conducts hazard mitigation planning for the county in partnership with local jurisdictions and special-purpose districts.	KCOEM
King County Conservation District	The King County Conservation District is an independent special purpose district with separately-elected commissioners. It promotes water, land, soil, and forest conservation and preservation and conducts wildfire risk reduction activities.	King County Conservation District
King County Flood Control District	In 2007, the King County Flood Control District was established to provide a proactive, regional approach to flooding as well as funding to improve the county's nearly 500 aging and inadequate flood protection facilities. Funding for the Flood Control District comes from a county-wide property levy of 12.9 cents per $1,000 assessed value. This amounts to $54 per year on a $416,000 home. The levy raises roughly $54.5 million a year. This funding dramatically increases the number of projects that can be completed each year. The additional local funding also enhances the District's ability to receive federal and state matching funds. The King County Flood Control District is a separate special purpose district.	King County Flood Control District

Land Use Planning and Zoning	Land use planning and zoning establishes growth and land use patterns that are consistent with long-range plans and supported by infrastructure.	King County Executive's Office
Landslide Hazards	The Landslide Hazards program conducts mapping and outreach associated with landslide risk.	DNRP Water and Land Resources Division
Mutual Aid Agreement	King County's mutual aid strategy was originally outlined in the Regional Coordination Framework and included an omnibus document that later became known as "the Agreement." While the broader strategy is now being incorporated into the county's Comprehensive Emergency Management Plan (CEMP), the Agreement remains a separate, binding document. The Agreement outlines the obligations and basic procedures for resource sharing between entities that have signed on. This framework ensures that during emergencies, all parties understand their roles and responsibilities in facilitating mutual aid. By maintaining the Agreement alongside the evolving CEMP, King County reinforces a structured and coordinated approach to emergency response. Ultimately, this dual approach strengthens the county's overall emergency management capabilities.	KCOEM
National Flood Insurance Program (NFIP)	Communities that participate in the National Flood Insurance Program adopt a floodplain management code in exchange for FEMA making flood insurance available to residents and businesses.	DNRP, DLS – Permitting Division
NFIP Community Rating System (CRS)	The CRS program rewards communities that have established exceptional floodplain management programs and undertaken certain activities to reduce flood risk. King County is one of the highest rated communities in the country. The program provides NFIP policyholders in floodplains with a discount of up to 40% on their insurance.	DNRP DLS KCEM

Puget Sound Climate Preparedness Collaborative	King County advances climate resilience through collaborative initiatives such as the Puget Sound Climate Preparedness Collaborative. This initiative strengthens the regional partnerships to advance climate preparedness and foster cross-jurisdictional coordination across the Puget Sound basin.	ECO
RainWise Rebate Program	RainWise helps private property owners install rain gardens and cisterns to help manage the rain that falls on their roofs. These installations can also add attractive landscaping, provide water for summer irrigation, and may reduce flooding. RainWise rebates cover most or all of the cost of installing cisterns and rain gardens on private properties in eligible combined sewer overflow basins. The average rebate is approximately $4,740.	DNRP
Regional Code Collaboration (RCC)	Jurisdictions across the Puget Sound Region work together to share resources and expertise to develop codes, policies, and tools supporting sustainable building practices that can be adopted/utilized locally.	DNRP
ShakeAlert	The USGS ShakeAlert Earthquake Early Warning system sends a warning to mobile phone users that shaking is about to occur. The system uses ground-motion sensors to detect earthquakes that have already started and estimates their size, location, and impact. When it detects a significant magnitude, the system issues a ShakeAlert® Message, providing a warning a few seconds before shaking begins.	USGS, PNSN

Shoreline Master Program	King County has nearly 2,000 miles of shoreline along major lakes and rivers and Vashon-Maury Island. These shorelines provide habitat for fish and wildlife, places for public enjoyment and space for wide-ranging waterfront land uses. The Shoreline Master Program helps preserve King County's nearly 2,000 miles of shoreline, thereby reducing risk to hazards including sea-level rise.	DLS – Permitting Division
StormReady	StormReady is an NWS planning tool to become better prepared for hazardous weather events. To become StormReady, the county had to meet specific criteria, such as having a 24-hour emergency operations center, providing severe weather notifications to residents, conducting public awareness programs, and maintaining a trained team of weather spotters. The goal is to enhance the county's readiness to respond to severe weather events, ensuring public safety and effective communication during storms.	National Weather Service (NWS)
The Integrated Public Alert & Warning System (IPAWS)	IPAWS is FEMA's national system for local alerting that provides authenticated emergency and life-saving information to the public through mobile phones using Wireless Emergency Alerts (WEA), to radio and television via the Emergency Alert System (EAS), and on the National Oceanic and Atmospheric Administration's Weather Radio.	KCOEM

19.2.1 NFIP Participation

The National Flood Insurance Program (NFIP) provides federally backed flood insurance in exchange for communities enacting floodplain regulations. Participation and good standing under NFIP are prerequisites to grant funding eligibility under the Robert T. Stafford Act. The County and most of the partner cities for this plan participate in the NFIP and have adopted regulations that meet the NFIP requirements.

Many cities in King County have mapped flood hazard areas, and 37 of the 39 incorporated municipalities participate in the NFIP; all are currently in good standing with the provisions of the

NFIP. The five jurisdictions that do not currently participate in NFIP are Beaux Arts Village, Hunts Point, Maple Valley, Newcastle and Yarrow Point. Except for Newcastle, these communities have no special flood hazard areas.

Participants in the NFIP must, at a minimum, regulate development in floodplain areas in accordance with NFIP criteria. Communities participating in the NFIP may adopt regulations that are more stringent than those contained in 44 CFR 60.3, but not less stringent. The Washington State Building Code Act requires new construction to be elevated to 1 foot above the base flood elevation or to the design flood elevation, whichever is higher. Some communities in King County have adopted more stringent standards. For example, a 3-foot freeboard (height above the 100-year flood elevation) is standard for most structures in unincorporated King County.

Additionally, in the Puget Sound watershed, communities are required to regulate development in floodplains in a way that doesn't cause habitat loss or negative impacts to Chinook, coho, and steelhead salmon species. This is part of the FEMA/NOAA Biological Opinion related to communities' participation in the National Flood Insurance Program.

In Washington State, the Department of Ecology is the coordinating agency for floodplain management. Ecology works with FEMA and local governments by providing grants and technical assistance, evaluating community floodplain management programs, reviewing local floodplain ordinances, and participating in statewide flood hazard mitigation planning. Compliance is monitored by FEMA regional staff and by Ecology. Maintaining compliance under the NFIP is an important component of flood risk reduction. All planning partners that participate in the NFIP have identified initiatives to maintain their compliance and good standing. Planning partners who do not currently participate have identified initiatives to consider enrollment in the program.

Table 19-3 King County NFIP Participants

Community Name	NFIP Participation	Curr Eff Map Date	Reg-Emer Date
Algona	No	(NSFHA)	5/25/1978
Auburn	Yes	8/19/2020	6/1/1981
Beaux Arts Village	No	(NSFHA)	2/4/2000
Bellevue	Yes	8/19/2020	12/1/1978
Black Diamond	Yes	8/19/2020	10/30/1979
Bothell	Yes	8/19/2020	6/1/1982
Burien	Yes	8/19/2020	9/30/1994

Carnation	Yes	8/19/2020	3/4/1980
Clyde Hill	No	(NSFHA)	11/3/2008
Covington	Yes	8/19/2020	4/19/2001
Des Moines	Yes	8/19/2020	5/15/1980
Duvall	Yes	8/19/2020	6/4/1980
Enumclaw	Yes	8/19/2020	8/19/2020
Federal Way	Yes	8/19/2020	6/21/1996
Hunts Point	No	(NSFHA)	1/11/2022
Issaquah	Yes	8/19/2020	5/1/1980
Kenmore	Yes	8/19/2020	11/13/1998
Kent	Yes	8/19/2020	4/1/1981
King County	Yes	8/19/2020	9/29/1978
Kirkland	Yes	8/19/2020	6/15/1981
Lake Forest Park	Yes	8/19/2020	2/15/1980
Maple Valley	No		
Medina	No	(NSFHA)	3/16/1979
Mercer Island	Yes	(NSFHA)	6/30/1997
Milton	No	(NSFHA)	
Muckleshoot Indian Tribe	No		
Newcastle	Yes	8/19/2020	9/15/2021
Normandy Park	Yes	8/19/2020	11/2/1977
North Bend	Yes	8/19/2020	8/1/1984
Pacific	Yes	8/19/2020	12/2/1980

Redmond	Yes	8/19/2020	2/1/1979
Renton	Yes	8/19/2020	5/5/1981
Sammamish	Yes	8/19/2020	5/25/2000
SeaTac	Yes	8/19/2020	9/30/1994
Seattle	Yes	8/19/2020	
Shoreline	Yes	8/19/2020	3/4/1997
Skykomish	Yes	8/19/2020	7/2/1981
Snoqualmie Indian Tribe	Yes	8/19/2020	5/11/2007
Snoqualmie	Yes	8/19/2020	7/5/1984
Tukwila	Yes	8/19/2020	8/3/1981
Woodinville	Yes	8/19/2020	10/10/1997
Yarrow Point	No		

19.2.2 CRS Participation

The Community Rating System is a voluntary program within the NFIP that encourages floodplain management activities that exceed the minimum NFIP requirements and rewards discounts to ratepayers in participating communities. King County is a Class 2 community. Flood insurance premiums are discounted to reflect the reduced flood risk resulting from community actions meeting the following three goals of the CRS:

- Reduce flood losses.
- Facilitate accurate insurance rating.
- Promote awareness of flood insurance.

For participating communities, flood insurance premium rates are discounted in increments of 5 percent. For example, a Class 1 community receives a 45-percent premium discount, and a Class 9 community receives a 5-percent discount. (Class 10 communities are those that do not participate in the CRS; they receive no discount.) The CRS classes are based on 18 creditable activities in the following categories:

- Public information

- Mapping and regulations
- Flood damage reduction
- Flood preparedness

As of this writing, there are 10 CRS-rated communities in King County.

Table 19-4 King County CRS Participation

Community Name	Class	% Discount in SFHA	% Discount in non-SFHA
Auburn	5	25%	10%
Bellevue	5	25%	10%
Issaquah	5	25%	10%
Kent	5	25%	10%
North Bend	5	25%	10%
Renton	5	25%	10%
Snoqualmie	5	25%	10%
Carnation	6	20%	5%
Redmond	5	25%	10%
King County	2	40%	10%

19.2.3 Flood Warning Program

The King County Flood Control District was established in 2007 to regionally manage flood hazards and reduce risk, in partnership with the Department of Natural Resources and Parks' River and Floodplain Management Section. The newly updated 2024 King County Flood Management Plan drives much of the work that both the District and King County do to reduce flood risk and manage flood-related hazards.

King County has a long-established Flood Warning Program that has been monitoring river systems for over 50 years. The King County Department of Natural Resources and Parks' River and Floodplain Management Section operates a Flood Warning Center that opens 24 hours a day when flooding occurs on any of the river systems with gages. For the Flood Warning Program, the rivers are measured by a "flood phase" system based on real-time flow information. When a river reaches flood phase 2, the Center opens, coordinates with local, state, and federal agencies, and accepts calls from the public requesting information about flooding. When a river reaches flood phase 3, patrol teams are sent out to monitor flood protection facilities and any potential flooding impacts. When a river reaches flood phase 4, additional staff are brought into the Flood Warning Center, sent on flood patrols, and begin to collect damage information in case of a disaster declaration.

Table 19-5 Flood Warning Phase Thresholds

Phase	South Fork Skykomish River	Tolt River	Snoqualmie	Issaquah Creek	Cedar River	Green River	White River
1	6,000 cfs	2,500 cfs	6,000 cfs	6.5 ft	1,800 cfs	5,000 cfs	4,000 cfs
2	10,000 cfs	3,500 cfs	12,000 cfs	7.5 ft	2,800 cfs	7,000 cfs	5,000 cfs
3	18,000 cfs	5,000 cfs	20,000 cfs	8.5 ft	4,200 cfs	9,000 cfs	7,000 cfs
4	27,000 cfs	8,500 cfs	38,000 cfs	9.0 ft	5,000 cfs	12,000 cfs	9,000 cfs

19.3 Staffing & Departments

With over 15,000 employees and dozens of departments and offices, King County has a tremendous capability to implement mitigation projects. Mitigation efforts are underway throughout the county, including such organizations as the Rivers and Floodplain Management Section of DNRP and the Wastewater Treatment Division of DNRP.

Staff & Departments	Description	Lead Agency
Building and Development Code Enforcement	The Department of Local Services, Permitting Division is the agency that provides land use, building and fire regulatory and operating permits, code enforcement and a limited number of business licenses for unincorporated areas of King County. Other local jurisdictions provide similar services within incorporated areas. The Code Enforcement Section investigates complaints regarding violations of King County Codes (KCC) related to zoning, building, property maintenance, shorelines and critical areas in unincorporated King County.	DLS– Permitting Division

Emergency Operations Center	The King County Emergency Operations Center (EOC) serves as the central hub for coordinating emergency response and managing resources during crisis situations. It is operated by KCOEM staff who double as Emergency Management Coordinators.	KCOEM
Facilities Management Division	The Facilities Management Division (FMD) oversees and maintains King County's real estate assets. The Major Projects and Capital Planning section is tasked with efficiently and effectively delivering large-scale projects in alignment with the policy directives of King County government, the facility needs of employees and the public, and for overall service to the community. Part of this includes the development of hazard-resilient facilities.	Department of Executive Services, FMD
Information Technology	KCIT leads the county's response to, and preparedness for, cyber incidents. KCIT has helped local cities recover from ransomware and other attacks.	KCIT
Local Emergency Planning Committee (LEPC)	The Local Emergency Planning Committee (LEPC) covers all of King County, excluding areas with other emergency plans, such as the City of Seattle, the City of Kent, and regions overseen by a Tribal Emergency Response Committee. Its primary mission is to enhance chemical safety and protect public health and the environment. The LEPC is responsible for developing a community Hazardous Materials Response Plan, conducting annual reviews of this plan, and collecting and maintaining chemical inventory forms and release reports. It also provides chemical inventory information to the public upon request.	KCOEM
Mapping Specialist (GIS)	King County GIS provides analysis support, mapping, and other data to all King County departments. This data is valuable for hazard mitigation planning activities.	KCIT

NFIP Floodplain Administrator	The NFIP (National Flood Insurance Program) Floodplain Administrator oversees and managing floodplain management activities including enforcing floodplain regulations and educating the public about flood management.	DNRP
Office of Risk Management Services	Risk Management investigates and resolves claims against King County in a fair and expeditious manner, and also provides internal services to King County agencies, including: • Insurance: King County administers a self-insurance program and purchases a variety of other insurance policies and related services consistent with good risk management practices and the needs of the County. • Contracts: Risk Management advises King County agencies on insurance requirements, indemnification, release, and hold harmless provisions in all types of contracts. Risk Management actively negotiates these provisions and, together with the Prosecuting Attorney's Office, assists agencies in pursuing and tendering claims arising out of contractual relations. • Recovery Services: The recovery section of Risk Management is charged with seeking compensation for damages caused to King County property or injury to King County employees by negligent third parties. • Loss Control Program: The Loss Control Manager works with King County agencies to identify areas of potential loss and recommend strategies to reduce exposure to liability. The Loss Control Program also administers continuing workplace training and education for King County employees. Part of this work includes the development and maintenance of a risk register of events and information on how those events can impact King County.	Department of Executive Services
Road Services Division	Road services builds and maintains over 2000 miles of road and 200 bridges. They are responsible for many mitigation activities,	Department of Local Services

	including those related to culvert replacement, pavement preservation, and bridge retrofits.	
Wastewater Treatment Division	Invest in upgrades to pipe and water treatment facilities to make them more resilient to earthquakes, severe weather, flooding, and climate-change.	DNRP

19.3.1 Departments and Jurisdiction Coordination

Beyond departmental collaboration, King County works with local jurisdictions, special purpose districts, and Tribes to support effective risk reduction. King County coordinates activities related to emergency management and hazard mitigation through two bodies, the Emergency Management Coordinating Committee (EMCC) and the Emergency Management Advisory Committee (EMAC), which are each described in greater detail in the table below.

Table 19-6 King County Stakeholder Integration Capabilities

Committees	Description	Membership
Emergency Management Coordinating Committee (EMCC)	EMCC is charged by the King County Council with coordinating interdepartmental emergency preparedness matters. EMCC works to support departments in developing continuity of operations plans (COOP), preparedness plans, and hazard mitigation plans. It also contributes to after action reports. EMCC has played an important role in the mitigation plan update process for the county by identifying and dedicating key staff to participate in planning and by reviewing and providing feedback on planning team activities.	EMCC is made up of internal King County agencies/departments. All county departments are included in the EMCC. The following are those who attend meetings more regularly: • Assessor • Community and Human Services • District Court • Elections • Executive Services • Human Resources • Judicial Administration • Information Technology • King County Council • King County Executive • Local Services • Metro Transit • Natural Resources and Parks • Prosecuting Attorney • Public Health • Public Defender • Sheriff

		• Superior Court
Emergency Management Advisory Committee (EMAC)	EMAC advises, assists, reviews, and comments on emergency management and homeland security issues, regional planning, and policies. They measure and prioritize core capabilities and recommend homeland security allocations and work products to sustain and enhance preparedness and operational levels. Members, as set forth in code, provide regional and multi-disciplinary perspective, and represent cities, fire service, law enforcement, hospitals, the Port of Seattle, government, special purpose districts, tribes, utilities, non-profit agencies, and the private sector.	EMAC is made up of both internal and external partners. The committee is composed of members who represent the following emergency management interests: • Central region EMS and Trauma Care Council • City of Bellevue • City of Kent • City of Renton • City of Seattle • 1 Utility • 1 Faith-Based Organization • 1 Financial Community Organization • American Red Cross • KC DNRP • KC Metro • KC Roads • KC Executive Office • King County Fire Chief's Association • King County Fire Commissioner's Association • King County Police Chief's Association • King County Sheriff's Office • KC Local Emergency Management Planning Committee • Muckleshoot Tribal Nation • Northwest Healthcare Response Network • Port of Seattle • 1 Private Industry Representative • Public Health Seattle and King County • Puget Sound Educational Services District • Snoqualmie Tribal Nation • Sound Cities Association • Washington Association of Building Officials

EMAC, in particular, serves as the advisory body designated by the funding requirements to provide input from a stakeholder group. However, the committee's role has evolved over time, influenced by how the federal and state guidelines for distributing funds—specifically the State Homeland Security Grant Program (SHSP)—are structured. Members are tasked with forming a task force to prioritize projects by discipline for submission to the state for competitive funding consideration. EMAC's involvement primarily focuses on the SHSP, though they are informed about other HSGP awards (excluding UASI, which follows a separate process) for transparency and awareness.

19.4 Potential Funding Sources

Hazard mitigation projects are most often completed with funding from capital budgets as part of the normal building and maintenance processes that occur in any jurisdiction. There is also source and use-specific funding, such as that provided by the King County Flood Control District that is part of regular program funding and is highlighted in the program section above. Beyond regular capital funding, there are dedicated mitigation programs operated by state, county, and federal agencies.

Table 19-7 Potential sources of hazard mitigation funding

Program	Lead Agency	Description	Project Types
Federal Programs			
BUILD Grants	Department of Transportation (DOT)	Grants support investments in surface transportation infrastructure and are to be awarded on a competitive basis for projects that will have a significant local/regional impact.	Transportation and related infrastructure retrofits, including stormwater projects
Building Blocks for Sustainable Communities	Environmental Protection Agency (EPA)	This EPA program provides targeted, technical assistance to communities to develop resilience plans, development plans, sustainability strategies, etc.	Planning and feasibility studies
Climate Resilience Regional Challenge grant	National Oceanic and Atmospheric Administration (NOAA)	A competitive grant program is focused on collaborative projects that increase the resilience of coastal communities to extreme weather and other climate change impacts, including sea level rise and drought.	Coastal flooding, sea level rise, restoration, nature-based improvements

Community Development Block Grants (CDBG)	Department of Housing and Urban Development (HUD)	CDBG funds comprehensive plans, limited infrastructure planning/construction, feasibility studies, community action plans. Income and population restrictions apply.	Housing and infrastructure retrofits, feasibility studies, planning
Cooperating Technical Partnership Program	Federal Emergency Management Agency (FEMA)	The program creates partnerships between FEMA and qualified local and state partners to create, maintain, and publicize up-to-date flood and other hazard maps and data.	Planning, outreach, feasibility studies
Emergency Watershed Protection Program	Natural Resource Conservation Service (NRCS)	Emergency recovery measures for runoff retardation and erosion prevention to relieve imminent hazards created by a natural disaster.	Infrastructure retrofits, slope stabilization, source-water protection, flood risk reduction, erosion prevention
Flood Mitigation Assistance (FMA) Grant Program	Federal Emergency Management Agency (FEMA)	FMA provides funding to local jurisdictions and states for projects and planning that reduces or eliminates long-term risk of flood damage to structures insured under the NFIP.	Flood risk reduction projects that benefit the NFIP, including acquisitions, elevations, and some structural mitigation such as local risk reduction structures and dry floodproofing.
Hazard Mitigation Grant Program	Federal Emergency Management Agency (FEMA)	HMGP is authorized statewide after a disaster declaration and is the most flexible of FEMA's three mitigation programs. Jurisdictions must have an approved hazard mitigation plan and projects must be cost effective.	Most long-term risk-reduction projects that protect against fire, flood, earthquake, and other natural hazards.
Post-Fire Hazard Mitigation Grant Program	Environmental Protection Agency (EPA)	Program authorized following a Fire Management Assistance Grant (FMAG) declaration. Program focuses on wildfire risk and post-fire	Fire-related mitigation, including defensible space, generators, and post-

		risk mitigation, including fuels reduction and post-fire flood control projects. Program prioritizes the county receiving the FMAG declaration.	fire flood risk reduction, planning, feasibility studies
State Homeland Security Program (SHSP)	Federal Emergency Management Agency (FEMA)	SHSP is divided up into two sections, the National Priority Area projects are competitive at the state level and voted on by the Homeland Security Coordinators for each region. The remaining funds are allocated direct to each region for them to cover other projects not approved through the National Priority Area projects. All projects must be primarily for counter-terrorism projects.	Planning, staffing, counter-terrorism, equipment, training, exercises
State & Local Cybersecurity Grant Program (SLCGP)	Federal Emergency Management Agency (FEMA)	SLCGP is a federal program that helps state, local, and tribal governments improve cybersecurity and protect their systems from threats.	Firewalls, system testing, cybersecurity monitoring, identity management (multi-factor authentication), training, and policy development.
Urban Area Security Initiative (UASI)	Federal Emergency Management Agency (FEMA)	The UASI functions through targeted subcommittees that provide grant projects to Urban Area Working Group Voting Members for review and finally to the Core Group for approval. Each of the 5 jurisdictions have one representative at each of these levels. All projects must be primarily for counter-terrorism projects.	Planning, staffing, counter-terrorism, equipment, training, exercises
Urban and Community Forest Program	Department of Agriculture (USDA)	Program provides technical, financial, research and educational services to local jurisdictions and organizations for the preservation, protection, and restoration of forestlands.	Natural resource protection, public information, planning

State Programs			
Community Economic Revitalization Board	WA Department of Commerce	CERB provides loan funding to local jurisdictions for public infrastructure to support private business growth and expansion.	Infrastructure retrofits, public-private partnerships
Combined Water Quality Funding Program	WA Department of Ecology	Fund sources for projects associated with publicly-owned wastewater and stormwater facilities. The integrated program also funds nonpoint source pollution control activities.	Drinking-water system improvements, feasibility studies, source-water protection, infrastructure retrofits
Drinking Water State Revolving Fund	WA Department of Health	The Drinking Water State Revolving Fund (DWSRF) provides loans to drinking water systems to pay for infrastructure improvements. In some cases, partial loan forgiveness is offered.	Infrastructure retrofits, source-water protection, planning, drinking-water system improvements
Estuary and Salmon Restoration Program	WA Department of Fish and Wildlife (DFW)	ESRP provides funding restoration and protection efforts in Puget Sound, including projects such as flood storage, erosion control, and climate resilience measures.	Acquisitions, slope stabilization, flood risk reduction projects, ecosystem restoration
FireWise Fuel Mitigation Grant Program	WA Department of Natural Resources	The Fuel Mitigation Grant provides a cost share for communities engaged in defensible space and fuels reduction projects.	Wildfire fuels reduction, defensible space
Flood Control Assistance Account Program (FCAAP)	WA Department of Ecology	FCAAP provides two types of grants to communities; (1) planning grant, which supports integrated flood hazard management planning by communities. this planning has to be related to a new or existing comprehensive flood hazard management plan or CFHMP; and (2) emergency grant that supports local emergency response activities.	Planning, mapping, permitting, engagement, response, recovery, federal match

Floodplains by Design	WA Department of Ecology	Floodplains by Design is the primary grant program for projects that reduce flood hazards while restoring the natural functions that Washington rivers and floodplains provide.	Slope stabilization, ecosystem recovery, flood-risk recovery
Public Works Board	WA Department of Commerce	Low-interest loans for pre-construction or new construction for replacement/repair of infrastructure for stormwater, solid waste, road, or bridge projects. Emergency loans are available for public projects made necessary by a disaster or imminent threat to public health and safety.	Utility and infrastructure retrofits
Source Water Protection Grant Program	WA Department of Health	Projects and studies to identify solutions to source water protection problems, implement protection plans, or update data that directly benefits source water protection.	Source-water protection, drinking water system improvements, other retrofits, feasibility studies
Transportation Improvement Board	WA Transportation Improvement Board	TIB makes and manages street construction and maintenance grants to 320 cities and urban counties.	Infrastructure retrofits, flood risk reduction
Local Programs			
Community Climate Resilience Grant Program	King County	The CCR Grant Program funds community-based climate justice projects in communities disproportionally impacted by climate change.	Community capacity development, public health, emergency preparedness, heat mitigation
Flood Control District Flood Reduction Grants	King County Flood Control District	The Flood Reduction Grants target medium and small local flood reduction projects including projects where the control of stormwater will have a direct benefit in reducing flooding. Eligible applicants include	Projects can address either existing or potential flooding and proposals should show that the flooding has current

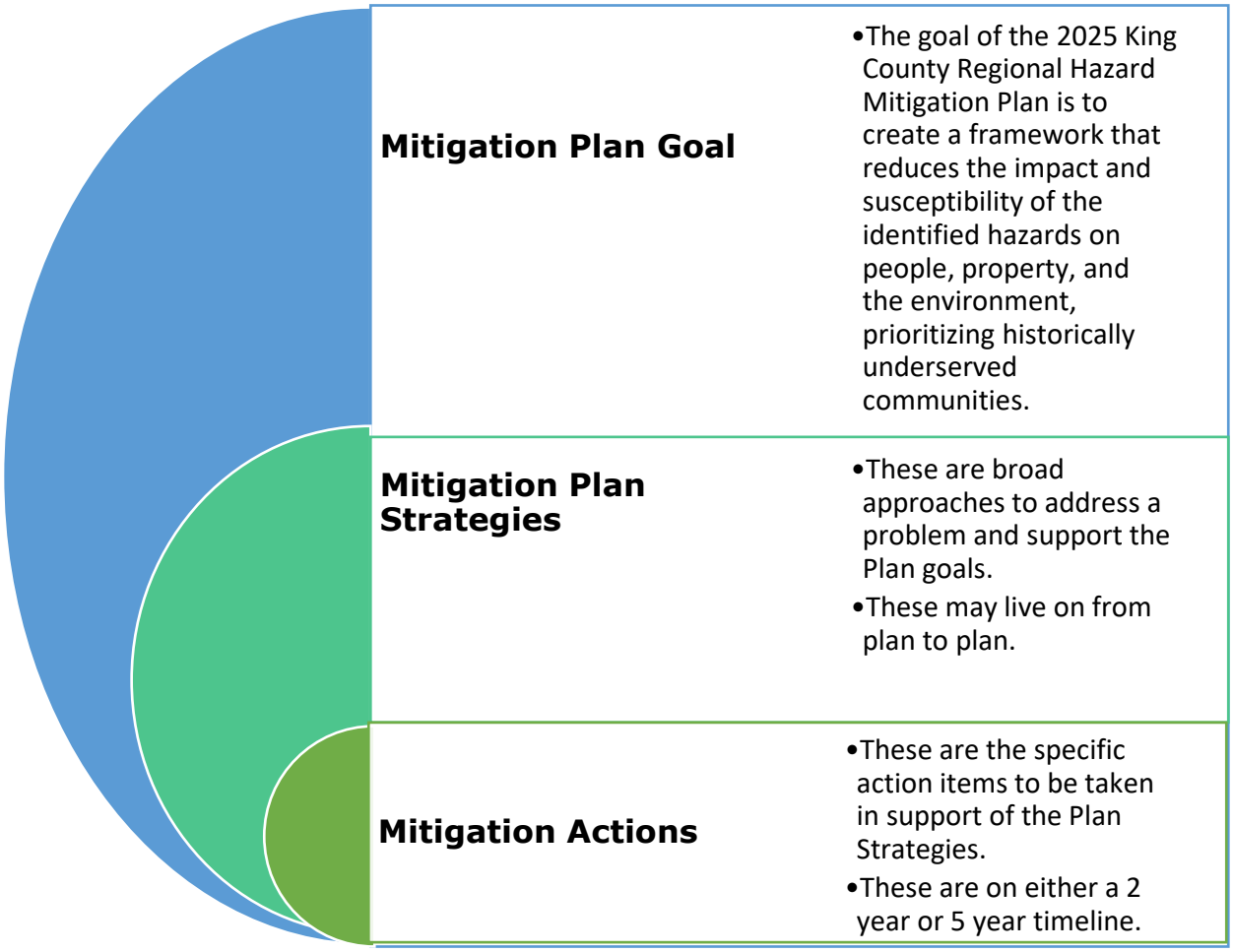
		homeowners, special districts, tribes, cities, and county agencies.	or potential economic impacts.
General Budget	King County	The two-year King County budget for 2019-2020 was approximately $11.6 billion dollars. Approximately 15% of this money makes up the general fund. Major Expenditures are: Metro Transit (21%), Wastewater (14%), Health & Human Services (13%), and Law, Safety, & Justice (12%). There are ~15,000 full-time-equivalent (FTE) county employees with most employed in Transit (35%), Criminal Justice (25%), and Public Health (9%).	Various
Loss Control Fund	King County Office of Risk Management	The Loss Control Fund is for internal county projects and is limited to emergent risks where advance planning and budgeting were unavailable. $2M has been appropriated for the 2019-2020 biennium.	Emergent risks, to include likely infrastructure failure
Conservation Futures Tax levy	King County DNRP	Conservation Futures is an open space acquisition grant program. Our grants help buy parks and open spaces such as natural lands, urban greenspaces, forests, community gardens, farms, and trails.	Land acquisitions
Parks Levy	King County	Revenue generated by the parks levy goes to fund open space protection, new parks, trails, and other assets. This funding could theoretically be used for the acquisition of threatened properties for preservation as open space.	Acquisition of high-hazard properties for preservation as open space
Non-Government Organization (NGO) Programs			
American Cities Grant	Kresge Foundation	Kresge Foundation seek efforts that will result in expanded opportunity for city residents, engage the community in a meaningful way,	Varies

		have potential for long-term sustainability or community impact, and have potential for scalability or translation to other communities. We use an array of funding and investment tools to foster change, including project grants, operating support, planning grants and program-related investments.	
Cooling Program	ClimateWorks Foundation	The ClimateWorks Cooling Program leads the clean Cooling Collaborative, an initiative advancing efficient, climate-friendly cooling for all. Clean Cooling Collaborative focuses on solutions that cool people and the planet, including super-efficient appliances, climate-friendly refrigerants, and passive cooling.	Extreme heat
Environment Program Grants	Hwelett Foundation	The Environment Program makes grants to address climate change globally and to conserve the U.S. West. The Foundation make a wide range of grants to protect the extraordinary natural resources of the Western United States, and back efforts to build broad public support and empower citizens who care about the conservation of land, water and air in the West.	Conservation
National Climate Solutions RFP	Paul G. Allen Family Foundation	This Paul G. Allen Family Foundation initiative, with an RFP announced in 2024, will fund 3-5 rigorous, place-based Natural Climate Solutions efforts in the Pacific Northwest. The foundation is looking to fund programs that accelerate climate change mitigation, while also providing biodiversity and human wellbeing co-benefits.	Resiliency, nature-based solutions

Resilient Community Impact Fund	Resilient Cities Network (RCN)	RCN has established the Resilient Community Impact Fund, providing critical funding to cities and organizations to initiate local resilience projects. This fund supports initiatives designed to help communities withstand the impacts of extreme weather events, including heatwaves and flooding.	Resiliency, extreme heat, fooding
Rural Community Assistance Corporation	Rural Community Assistance Corporation	Water, wastewater, stormwater, and solid waste planning; environmental work; to assist in developing an application for infrastructure improvements for small, rural communities.	Planning, feasibility studies
Rural Water Revolving Loan Fund	National Rural Water Association	The RWLF provides low-cost loans for short-term repair costs, small capital projects, or pre-development costs associated with larger projects to small, rural communities.	Source-water protection, drinking water system improvements, other retrofits
Wildfire Resilience Initiative	Moore Foundation	The Wildfire Resilience Initiative aims to support a transformation in the role that fire plays and is perceived to play in Western North America, from an unwanted, destructive threat to a vitalizing element in our landscapes.	Wildfire

Chapter 20: Mitigation Strategies

The primary focus of this plan update was the creation of new comprehensive, operationally viable hazard mitigation strategies and promote their implementation. Plan strategies were developed using the following structure:



Hazard mitigation strategies were developed by KCOEM and various KC agencies as described in the planning partner engagement section of the introduction.

The KCOEM Hazard Mitigation Team coordinated with each KC agency and assisted with each developing and submitting a list of potential hazard mitigation strategies and projects.

20.1 Mitigation Plan Goal

The goal of the 2025 King County Regional Hazard Mitigation Plan is to create a framework that reduces the impact and susceptibility of the identified hazards on people, property, and the environment, prioritizing historically underserved communities.

20.2 Mitigation Plan Strategies

Mitigation Plan Strategies will be developed based on threats to essential assets and capabilities from hazards within cities and unincorporated areas of King County. In the past these have included strategies for risks such as land movement and flood impacts and projects such as bridge seismic retrofits and generators for critical facilities. For this plan, hazard mitigation strategies are sets of coordinated actions that, taken together, address a risk or vulnerability. They are comprehensive, long-term, and designed to be regularly updated as actions are completed.

The updated strategy format will be used going forward in order to better support long-term tracking of mitigation actions and strategies. The updated strategy template is displayed below.

Table 20-1 Mitigation strategy template

<table>
<tr><td>Lead Points of Contact (Title)</td><td>Partner Points of Contact (Title)

Who else outside your jurisdiction benefits from the strategy or will help implement the strategy?</td><td>Hazards Mitigated</td><td>Funding Sources and Estimated Costs</td></tr>
<tr><td colspan="4">Strategy Vision/Objective

Long-term objective and vision for the strategy</td></tr>
<tr><td colspan="4">Mitigation Strategy

Describe the program/proposed program</td></tr>
<tr><td colspan="2">2-Year Objectives</td><td>5-Year Objectives</td><td>Long-Term Objectives</td></tr>
</table>

Implementation Plan/Actions *This can provide a timeline, indicate partners, discuss implementation stages, etc. Use this to discuss how the strategy/program will be implemented over the long term.*
Performance Measures

With the support of King County Risk Management, this template will be built into a database where strategies can be entered, updated, and projects can be tracked consistently and effectively. The goal is for strategies to remain in place through future updates, while implementation plan actions are changed.

20.3 Mitigation Plan Actions

Mitigation Plan Actions represent the specific work to be done to mitigate a risk or hazard. Candidate actions will be developed and considered for and by each participating jurisdiction. These actions will be taken into consideration when scoring the overall strategies for prioritization.

20.4 Prioritizing Mitigation Strategies

Emergency management is centered around communities and people – those who understand their communities' unique demographic, economic, and physical characteristics best and know the most appropriate actions necessary to promote resilience and facilitate recovery from disaster. While several studies show the disproportionate impacts of disasters, they also show that federal response programs intended to support communities before and after disasters are also inequitable and inaccessible for those most vulnerable. Likewise, the methods used to quantify disaster impacts and justify risk reduction measures and mitigation projects do not account for the disparate impacts of these hazards. This incomplete measure of the total effects lends itself to prioritizing projects that can ignore measures that reduce the long-term consequences of disasters in these populations. Moreover, the siloing of these impact considerations fails to acknowledge the compounding effects these disasters can have on our built environments, nor do they offer tailored solutions designed to meet the unique needs of these communities.

It's no secret that humanity continues to have an adverse effect on weather, and human-induced climate change has led to an increase in the frequency of catastrophic devastation caused by severe weather. Historically marginalized populations, due to historic housing discrimination and housing

segregation, continue to suffer more damage from these disasters and take the longest to recover (for a summary, see the Brookings memo "Hurricanes Hit the Poor the Hardest"). These communities are most likely to exist in disaster-prone areas, lack sufficient financial resources for emergencies, and generally are less resilient to climate change, natural disasters, and their increasing devastation. Further, lower-income and minority communities are much more likely to experience public forms of vulnerability, epitomized by substandard infrastructure and less public infrastructure investment overall, and are in close proximity to hazardous materials with less public protection. Previous research shows that the primary determinants of post-disaster recovery include socioeconomic and demographic conditions, pre-existing vulnerability, and access to and receipt of aid, of which the most marginalized and vulnerable communities struggle.

Too often, disaster risk reduction strategies and mitigation projects are assessed with an equity and social justice lens too late in the process to be effective. However, with the right changes, we can turn this around. In 2019, King County set out to apply an approach to prioritization of mitigation projects designed to benefit those most vulnerable to disaster. With the adoption of the previous iteration of our hazard mitigation plan, we became among the first counties in the nation that applied an equity approach both in our base plan and subsequent annexes, as well as our project prioritization. We recognize the continuing inequities present in our society and in our pre-disaster preparedness and response, and, again, call for a reconsideration of all projects regardless of those targeted. Our industry has only recently begun incorporating equity into our work, and the prioritization methods used so far have not been effective. Likewise, research shows that emergency managers have a long road ahead. By prioritizing disaster risk reduction and mitigation projects that account for this institutional failure, we can make a significant and positive impact over time, increasingly putting more resources in areas and communities where they are needed most.

Methods

Before revising the previous method for ranking mitigation projects based on equity, the core planning team reviewed the last version of the document and found several deficiencies:

1. Localities did not have rigid guidelines against which to rank their projects.
2. The language following the factors was either vague or supposedly inherent in the mission of hazard mitigation.
3. Localities were given the 14 determinants of equity and informed on their importance but needed to be given practical strategies to analyze these determinants and factors in their projects.
4. Because the matrix lacked structure and guidelines, projects could be ranked in a manner determined by an individual contributor that was inconsistent with other rankings elsewhere in the county using the same matrix.

This methodology solves several of these issues by providing localities annexing onto the hazard mitigation plan guidelines on how to rank their projects, straightforward language and scoring methods allowing for consistency in project rankings across the county. These methods were discussed again with the larger hazard mitigation planning team and reviewed by internal Office of Emergency Management Equity and Social Justice Change Team members, the Department of Executive Services Intradepartmental Teams, and the Office of Equity, Racial, and Social Justice. FEMA determined these methods to meet the Justice40 Initiative requirements for localities seeking future federal funding for hazard mitigation projects.

King County developed a prioritization process based on criteria taken from national best practices and priorities identified by the King County Executive. These criteria are used to prioritize projects within strategies. Strategies are also prioritized in this way to identify those areas of emphasis for KCOEM and the mitigation steering committee, though this may not impact which strategies are implemented since many depend on exclusive funding sources. The below criteria will be used to establish priorities. These priorities will be applied to projects annually for submission to FEMA Hazard Mitigation Grants.

The updated scoring matrix broken into categories, like previous iterations. These categories are **Economics and Equity; Multi-Jurisdictional; Multi-Beneficial; Community Resilience and Long-Term Vulnerability Reduction; Climate, Environment and Sustainability; Effectiveness; Urgency; and Shovel-Ready.** Each category is given a score between 0 and 4, with 0 being the lowest score a project can receive in a certain category and 4 being the highest. Due to the close collaboration between urban and land-use planners, public works and emergency management professionals, environmental regulators, government officials, and community members needed to analyze these projects we removed negative scoring as a component of this version. It's important to note that communities should prioritize projects that have high marks in all categories, with a particular emphasis on the first four, when funding becomes available. We do, however, recognize these projects typically require significant financial investments well beyond the capacity of localities and grant funding over several years and lower-ranked projects may be more feasible with limited funding and time. Below you will find the factors for consideration and the process by which to analyze and score potential mitigation projects.

- 0 Unsatisfactory for this factor
- 1 Minimal level of standards for this factor
- 2 Satisfactory level of standards for this factor
- 3 High level of standards for this factor
- 4 Outstanding or beyond expectations for this factor.

Table 20-2 Mitigation strategy priority scoring matrix

2025 Hazard Mitigation Strategy:	
Factors for Consideration	**2025 Hazard Mitigation Strategy Score**
• Economics and Equity (project is designed to benefit, account for, and include vulnerable populations, especially those in the community most likely to suffer harm from a disaster and those likely to take longest to recover after a disaster)	
• Multi-Jurisdictional (project is supported by multiple jurisdictions or agencies)	
• Multi-Beneficial (project has benefits beyond hazard risk reduction, including environmental, social, or economic benefits)	
• Community Resilience and Long-Term Vulnerability Reduction (project is designed to increase community resilience and focus on the long term impacts to vulnerable areas)	
• Climate, Environment, and Sustainability (project helps people, property, and the environment become more resilient to the effects of climate change, regional growth, and development)	
• Effectiveness (project is designed to attain the best-possible benefit-cost ratio)	
• Urgent (project is urgently needed to reduce risk to lives and property)	

• Shovel-Ready (project is largely ready to go, with few remaining roadblocks that could derail it)	
Total Scores	

Process Note: Once a jurisdiction has prioritized projects within that jurisdiction, those projects will be advanced to the regional plan. If ever there is competition between projects advanced from different jurisdictions, the RHMP Steering Committee, consisting of representatives from county departments and jurisdiction partners, will establish the order of priorities based on the values identified above. The Steering Committee will also organize priority projects with corresponding strategies. It should be noted that while prioritized projects will be included in the plan, they may not all receive funding. The Steering Committee may also seek to promote a diversity of projects so that all plan goals receive some benefits. In the case of a tie between projects during scoring, the higher prioritization may go to the less-represented mitigation strategy.

20.5 Crosswalk with the Strategic Climate Action Plan

Several strategies appear in some form in both the 2025 SCAP and this plan. This was done to ensure multiple avenues of implementation and monitoring and to help relevant actions gain a higher profile with other departments. Below are strategies that appear in some form in both plans. It is important to note that strategies can be added to this list throughout the lifecycle of both plans.

Table 20-3 Mitigation strategies developed with the 2025 Strategic Climate Action Plan (SCAP)

Regional Hazard Mitigation Plan Strategy	Strategic Climate Action Plan Action
Integrate Hazard Mitigation into County Plans	OEM Hazard Mitigation Training
2024 Floodplain Management Enactment	2024 Floodplain Management Enactment
Resilience Hubs	Resilience Hubs
Community Wildfire Protection Plan	Community Wildfire Protection Plan
Extreme Heat Communications	Implementation of Extreme Heat Strategy
Climate Change and Health Adaption	PHSKC Climate Impacts

20.6 Mitigation Strategy 2020 Status Updates

The format for hazard mitigation strategies has been completely changed in the 2020 plan update. All actions previously identified have been removed and/or incorporated into new mitigation strategies. The updated strategy format will better support tracking and implementation of mitigation strategies and their constituent actions. Strategies that are preparedness focused have been removed, as well as those that are ongoing in nature and do not have specific targets or responsible entities.

The following tables are taken from the 2023 annual progress report for the 2020 King County Regional Hazard Mitigation Plan. This list only includes strategies submitted by King County departments and countywide strategies. Individual jurisdiction action progress reports are included in each annex. The new statuses for strategies include:

- Removed – Strategy is not carried forward into the new plan
- Complete – Strategy is complete and not carried forward into the new plan
- Updated – Strategy is updated and carried forward into the new mitigation plan.

CURRENT PROGRESS ON 2020 ACTION PLAN INITIATIVES				
Progress (Yes/No)	Timeline	Update Status	Comment (Describe progress or changed priority)	2025 Status
DLS – Roads: Reduce Flood Impacts to Unincorporated King County Road System				
Yes	Long Term	Removed	This study looks at different ways to reduce or eliminate traffic problems caused by flooding in the Snoqualmie Valley. It focuses on keeping at least one of four existing roads and bridges that cross the Snoqualmie River open during floods rather than solving the flooding itself. The county and our partners began the Cross Valley study in December 2022. The first phase was completed in October of 2024.	Ongoing
DLS – Roads: Increase Seismic Resilience of Bridges in Unincorporated King County				
Yes	Long Term	Removed	The study "Impacts of Cascadia Subduction Zone M9 Earthquakes on Bridges in Washington State" was published in June 2022. Work on retrofitting bridges in King County continues.	Ongoing
DNRP – WLRD: Stormwater Outfall Erosion Hazard Inventory				
Yes	Long Term	Removed	The King County Stormwater Management Action Plan was completed December 21, 2022. Seeking funding for action items in the plan continues.	Ongoing
DNRP – WTD: Resilience in Design and Build of Critical Water Treatment and Conveyance Facilities				
Yes	Long Term	Removed	West Point is undergoing upgrades to make the facility more resilient in the event of an earthquake. King County is improving large, enclosed sedimentation tanks that play a key role in the wastewater treatment process. This project began in 2021.	Ongoing
DNRP – WLRD: Landslide, Erosion, and Sedimentation Event Mapping				
Yes	Long Term	Removed	King County routinely updates its iMap layers including landslide and erosion. This work is expanded upon in the 2025 strategies.	Ongoing
DNRP – WLRD: Stormwater and Surface Water Infrastructure Risk Reduction				

Yes	Long Term	Removed	Action items for this strategy can be located in the Stormwater Management Action Plan of 2022.	Ongoing
DNRP – WTD: Sea Level Rise Resilience in Wastewater Facilities				
Yes	Long Term	Removed	Work continues in addressing the impacts of Climate Change on WTD facilities.	Ongoing
DNRP - WTD: Control System Security and Performance				
Yes	Long Term	Updated	Cyber-attacks continue to be an ongoing threat for DNRP and other King County agencies. The work on this strategy is expanded upon in the 2025 strategies.	Ongoing
DNRP – WTD: GIS Emergency Response Mapping and Real-Time Flow Data				
Yes	Long-term	Updated	In 2022 King County created the Equity in Response Planning tool that addresses a majority of mapping layers identified in this strategy. The work for improving and updating those layers is an ongoing project for King County.	Ongoing
KCIT- Emergency Communications Enhancements				
Yes	Short Term	Removed	All King County agencies have received new 800MHz Radios and routinely complete bimonthly radio checks. KCOEM offers trainings to agencies on how to use these radios.	Complete
DNRP – WTD: Emergency Event Management System				
Yes	Long-term	Removed	DNRP staff and other KC staff routinely test and train on how to use WebEOC.	Ongoing
DNRP – Flood Services: Flood Warning System				
Yes	Long Term	Updated	The purpose of the King County Flood Warning System is to warn KC residents about rising floodwaters on major rivers so they can prepare before serious flooding occurs. In most places, the warning system provides at least 2 hours lead time before floodwaters reach damaging levels. Since flooding is a common occurring hazard in the	Ongoing

			County, the work that the Flood Warning System does is expanded upon in the 2025 strategies.	
DNRP/KCOEM: Post-Flood Recovery Efforts				
Yes	Long Term	Updated	KCOEM continues to work with partners to create a comprehensive Recovery Plan including recovering from floods. KCOEM staff are routinely trained on how to complete damage assessments in addition to understanding how FEMA's IA and PA programs are implemented.	Ongoing
DNRP – Flood Services: Home Elevations				
Yes	Long-term	Removed	Homeowners located in a flood-prone area of King County may be eligible for help from the Flood Elevation Program. Currently funding is only available for home elevation projects in the Snoqualmie River Basin. The first floor of the home must be below the Base Flood Elevation as documented on a FEMA Elevation Certificate produce by a licensed surveyor. There is usually more property owners interested in this program than funds available. King County maintains a list of property owners who want to participate in the program and will reach out to them as funds become available. The elevation program is only for properties where the owner has agreed to take part in the program.	Ongoing
DNRP – Flood Services: Home Acquisitions and Relocations				
Yes	Long-term	Removed	The King County Flood Buyout Program purchases homes at risk of damage from flooding. Buyouts are voluntary. Flood-prone properties and structures are sold to King County and all structures are removed. Flood buyouts eliminate future flood damages and health and safety risks for owners and rescuers. This helps reduce the cost of emergency response actions such as evacuations, emergency shelters, temporary housing, debris	Ongoing

			removal and repairs to damaged structures. After all structures are removed, the property is restored to permanent open space. This allows more room for flood water storage and flow, and creates natural space for fish, wildlife, and passive recreation. Any structure located in a flood-prone area of unincorporated King County may be eligible for this program. Buyouts are appropriate in areas where there is deep, fast-moving water, serious bank erosion, and significant risk of channel migration.	
DNRP – WLRD: Protect and Restore Natural Floodplain Functions				
Yes	Long-term	Removed	The 2024 King County Flood Management Plan outlines a vision for reducing flood and flood-related risks countywide. It describes the actions King County will take to manage risks associated with flooding along our rivers, creeks, and shorelines, including opportunities for the County to work with cities, partners, and community members to build flood resilience. These action items include many that restore natural floodplain functions.	Ongoing
DNRP – WLRD: Flood Risk Mapping				
Yes	Long-term	Updated	Flood maps are one tool that communities can use to know which areas have the highest risk of flooding. The maps help people make decisions about where to live, what to build, and how to reduce flood risks. Property owners, insurance agents, and lenders can use flood maps to determine flood insurance requirements and policy costs. King County conducts flood studies using the latest data and technology to produce more accurate flood maps. These maps are submitted to the Federal Emergency Management Agency (FEMA) for adoption. King County routinely updates	Ongoing

			its Flooding Layers in iMap with the most recent data. This is expanded upon in the 2025 strategies.	
DNRP/KCOEM: Public Information Flood Activities				
Yes	Long-term	Removed	Both DNRP and KCOEM update their public websites including www.kcemergency.com which provides residents on the latest information on signification events happening in King County, including flooding.	Ongoing
DNRP – Flood Services: Flood Insurance Promotion				
Yes	Long-term	Removed	King County has a Class 2 CRS rating. A Class 2 rating provides a 40 percent discount on flood insurance premiums for all insurable properties located within unincorporated King County. King County was the first county in the nation to achieve this rating in 2007 and remains one of only three counties in the region with a Class 2 rating. In 2022, flood insurance policyholders in unincorporated King County saved $806,292, an average of $523 per annual policy. This work is located in the updated Floodplain Management Plan.	Ongoing
DLS/DNRP: Enforce Higher Floodplain Management Regulations				
Yes	Long-term	Removed	This strategy is addressed in the 2024 King County Floodplain Management Plan.	Ongoing
DNRP – Flood Services: Manage Flood Protection Facilities				
Yes	Long-term	Removed	This strategy is addressed in the 2024 King County Floodplain Management Plan.	Ongoing
FMD: Seismic Evaluation of King County Courthouse and Maleng Regional Justice Center				
No	Long-term	Removed	King County was not awarded a PDM grant for this project in 2020.	No Progress

FMD: Kent Valley Flood Facility Mitigation				
Yes	Long-term	Removed	Work identified for this strategy can be located in the 2024 King County Floodplain Management Plan.	Ongoing
KCOEM: Integrate ESJ into Mitigation, Response, and Recovery Activities				
Yes	Long-term	Removed	KCOEM continues to integrate ESJ into all aspects of their work.	Ongoing
KCOEM/ECO: Mitigate Weather Impacts to Vulnerable Communities				
Yes	Long-term	Removed	The Extreme Heat Mitigation Strategy was completed in 2024 and includes 20 actions. The actions take a comprehensive approach to equitably preparing people and places in King County for the impacts of hotter summers and more extreme heat events. The King County Extreme Heat Mitigation Strategy was co-developed in collaboration with state and local governments, service providers, community-based organizations, frontline communities, and other partners to provide strategic direction for local and countywide work on heat mitigation.	Ongoing
KCOEM: Seismic Lifeline Route Resilience				
Yes	Long-term	Removed	WSDOT updates its Online Map Center with Seismic Lifeline layers. The last update was in June 2024.	Ongoing
KCOEM: Integrate Hazard Mitigation and Comprehensive Planning				
Yes	Long-term	Removed	KCOEM addresses hazard mitigation in the updated county comprehensive plan.	Ongoing
KCOEM: Engage Community Organizations in Emergency Management				
Yes	Long-term	Removed	KCOEM has a robust public outreach program that focuses on engaging underserved communities in emergency management, reducing risk, and disaster preparedness. This work is expanded upon in the 2025 strategies.	Ongoing

KCOEM: Climate Integration Training				
Yes	Long-term	Removed	All programs in KCOEM consider climate and climate induced hazard impacts in their planning where applicable.	Ongoing
KCOEM: Disaster Skills Risk Reduction Training				
Yes	Long-term	Updated	King County Emergency Management continues to deliver the county's disaster education, and provides year round free training and education to county employees, residents, and organizations/businesses via several programs and activities aimed at promoting personal and community risk reduction.	Ongoing
KCOEM: Dam Failure Risk and Impact Reduction				
Yes	Long-term	Updated	KCOEM continues to fund the role of Dam Safety coordinator with the overall goal of lowering the risk and impacts of dam failure in King County.	Ongoing
KCOEM: Wildfire Preparedness and Risk Reduction				
Yes	Short-term	Removed	In 2022 King County completed the Wildfire Risk Reduction Strategy. This work is being expanded upon by KCOEM in creating a Community Wildfire Protection Plan (CWPP).	Complete
KCOEM: Hazard Mitigation Assistance Grant Support				
Yes	Long-term	Updated	KCOEM continues to assist local governments and county departments with Hazard Mitigation Assistance (HMA) grant applications, providing guidance and support throughout the application process. This includes trainings, webinars, and guidance on how to properly create competitive HMA grants for King County Agencies and eligible partners.	Ongoing
KCOEM: Public Assistance Grant Support				
Yes	Long-term	Removed	KCOEM continues to assist eligible King County applicants in FEMA's PA program.	Ongoing

KCOEM: Language Accessible Video Emergency Messaging				
Yes	Long-term	Updated	KCOEM is continuing to expand its efforts to make emergency messaging more accessible to county residents.	Ongoing
PHSKC: King County Facilities Indoor Air Quality Monitoring Network				
No	Long-term	Removed	The county has yet to procure and deploy 280 Dylos DC1100 (indoor aire quality monitors). PHSKC will continue to find methods of funding for this strategy.	No Progress
PHSKC: Medical Gas Seismic Detection & Emergency Shut Off				
Yes	Long-term	Removed	Work on retrofitting Harborview Medical Center is ongoing.	Ongoing
Parks: Park and trail Facility Landslide Protection				
No	Long-term	Removed	KC Parks was not awarded a 2021 BRIC grant for this project.	No Progress
Parks: Seismic Evaluation and Retrofits of King County Parks Facilities				
No	Long-term	Removed	KC Parks was not awarded a 2021 BRIC grant for this project.	No Progress

20.7 Mitigation Strategies 2025

King County identified the following strategies through meetings among county departments. They are a mix of current projects the County is working on as well as projects identified by the County that require outside funds to complete. These strategies were scored by KCOEM's Hazard Mitigation Program using the prioritization criteria outlined earlier in this section. The strategies are listed in no particular order. It is important to note that these strategies are evolving. King County agencies are welcomed and encouraged to add strategies to this plan throughout the lifecycle of the plan. As more strategies are created, both WA EMD and FEMA will be made aware of the existence of new strategies. Below is the current list of King County Hazard Mitigation Strategies:

Table 20-4 Mitigation Strategies 2025

STRATEGY	PRIORITY (SCORE)	LEAD AGENCY	VISION
Expand King County Jumpstart Program	23	Executive Climate Office (ECO)	To create a diverse, skilled workforce capable of building greener infrastructure and advancing King County's clean energy goals.
Identify and Create County-Wide Resilience Hubs	19	KCOEM/ECO	As King County grows, and awareness of climate change-driven wildfire risk grows, King County has a coordinated strategy to support individuals and local jurisdictions in identifying and managing wildfire risk, including risk to property and public health.
Unreinforced Masonry Mapping for King County	16	KCIT/GIS	To enhance community safety and resilience by accurately mapping unreinforced masonry (URM) buildings in King County, enabling targeted mitigation strategies that reduce the risk of severe damage during seismic events and other natural hazards.
Expand Dam Failure Emergency Action Plans	14	KCOEM	By 2030, all dams within King County will have fully updated Emergency Action Plans (EAPs) and Emergency Operations Plans (EOPs) to ensure coordinated and timely responses to any potential emergencies, enhancing public safety and minimizing the impact of dam-related disasters.
Expanding Public Awareness of "Make It Through" Website	20	KCOEM	To ensure every resident in King County has the knowledge and resources to prepare for and respond to emergencies by expanding the reach and impact

			of www.makeitthrough.com, providing timely, accessible, and practical preparedness information.
Climate Change and Health Adaptation Strategy	23	PHSKC	To create the necessary conditions to prepare for, adapt to, and mitigate the health impacts of climate change in King County, particularly in communities that are most vulnerable and disproportionately impacted by climate hazards.
Expand King County Energize! Program	21	ECO	To improve energy efficiency and reduce environmental impacts in King County homes by providing affordable access to clean, energy-efficient technology, such as heat pumps, weatherization, and electric appliances.
Risk Reduction Through Equitable Language Access	22	KCOEM	To enhance community resilience by improving public translation, cultural communications, and community partnerships, ensuring consistent and accurate information delivery to all residents in King County during emergencies.
Extreme Heat Event Communications	21	KCOEM	To ensure all King County residents, especially those with limited English proficiency, have access to culturally relevant, multilingual heat safety and preparedness information to increase community resilience to extreme heat events.
Enhanced Cooling Centers	21	KCOEM	To increase awareness, accessibility, and utilization of public cooling centers in King County, ensuring all residents, especially those in heat-impacted

			neighborhoods, have safe, reliable access to cooling during extreme heat events.
Shake Alert Sign Up Campaign	18	KCOEM	To ensure that all King County residents are registered for ShakeAlert to receive timely earthquake early warnings, enabling them to take immediate protective actions to reduce injury and property damage during seismic events.
Increase Alert King County Registrations	24	KCOEM	To increase the number of residents signed up for Alert King County by fostering community awareness, engagement, and trust, ensuring that all residents receive timely emergency alerts to protect life and property.
King County Community Wildfire Protection Plan	25	KCOEM	To develop a county-scale Community Wildfire Protection Plan (CWPP) for King County that enhances resilience against wildfire risks through proactive planning, stakeholder collaboration, and public involvement. This CWPP will ensure the county's preparedness, response, and recovery capabilities are robust, inclusive, and community-driven.
Integration of Hazard Mitigation into County Plans	19	KCOEM	To ensure that hazard mitigation strategies are seamlessly integrated into all current King County plans, strengthening the community's resilience to disasters and reducing long-term risk to lives, property, and infrastructure.
King County Flood Warning Center	21	DNRP - Flood	To ensure timely and effective flood warnings and response

			actions for King County residents, minimizing loss of life, property damage, and public health risks during flood events.
Update Liquefaction Mapping King County	21	DNRP	Enhance community resilience in King County by updating and improving liquefaction hazard mapping, leading to better-informed land use planning, infrastructure development, and disaster preparedness in areas vulnerable to liquefaction during seismic events.
Expanding Roadway Access to Isolated Communities in Unincorporated King County	18	DLS- Roads	To ensure that isolated communities in unincorporated King County have reliable and safe access routes for evacuation and emergency response, particularly during wildfire events and power outages. This strategy aims to enhance community resilience and improve public safety by reducing the risk of isolation during extreme events.
HVAC Upgrades for Extreme Weather	18	FMD	To enhance the resilience of King County facilities to extreme weather events by upgrading HVAC systems to ensure reliable temperature control, air quality, and energy efficiency, safeguarding public health and infrastructure, while reducing long-term operational costs.
King County OEM Zone Program	22	KCOEM	Overall, the role of the Zone Liaison is to promote, support, and facilitate regional coordination, communication, and collaboration, in an effort to unify and/or connect region-wide

			emergency management practices, with the aim of maximizing benefits from individual efforts and reducing redundancies.
Actively Manage King County Devices	20	KCIT	To establish a secure, streamlined, and adaptive IT environment within King County by actively managing network devices and software. Starting with a controlled, known baseline, King County will minimize attack surfaces and enhance its ability to adapt to dynamic cybersecurity threats.
Multi-Factor Authorization for King County Devices	19	KCIT	To strengthen King County's cybersecurity posture by prioritizing the protection of accounts with elevated privileges, remote access, and high-value assets through the adoption of multi-factor authentication (MFA) and the reduction of reliance on single-factor authentication systems.
Timely Software Updates for King County Devices	19	KCIT	To ensure King County's IT systems remain secure and resilient by applying all available software updates immediately, automating the update process wherever possible, and maintaining a high level of vigilance against threats, reducing the risk of exploitations and ensuring the integrity of county systems
Creation of County-Wide Recovery Plan	20	KCOEM	To create a comprehensive, resilient, and flexible county-wide recovery plan that effectively addresses the unique needs of all

			communities in King County, ensuring a swift and equitable recovery process after disasters. This plan will integrate community needs, enhance preparedness, and optimize resource allocation, providing clear guidance for a seamless recovery effort.
Wastewater Treatment Division Workforce Development Program	21	DNRP	To create a sustainable and diverse workforce for the clean water sector by providing comprehensive recruitment, mentorship, training, and career growth opportunities to entry-level candidates. The program ensures that individuals are equipped with the skills and knowledge necessary to thrive in the wastewater treatment industry while contributing to a more equitable and inclusive workforce
King Conservation District Wildfire Mitigation Program	22	KCD	To reduce the risk of wildfire damage to homes and communities in King County, especially in the Wildland Urban Interface (WUI), through proactive risk assessments, strategic wildfire mitigation projects, and collaborative efforts aimed at enhancing community resilience.
Improving Emergency Management Public Outreach	21	KCOEM	To ensure that all residents of King County are well-informed and prepared to effectively respond to and mitigate the impacts of hazards, through comprehensive and targeted public outreach strategies. By enhancing public awareness and

			providing accessible resources, we aim to reduce vulnerability and improve community resilience.
Maintain LEPC in King County	20	KCOEM	To ensure the continued protection of King County residents, workers, and the environment by maintaining a robust and effective Local Emergency Planning Committee (LEPC) focused on hazardous materials. The LEPC will provide proactive mitigation strategies, streamline emergency response coordination, and promote the safe management of hazardous materials throughout the county.
Strengthening and Maintaining Partnerships for Emergency Response and Coordination	20	KCSO	To create a coordinated, resilient emergency response system by maintaining strong and effective partnerships between the King County Sheriff's Office, the King County Office of Emergency Management, and the Fusion Center, ensuring a rapid, unified, and data-driven approach to mitigating and responding to a wide range of hazards.
Implementation of 2024 King County Floodplain Management Plan	22	DNRP	To reduce the vulnerability of communities, infrastructure, and ecosystems to flooding by implementing the King County Floodplain Management Plan, fostering resilience through sustainable land use, strategic mitigation, and enhanced floodplain management practices.

Mount Si Road Undergrounding Project	18	Tanner Electric/Roads	To enhance energy resilience and mitigate wildfire and storm-related risks for the North Bend community by undergrounding critical electrical infrastructure along Mount Si Road, ensuring consistent, safe, and uninterrupted power supply to residents, businesses, and essential services.
Plan for Post-Wildfire Community Recovery	23	OEM	Ensure King County is prepared to support equitable, coordinated, and efficient recovery from wildfires—particularly those that impact homes, public facilities, and infrastructure—through a dedicated planning framework that guides action, accountability, and access to recovery resources.
Standardize and Promote Best Management Practices for Wildfire Mitigation	19	DNRP	Reduce wildfire risk to homes, infrastructure, and evacuation routes in King County through coordinated and standardized best management practices that can be easily adopted and implemented by fire departments, agencies, and communities.
Expand Access to Cooling Locations for Communities	20	ECO	Ensure equitable access to safe, welcoming, and community-trusted cooling locations throughout King County to protect high-risk populations during extreme heat events.

Expand the Use of Residential Flood Risk Mitigation Tools Countywide to Benefit Those Who Are Most Vulnerable to Flooding	23	DNRP	Expand access to effective, equitable residential flood risk mitigation tools across King County—such as buyouts and home elevations—to reduce the impacts of flooding for the most vulnerable and financially burdened property owners while also aligning with community priorities and environmental values.
Identify and Seek Funding to Reduce Sea Level Rise and Flood Risks to On-Site Wastewater Infrastructure in unincorporated King County	19	PHSKC	Protect public health and environmental quality by proactively addressing the risks that sea level rise and flooding pose to on-site wastewater infrastructure in vulnerable unincorporated areas of King County, with a focus on equitable outcomes.
WSDOT Avalanche Forecasting and Control Program	15	WSDOT	Maintain the safety and reliability of Washington's mountain highway corridors by proactively forecasting and controlling avalanches to reduce hazards for motorists, freight traffic, and recreational users.

20.7.1 Expand King County JumpStart Program

Lead	**Partners**	**Hazards Mitigated**	**Funding Sources and Estimated Costs**
King County Executive Climate Office (ECO)	County Agencies	Extreme Weather Hazardous Materials Cyber Incident Earthquake	County Budget

Vision

To create a diverse, skilled workforce capable of building greener infrastructure and advancing King County's clean energy goals.

Description

JumpStart is a workforce development program designed to help young adults (ages 18-24) from underrepresented communities pursue careers in clean energy and skilled trades. The program focuses on pathways in electrical, HVAC, solar energy, and project management. Participants receive training in these fields and are then matched with local contractors for 240 hours of paid work-based learning. This initiative provides opportunities to work on sustainable, living-wage career paths, helping young people contribute to a cleaner, healthier King County.

2-Year Objectives	**5-Year Objectives**	**Long-Term Objectives**
• Recruit young adults (ages 18-24) for participation in skilled training programs • Partner with at least 10 local contractors to join the JumpStart Network • Train 150+ young adults in clean energy-related career pathways • Provide paid internships to 100+ program participants • Build a strong, diverse workforce ready to take on jobs in clean energy and trades	• Expand partnerships with additional pre-apprenticeship and training organizations • Increase the number of clean energy infrastructure projects within King County • Develop a long-term pipeline for workers in fields such as HVAC, electrical, solar, and project management • Ensure sustainable employment for at least 80% of participants in the program's work-based learning phase • Help contractors successfully integrate young, diverse talent into their workforce	• Contribute to King County's clean energy goals by significantly increasing the number of skilled workers in the sector • Ensure a lasting and diverse workforce capable of building and maintaining green infrastructure across the region • Foster an inclusive and equitable clean energy transition with job opportunities for historically underrepresented communities • Enable sustained career success for program participants, helping to close gaps in access to well-paying jobs in green sectors

Implementation Plan/Actions
• Recruit young adults for training in electrical, HVAC, solar, and project management pathways • Partner with training program providers to deliver hands-on learning opportunities • Match participants with JumpStart Network contractors for work-based learning opportunities • Promote the JumpStart program to local businesses and contractors to grow the network and increase job opportunities • Work with local contractors to train the next generation of skilled workers • Provide resources and guidance to contractors on contracting opportunities with King County and clean energy incentives
Performance Measure
• Number of young adults recruited into training programs • Number of local contractors participating in the JumpStart Network • Number of paid internships completed by participants • Number of participants employed in clean energy and skilled trades positions post-program • Feedback from contractors regarding the readiness and performance of program participants • Retention rates of participants in the clean energy and trades sectors after completing the program

20.7.2 Identify and Create County-Wide Resilience Hubs

Lead	**Partners**	**Hazards Mitigated**	**Funding Sources and Estimated Costs**
KCOEM and ECO	DNRP, WLRD, DNRP, Parks, DLS, Permitting KC Fire Districts, WA DNR, King Conservation District, Tribes, USFS, KC Climate Preparedness Public Health Seattle-KC	Wildfire Extreme Weather Flood	Existing Resources

Vision

As King County grows, and awareness of climate change-driven wildfire risk and extreme weather grows, King County has a coordinated strategy to support individuals and local jurisdictions in identifying and managing risk, including risk to property and public health.

Description

Partner with King County communities, fire districts, and other organizations to develop an integrated King County strategy for wildfire. The strategy will review current efforts to address wildfire risk in King County and develop recommendations for addressing identified gaps and opportunities. These recommendations will be carried out through a coordinated Firewise technical assistance program, likely led by DNRP. This effort will be coordinated with a SCAP action seeking a similar outcome. This strategy will be based in part on the results of WA DNR effort to map the Wildland Urban Interface in King County.

2-Year Objectives	**5-Year Objectives**	**Long-Term Objectives**
• Convene a multiagency committee to develop a strategy • Request funding for outreach	• Implement the strategy through coordinated technical assistance between the county and local communities	• Maintain consistent outreach to potentially-impacted communities.

Implementation Plan/Actions

- KC EM will work with DNRP, WLRD and the Climate Preparedness team to identify partners.
- Continue to partner with WA DNR and DLS to map WUI areas – ultimately use this map to target strategy priorities.
- Socialize results of WUI mapping efforts with comprehensive plan staff and look into planning policies that could limit density or development in fire-prone areas.
- Convene multiagency committee once WA DNR WUI maps are closer to being finalized
- Identify existing preparedness actions and gaps, including areas that are/are not receiving Firewise outreach and support.
- Develop wildfire preparedness and mitigation coordination strategy and socialize it.
- DNRP to request $150k funding for an additional FTE to support Firewise efforts.
- Look into model codes, ordinances, or other strategies to promote in addition to Firewise.
- Host an annual tabletop at the wildfire workshop held each year by KCEM.

Performance Measure

- KC EM was successful/not successful in convening *all* the necessary partners to establish a unified strategy for community wildfire preparedness and risk reduction.

20.7.3 URM Mapping Specific to King County

Lead	Partners	Hazards Mitigated	Funding Sources and Estimated Costs
DNRP GIS	KCOEM	Earthquake Extreme Weather	County Budget HMGP

Vision

To enhance community safety and resilience by accurately mapping unreinforced masonry (URM) buildings in King County, enabling targeted mitigation strategies that reduce the risk of severe damage during seismic events and other natural hazards.

Description

Unreinforced masonry buildings (URMs) pose a significant risk during earthquakes due to their structural vulnerabilities. In King County, the exact number and distribution of these buildings are not fully mapped or documented. This strategy aims to conduct a comprehensive update of the URM building mapping within King County. The updated data will guide mitigation measures such as retrofitting, building code updates, and prioritizing resources for emergency response.

2-Year Objectives	5-Year Objectives	Long-Term Objectives
• Complete a comprehensive update of URM building data within King County using available building permits, structural reports, and GIS mapping tools. • Conduct outreach to property owners, developers, and local jurisdictions to improve building data accuracy. • Establish a baseline risk assessment for all identified URM structures in high-risk seismic zones. • Initiate educational campaigns for property owners on the importance of retrofitting and strengthening URM buildings.	• Complete the full retrofitting or replacement of a significant number of high-risk URM buildings in King County through targeted funding and grants. • Implement local ordinances requiring retrofitting for URMs in high-risk zones. • Develop a collaborative funding program with local municipalities to subsidize retrofitting for private building owners. • Improve local zoning codes to encourage safer construction in areas with high concentrations of URM buildings.	• Achieve a substantial reduction in URM-related fatalities and injuries in the event of a major earthquake in King County. • Establish a system for regularly updating URM building data and conducting periodic re-assessments of seismic vulnerabilities. • Foster long-term community resilience by ensuring all vulnerable buildings are retrofitted or replaced with more seismically resilient structures.

Implementation Plan/Actions

- **Action 1:** Collaborate with local governments to compile existing data on URM buildings.
- **Action 2:** Utilize GIS tools and risk assessment software to update building vulnerability data across King County.
- **Action 3:** Launch public outreach programs to inform property owners about the importance of retrofitting URMs and available funding programs.
- **Action 4:** Establish partnerships with structural engineering firms to evaluate and propose retrofitting solutions for the most at-risk URM buildings.
- **Action 5:** Secure funding from federal and state sources for high-priority retrofitting projects.
- **Action 6:** Integrate updated URM mapping into King County's broader hazard mitigation and emergency response planning frameworks.
- **Action 7:** Provide ongoing training for local emergency responders on identifying URMs and the associated risks in disaster scenarios.

Performance Measure

- Completion of updated URM building mapping within King County (measured as a percentage of total URM buildings mapped).
- Number of URM buildings assessed for retrofit or replacement within the first 2 years.
- Percentage of URM buildings identified as high-risk that undergo retrofitting within the 5-year timeframe.
- Increase in the number of URM building owners participating in voluntary retrofitting programs.
- Reduction in the estimated number of injuries and fatalities in future seismic events due to URM vulnerabilities.

20.7.4 Dam Failure EAPs

Lead	Partners	Hazards Mitigated	Funding Sources and Estimated Costs
KCOEM	SPU Washington State Department of Ecology	Dam Failure Flooding Terrorism	County Budget FEMA Grants

Vision

By 2030, all dams within King County will have fully updated Emergency Action Plans (EAPs) and Emergency Operations Plans (EOPs) to ensure coordinated and timely responses to any potential emergencies, enhancing public safety and minimizing the impact of dam-related disasters.

Description

King County is home to a variety of dams that serve critical functions for flood control, water supply, and recreational purposes. However, as some of these dams are aging, it is crucial that up-to-date Emergency Action Plans and Emergency Operations Plans are in place for each. This strategy focuses on ensuring that every dam within the county has comprehensive, actionable, and regularly updated plans by 2030. These plans will be aligned with state and federal standards and will involve coordination with key emergency response agencies to ensure a swift and efficient response in the event of a potential dam failure or other emergency scenarios.

2-Year Objectives	5-Year Objectives	Long-Term Objectives
• Complete an initial review and assessment of all dams within King County to evaluate the status of their current Emergency Action Plans and Emergency Operations Plans. • Identify gaps or outdated components within existing plans and develop a prioritized action plan to address them. • Establish a working group with key partners (Emergency Management, DNRP, state agencies) to guide the process of updating plans. • Begin the process of updating EAPs and EOPs for the highest-priority dams (based on risk and condition).	• Update Emergency Action Plans and Emergency Operations Plans for at least 50% of the dams in King County. • Conduct at least two county-wide emergency response exercises involving dam failures, ensuring the participation of local, state, and federal agencies. • Create a public awareness campaign to inform the community about dam safety and emergency preparedness in the region. • Establish a long-term plan for maintaining and regularly updating EAPs and EOPs, ensuring they are revisited every 2-3 years.	• Ensure that 100% of dams in King County have updated EAPs and EOPs by 2030. • Improve public and agency preparedness and response times in case of dam failure events. • Continuously enhance coordination and communication protocols between local, state, and federal agencies in managing dam emergencies. • Secure long-term funding mechanisms to maintain up-to-date plans and facilitate regular drills.

Implementation Plan/Actions

• Conduct a comprehensive inventory of all dams in King County, identifying those with outdated or missing Emergency Action Plans and Emergency Operations Plans.
• Collaborate with local, state, and federal agencies to develop a unified approach to updating the EAPs and EOPs.
• Hire consultants or experts to assist with plan updates and ensure compliance with state and federal regulations.
• Provide training for all relevant stakeholders, including local emergency responders and community leaders, to ensure they understand the updated plans.
• Schedule regular drills and simulations to test the effectiveness of the updated plans and refine response protocols.
• Establish a system for regular plan reviews and updates, with an emphasis on technological advancements and emerging threats such as climate change.

Performance Measure

- Percentage of dams with up-to-date EAPs and EOPs by 2025 and 2030.
- Number of drills and exercises conducted each year to test the response capabilities related to dam emergencies.
- Feedback from local agencies and responders on the clarity and effectiveness of the updated plans.
- Reduction in response times during dam-related emergency events.
- Number of gaps identified and corrected during regular assessments.

20.7.5 Expanding Public Awareness of "Make It Through" Website

Lead	Partners	Hazards Mitigated	Funding Sources and Estimated Costs
KCOEM	PHSKC ECO DNRP KCIT	Avalanche Terrorism Volcano Earthquake Health Incident Extreme Weather Wildfire Cyber Incident Hazardous Materials	General Fund

Vision

To ensure every resident in King County has the knowledge and resources to prepare for and respond to emergencies by expanding the reach and impact of www.makeitthrough.com, providing timely, accessible, and practical preparedness information.

Description

This strategy aims to increase awareness of and engagement with www.makeitthrough.com, a critical online resource designed to help King County residents prepare for various hazards, including earthquakes, flooding, wildfires, and other public health emergencies. Through targeted outreach, educational campaigns, and strategic partnerships, the goal is to ensure that residents have the necessary tools, knowledge, and motivation to prepare themselves and their communities for a range of disaster scenarios.

2-Year Objectives	5-Year Objectives	Long-Term Objectives
• Increase website traffic by 50% through targeted campaigns and outreach. • Reach at least 20% of King County residents through media campaigns (TV, radio, social media). • Partner with 15 local organizations to promote the website and offer preparedness workshops. • Develop and distribute preparedness materials in 5 languages widely spoken in King County.	• Achieve a 100% increase in website traffic, with ongoing sustained engagement. • Establish long-term partnerships with 50+ local organizations to ensure continuous promotion and education. • Ensure 75% of King County residents report being aware of the website in post-campaign surveys. • Introduce and promote regional preparedness events featuring www.makeitthrough.com resources.	• Make www.makeitthrough.com a widely recognized tool for emergency preparedness across King County. • Ensure King County residents are among the best-prepared populations in the nation for emergencies. • Maintain a long-term, continuous education program to keep preparedness information relevant and up-to-date.

Implementation Plan/Actions

• **Website Enhancements**: Improve user experience and mobile access on www.makeitthrough.com.
• **Media Campaigns**: Launch multi-channel campaigns (social media, print, radio, TV) to drive awareness of the website.
• **Partnership Development**: Establish partnerships with schools, local businesses, nonprofit organizations, and community groups to share the website.
• **Community Outreach Events**: Host preparedness fairs, workshops, and town halls featuring the website's resources.
• **Material Distribution**: Create bilingual, culturally relevant preparedness pamphlets and digital resources to distribute to local organizations.

• **Public Service Announcements**: Collaborate with local media outlets to air public service announcements about www.makeitthrough.com. • **Surveys and Feedback**: Conduct regular surveys and community feedback sessions to assess awareness levels and adjust strategies as needed.
Performance Measure • Website traffic analytics (visits, unique users, page views) from the website's analytics platform. • Survey results measuring awareness of www.makeitthrough.com among King County residents. • Number of media impressions (TV, radio, social media reach). • Number of partnerships established and the number of preparedness events conducted. • Feedback from community organizations and participants on the effectiveness of outreach materials and events. • Number of preparedness materials distributed in targeted languages and communities.

20.7.6 Climate Change and Health Adaptation Strategy

Lead	Partners	Hazards Mitigated	Funding Sources and Estimated Costs
PHSKC	ECO	Avalanche Flood Health Incident Landslide Extreme Weather Wildfire	County Budget

Vision

To create the necessary conditions to prepare for, adapt to, and mitigate the health impacts of climate change in King County, particularly in communities that are most vulnerable and disproportionately impacted by climate hazards.

Description

The Climate Change and Health Adaptation Strategy focuses on improving community resilience to climate-related health risks, including extreme heat, wildfire smoke, and floods. Through co-created risk communication campaigns, community capacity building, evidence-based solutions, and integration of climate data, the strategy aims to mitigate adverse health impacts while promoting equitable climate change programs and policies. This multi-year initiative includes outreach efforts, technical assistance, the development of climate-related health data systems, and collaboration with healthcare and community organizations to reduce inequities caused by climate change.

2-Year Objectives	5-Year Objectives	Long-Term Objectives
• Co-create and deliver risk communication campaigns with communities impacted by extreme heat, wildfire smoke, and floods • Increase awareness in disproportionately impacted communities about how to mitigate and adapt to climate change • Support community programs addressing the health impacts of heat and wildfire smoke with technical assistance and evidence-based solutions • Begin data collection and improvement for key climate, health, and resilience indicators • Establish collaborative partnerships for integrating climate change into Public Health programs aligned with the Strategic Climate Action Plan	• Expand technical assistance to support communities in adapting to the health impacts of heat and wildfire smoke • Enhance the use of climate data dashboards for tracking health impacts and support policy changes based on qualitative and quantitative data • Ensure health services providers and partners across the region prioritize climate resilience through quarterly healthcare collaborative meetings • Strengthen partnerships with BIPOC communities to co-develop programs and policies that address climate-related health impacts • Increase community capacity to mitigate and adapt to climate hazards by scaling successful programs and strategies	• Influence regional and statewide leadership on climate policies focused on decarbonization, data use, and climate change resilience • Ensure health equity through the integration of climate data into public health decision-making and policy • Establish King County as a national leader in addressing the health impacts of climate change through community programming, research, and collaborations • Build long-term sustainability in community resilience through ongoing education, partnerships, and adaptation strategies

Implementation Plan/Actions • Collaborate with community partners to develop and disseminate educational resources in multiple languages • Implement strategies and solutions co-created with BIPOC communities to reduce health impacts from climate hazards • Establish and continuously improve a robust data system to monitor climate, health, and resilience indicators • Provide technical assistance to partners and support community-based programs addressing climate health impacts • Integrate climate change considerations into public health programs, ensuring alignment with King County's Strategic Climate Action Plan • Convene quarterly healthcare collaboratives to drive regional climate and health leadership • Collect and analyze data to support public health action and address health inequities
Performance Measure • Number of community-specific communications campaigns and strategies developed • Number of technical-assistance consultations provided and community partners engaged • Number of data requests, visits to the climate data dashboard, and feedback on data usage • Number of healthcare partners engaged annually in climate and health initiatives • Number of evidence-based programs successfully implemented to reduce health impacts of climate hazards

20.7.7 Expand King County Energize! Program

Lead	Partners	Hazards Mitigated	Funding Sources and Estimated Costs
ECO	North Highline and Skyway-West Hill communities	Extreme Weather	CCA FEMA

Vision

To improve energy efficiency and reduce environmental impacts in King County homes by providing affordable access to clean, energy-efficient technology, such as heat pumps, weatherization, and electric appliances.

Description

The Energize! Heat Pump Program focuses on installing heat pumps and other clean technologies in homes in the North Highline and Skyway-West Hill unincorporated areas of King County. The program targets income-qualified residents who may be eligible for 100% cost-coverage, while other residents may receive discounts. Heat pumps, which provide efficient heating and cooling, are part of King County's effort to reduce energy use and help residents lower their energy bills. In 2025, the program will expand through funding from the Climate Commitment Act (CCA) to include electric appliances, plumbing improvements, home energy audits, and weatherization services for single-family homes and small businesses across King County.

2-Year Objectives	5-Year Objectives	Long-Term Objectives
• Install heat pumps and other clean technology in homes in North Highline and Skyway-West Hill • Provide energy audits and weatherization services • Expand program eligibility to include small businesses in targeted areas • Increase awareness of the program to encourage broader participation from residents in the designated regions	• Install heat pumps and energy-efficient upgrades in across King County • Reduce energy consumption and lower energy bills for participating households • Expand the program to additional communities in King County • Support the installation of energy-efficient technologies for small businesses in King County	• Contribute to King County's clean energy goals by reducing reliance on fossil fuels for home heating and cooling • Improve air quality and lower carbon emissions in the region • Achieve widespread adoption of energy-efficient technology in homes and small businesses across King County • Ensure that lower-income and historically underserved communities have equitable access to clean energy solutions

Implementation Plan/Actions

- Continue installing heat pumps and energy-efficient technology in North Highline and Skyway-West Hill
- Increase outreach to income-qualified residents for 100% cost-coverage opportunities
- Partner with local contractors and service providers to ensure high-quality installations and services
- Expand program offerings to include electric appliances, plumbing improvements, home energy audits, and weatherization in 2025
- Use CCA funding to support program expansion and increase coverage for additional residents and businesses
- Track and evaluate energy savings and customer satisfaction for program improvements

Performance Measure

- Number of homes and small businesses participating in the program
- Total energy savings achieved through heat pump installations and other energy-efficient upgrades
- Reduction in energy bills for participating households
- Number of income-qualified residents who receive 100% cost coverage or discounts
- Customer satisfaction and feedback on program services and installation quality
- Successful implementation of the expanded program in 2025, with a measurable increase in participation and coverage

20.7.8 Risk Reduction Through Equitable Language Access

Lead	Partners	Hazards Mitigated	Funding Sources and Estimated Costs
KCOEM	PHSKC Trusted Partner Network	Cyber Incident Dam Failure Earthquake Flood Hazardous Materials Health Incident Landslide Extreme Weather Terrorism Tsunami Volcano Wildfire	County Budget Preparedness Grants

Vision

To enhance community resilience by improving public translation, cultural communications, and community partnerships, ensuring consistent and accurate information delivery to all residents in King County during emergencies.

Description

COVID-19 demonstrated the vital role of timely, accurate, and culturally relevant communication in protecting public health and the economy. King County engaged with community leaders and trusted partners to tailor messages for specific ethnic and language groups, focusing on vulnerable and marginalized populations. This initiative relied on various outreach methods such as webinars, social media, and direct communications to disseminate essential information during the pandemic. Building on this experience, the goal is to refine and expand these efforts to improve public hazard resilience, enhance language access, and sustain these partnerships for future emergency responses.

2-Year Objectives	5-Year Objectives	Long-Term Objectives
• Refine and build on the lessons learned from COVID-19 to strengthen community partnerships and cultural communication networks. • Invest in language access resources, including translation, interpretation, and media outreach, to ensure consistent services for all residents. • Formalize the network of Community Navigators to enhance the development and dissemination of in-language communications for emergency preparedness.	• Expand the use of digital and virtual outreach platforms (social media, online platforms) for broader communication access. • Broaden the role of Community Navigators in post-disaster recovery, providing continuous community engagement. • Foster community partnerships to ensure that the public health communication system can quickly adapt to new types of hazards.	• Establish a sustainable framework for language and cultural communications in all future emergency preparedness and mitigation efforts. • Ensure that King County is well-equipped to provide rapid, appropriate, and accurate information to diverse populations in future emergencies. • Integrate community partnerships into long-term resilience planning for environmental, biological, and physical hazards.

Implementation Plan/Actions • Expand language access resources, such as translation and interpretation services, to provide clear messaging for all King County residents. • Strengthen and formalize the Community Navigator network to ensure culturally appropriate information dissemination. • Increase community outreach efforts through social media and digital platforms to maintain flexibility and consistency in communication during emergencies. • Engage in continuous training and collaboration with local ethnic and media outlets to ensure that all communication is clear, timely, and accessible.
Performance Measure • Increase in the number of residents receiving emergency communications in their preferred language. • Number of community events and outreach initiatives conducted with diverse ethnic groups. • Effectiveness of public health messaging, as measured by surveys or feedback from target communities. • Tracking the engagement levels in virtual and social media outreach platforms. • Evaluation of the Community Navigator network's impact on reaching vulnerable populations.

20.7.9 Extreme Heat Event Communications

Lead	Partners	Hazards Mitigated	Funding Sources and Estimated Costs
KCOEM	PHSKC ECO Community based organizations	Extreme Weather Wildfire	County Budget

Vision

To ensure all King County residents, especially those with limited English proficiency, have access to culturally relevant, multilingual heat safety and preparedness information to increase community resilience to extreme heat events.

Description

Language and cultural barriers can limit the effectiveness of heat preparedness and mitigation efforts. This action focuses on the development and distribution of multilingual, culturally relevant materials about heat safety to better serve communities in King County, particularly those in the hottest areas. These areas have a high proportion of limited English-speaking residents who are more vulnerable to heat-related health impacts. Through collaboration with community organizations, local governments, and multilingual media, the aim is to increase the reach and impact of heat safety messages before, during, and after heat waves.

2-Year Objectives	5-Year Objectives	Long-Term Objectives
• Develop and distribute multilingual and culturally relevant heat safety and preparedness materials. • Partner with community organizations to evaluate heat messaging needs and priorities. • Increase the use of community networks and media to distribute heat safety messages, especially in communities with limited English proficiency. • Ensure the inclusion of heat safety content in various formats, such as print, digital, and multimedia. • Ensure preparedness messaging is provided well before heat waves to encourage early actions like purchasing cooling items.	• Co-create comprehensive, community-specific heat safety materials with a diverse set of local partners. • Build sustainable distribution channels for multilingual heat safety information, integrating them into community networks and media. • Provide consistent access to multilingual heat safety content in areas with high heat vulnerability. • Enhance outreach to include information on supporting at-risk populations, including low-income seniors and people with disabilities.	• Ensure equitable access to heat preparedness information for all residents, particularly those in the hottest areas of King County. • Make multilingual heat safety resources a consistent part of community resilience and public health efforts. • Foster long-term partnerships between King County, local governments, and community organizations for heat safety outreach and preparedness.

Implementation Plan/Actions

• **Co-create culturally relevant content**: Partner with community-based organizations, service providers, and residents to develop heat safety materials that reflect community needs and priorities.
• **Expand distribution networks**: Work with local, multilingual media and community-trusted organizations to adapt and distribute heat safety information in multiple languages through various formats (e.g., printed materials, digital media, video).
• **Integrate heat safety into pre-summer messaging**: Begin heat safety messaging early in the year, especially to encourage the purchase of cooling devices during the off-season.
• **Focus on high-risk communities**: Prioritize outreach to areas with the highest temperatures and most limited English-speaking populations.
• **Collaborate on cross-strategy multilingual materials**: Develop multilingual resources related to heat safety, in-

home support for vulnerable populations, urban tree canopy management, and energy efficiency. • **Facilitate access via an online clearinghouse**: Add multilingual heat safety materials to the extreme heat online clearinghouse (Action 19: Partnerships for Implementation) for easier access.
Performance Measure • Increased distribution of multilingual heat safety materials, measured by the number of materials distributed and the reach of messaging. • Increased engagement with community-based organizations and media partners to co-create and distribute content. • Higher levels of community awareness and preparedness for heat events, as measured through surveys and feedback. • Reduced language and cultural barriers to heat safety information, as indicated by the number of communities with limited English proficiency receiving the materials.

20.7.10 Enhanced Cooling Centers

Lead	Partners	Hazards Mitigated	Funding Sources and Estimated Costs
KCOEM	Local Community Organizers ECO	Extreme Weather	County budget, grants, public-private partnerships (cost estimation to be determined)

Vision

To increase awareness, accessibility, and utilization of public cooling centers in King County, ensuring all residents, especially those in heat-impacted neighborhoods, have safe, reliable access to cooling during extreme heat events.

Description

In response to community feedback and surveys by King County's Office of Emergency Management, there is a need for increased awareness, access, and services at existing public cooling centers. This action focuses on increasing the utilization of these centers through staffing improvements, enhanced amenities, and better transportation options, particularly targeting communities with elevated heat risks. Although cooling centers are available, utilization has been low, primarily due to a lack of awareness, family-friendly programming, and transportation barriers. This action calls for collaborative efforts to address these challenges and increase accessibility.

2-Year Objectives	5-Year Objectives	Long-Term Objectives
• Increase public awareness of cooling center locations and services. • Improve transportation options to cooling centers, particularly in heat-impacted neighborhoods. • Enhance amenities at cooling centers, such as snacks, water, Wi-Fi, and device charging capabilities. • Increase staff capacity and operational budgets to ensure extended hours of access.	• Achieve a significant increase in the utilization rates of public cooling centers, especially in identified heat islands and underserved communities. • Establish a comprehensive, multilingual communications strategy for cooling center outreach and updates during heat events. • Ensure long-term sustainability of funding for cooling center operations and staffing.	• Ensure year-round, reliable cooling center access for King County residents during extreme heat events. • Create a model of community engagement and center utilization that can be replicated in other regions facing similar challenges. • Establish consistent funding and infrastructure to support cooling centers as essential community resources.

Implementation Plan/Actions

• **Collaborate with local governments and agencies** to identify gaps in cooling center services and transportation access, particularly in heat-impacted neighborhoods.
• **Promote transit options** to and from cooling centers, ensuring accessibility for all community members.
• **Provide incentives** at cooling centers, including snacks, bottled water, Wi-Fi access, and charging stations.
• **Increase communications and outreach** about cooling center availability, focusing on heat events, multilingual messaging, and disability accessibility.
• **Budget for additional staff** and operational resources to support extended hours and improved services at cooling centers.

Performance Measure

• Increased utilization of cooling centers, measured by attendance data and community feedback.
• Greater awareness as indicated by surveys and outreach tracking.
• Improved accessibility, measured by transportation utilization rates and increased family participation in programs.

• Satisfaction levels of residents accessing cooling centers, as measured through surveys and community engagement.

20.7.11 Shake Alert Sign Up Campaign

Lead	Partners	Hazards Mitigated	Funding Sources and Estimated Costs
KCOEM	WAEMD USGS Local Jurisdictions	Earthquake	General Fund FEMA Preparedness Grants

Vision

To ensure that all King County residents are registered for ShakeAlert to receive timely earthquake early warnings, enabling them to take immediate protective actions to reduce injury and property damage during seismic events.

Description

ShakeAlert provides critical early warnings seconds before an earthquake strikes, allowing residents to take protective actions such as "Drop, Cover, and Hold On." Despite its importance, many King County residents remain unaware of ShakeAlert or are not registered to receive notifications. This strategy will focus on increasing awareness of the system, educating residents on how to sign up, and expanding accessibility to ensure that ShakeAlert reaches all King County residents, especially those in vulnerable communities.

2-Year Objectives	5-Year Objectives	Long-Term Objectives
• Conduct at least 10 public outreach events in community centers, schools, and libraries to promote ShakeAlert • Distribute ShakeAlert promotional materials to 100,000 households in King County • Launch a targeted social media and digital advertising campaign to educate residents about ShakeAlert • Implement ShakeAlert registration in at least 50 local schools and businesses	• Achieve a 50% increase in ShakeAlert registrations across all demographics in King County • Establish permanent partnerships with schools, libraries, and community organizations to continue ShakeAlert education and registration • Integrate ShakeAlert information into existing emergency preparedness initiatives across King County • Expand ShakeAlert accessibility to populations with limited access to smartphones or the internet	• Ensure that 90% of King County residents are registered for ShakeAlert • Establish King County as a national model for earthquake early warning systems, with widespread participation • Foster a resilient community where earthquake preparedness is ingrained in daily life

Implementation Plan/Actions

• **Community Outreach and Engagement**: Conduct in-person outreach at local community centers, schools, and libraries to demonstrate ShakeAlert registration and educate residents about the system's importance.
• **Partnership with Schools and Businesses**: Collaborate with local schools and businesses to encourage staff and students to register for ShakeAlert, ensuring that these groups are well-informed and can spread the message to families.
• **Public Awareness Campaign**: Use digital and traditional media (TV, radio, social media) to spread the word about ShakeAlert. Develop eye-catching ads that explain how to register and the benefits of receiving early earthquake warnings.
• **Multilingual Outreach**: Provide materials in multiple languages spoken in King County, such as Spanish, Chinese, and Somali, to ensure wide accessibility.
• **Incentivize Registration**: Host contests or offer small prizes for residents who sign up and engage in ShakeAlert awareness campaigns.
• **Mobile App Partnerships**: Work with mobile phone carriers to include ShakeAlert sign-up prompts or integration directly within their apps to make the process seamless for users.
• **Targeted Education for Vulnerable Populations**: Focus on outreach efforts to populations that may be harder to reach, including seniors, low-income households, and people with disabilities, providing them with information on how to register for ShakeAlert via different methods (e.g., text messages, landline phones, apps).

Performance Measure

• **Registration Metrics**: Track the number of new ShakeAlert sign-ups in King County over time and measure the percentage increase in registrations.
• **Outreach Effectiveness**: Monitor participation in community events, workshops, and other outreach efforts, measuring attendance and engagement through sign-up rates.
• **Social Media Engagement**: Evaluate the effectiveness of digital campaigns through social media analytics, such as likes, shares, comments, and click-through rates on ShakeAlert registration links.
• **Demographic Data**: Assess the demographic breakdown of ShakeAlert registrants (e.g., age, language, location) to ensure equitable access and participation across all communities in King County.
• **Community Feedback**: Collect feedback from community organizations, schools, and local leaders to evaluate the impact of outreach efforts and identify areas for improvement.

20.7.12 Increase Alert King County Registrations

Lead	Partners	Hazards Mitigated	Funding Sources and Estimated Costs
KCOEM	Local Jurisdictions	Avalanche Civil Disorder Cyber Incident Dam Failure Earthquake Flood Hazardous Materials Health Incident Landslide Extreme Weather Terrorism Tsunami Volcano Wildfire	General Budget

Vision

To increase the number of residents signed up for Alert King County by fostering community awareness, engagement, and trust, ensuring that all residents receive timely emergency alerts to protect life and property.

Description

Alert King County is a critical system for delivering emergency notifications to King County residents. However, a large portion of the population remains unregistered, especially among underserved communities, people with disabilities, and those with limited access to technology. This strategy will focus on outreach, education, and incentives to increase sign-ups, with particular emphasis on those vulnerable populations. By engaging residents and community organizations, we aim to raise awareness about the importance of timely alerts for disaster preparedness.

2-Year Objectives	5-Year Objectives	Long-Term Objectives
• Increase Alert King County registrations by 20% • Expand outreach to at least 50 community organizations and institutions • Host at least 10 community events focused on Alert King County registration • Collaborate with local schools and libraries to reach families and seniors • Develop multilingual promotional materials and outreach methods	• Achieve a 50% increase in Alert King County sign-ups across all demographic groups • Establish sustainable, ongoing partnerships with local organizations to ensure consistent outreach • Integrate Alert King County registration into emergency preparedness training and public health campaigns • Improve access to Alert King County for residents with disabilities or those without smartphones or internet access	• Ensure 90% of King County residents are signed up for Alert King County • Create a robust public engagement model that can be adopted by other regions in Washington State • Foster an emergency preparedness culture that includes all communities, particularly vulnerable populations

Implementation Plan/Actions • **Develop a Comprehensive Communication Campaign**: Launch targeted digital, print, and in-person outreach efforts. Use local radio, social media, and direct mail to inform residents about the benefits of registering. • **Host Community Registration Events**: Work with local libraries, community centers, schools, and places of worship to set up registration booths and provide live demonstrations. • **Incentivize Registration**: Offer rewards or incentives, such as raffle entries for prizes, to encourage people to sign up. • **Collaborate with Local Media**: Engage local news outlets to broadcast reminders and alerts about Alert King County registration. • **Multilingual Outreach**: Provide materials and registration assistance in Spanish, Russian, Somali, Mandarin, and other languages spoken in King County. • **Train Community Leaders**: Educate community leaders on the importance of emergency alerts, so they can share the information with their networks and encourage sign-ups. • **Address Accessibility Needs**: Partner with organizations that serve people with disabilities to ensure that Alert King County registration is accessible to all.
Performance Measure • **Registration Metrics**: Track the number of new registrants over time and compare it to baseline data to gauge the increase in sign-ups. • **Engagement Analytics**: Measure the effectiveness of outreach campaigns through website analytics (e.g., clicks on registration links), social media interactions, and event attendance. • **Community Feedback**: Gather feedback from community organizations and participants to assess the impact of outreach efforts. • **Demographic Breakdown**: Track the demographic breakdown of registrants (e.g., age, race, language, location) to ensure equitable outreach efforts.

20.7.13 King County Community Wildfire Protection Plan

Lead	Partners	Hazards Mitigated	Funding Sources and Estimated Costs
KCOEM	KCSO DNRP KCD KCECO	Wildfire	HMGP/FEMA/State Grants

Vision

To develop a county-scale Community Wildfire Protection Plan (CWPP) for King County that enhances resilience against wildfire risks through proactive planning, stakeholder collaboration, and public involvement. This CWPP will ensure the county's preparedness, response, and recovery capabilities are robust, inclusive, and community-driven.

Description

The King County Office of Emergency Management (KCOEM) is spearheading the development of King County's first county-scale Community Wildfire Protection Plan (CWPP). Over the next 18 months, KCOEM will hire a Temporary Limited Term planner to lead the planning process, working alongside key local agencies and jurisdictions. The CWPP will be developed through stakeholder collaboration, involving public, private, and Tribal entities to enhance wildfire preparedness, response, and recovery across King County. The plan will include a county-wide risk assessment, capabilities assessment, public outreach, and prioritization of mitigation actions.

2-Year Objectives	5-Year Objectives	Long-Term Objectives
• Hire and onboard a Temporary Limited Term planner to lead the CWPP development. • Develop a comprehensive risk assessment using GIS tools to identify wildfire risks and vulnerable populations in King County. • Complete the first draft of the CWPP and begin public outreach and community engagement. • Facilitate workshops with stakeholders and local communities to ensure a broad, inclusive planning process.	• Finalize and submit the King County CWPP for Federal and State review. • Create annexes for individual communities to provide detailed, localized wildfire mitigation plans. • Develop prioritized mitigation actions based on the risk assessment, forest health, and community input. • Implement priority wildfire risk reduction actions, including fuels reduction and structural hardening projects.	• Achieve increased resilience of King County forests and infrastructure to wildfire risks. • Enhance the wildfire preparedness, response, and recovery systems for all communities within the county. • Ensure ongoing public engagement and updates to the CWPP to reflect evolving wildfire risks and mitigation strategies.

Implementation Plan/Actions

• Convene a core planning team from relevant county departments, agencies, and external partners.
• Conduct risk assessments, including overlaying critical infrastructure, vulnerable populations, and historical wildfire data in a unified GIS tool.
• Perform community outreach, surveys, and meetings to gather local knowledge and input.
• Develop and prioritize mitigation actions, focusing on fuels reduction, defensible space, and structural hardening across the county.
• Facilitate the creation of annexes for individual communities, offering tailored wildfire mitigation strategies.
• Ensure the CWPP aligns with broader state and national wildfire strategies, including the National Cohesive Wildland Fire Management Strategy.

Performance Measure

• Completion of the CWPP within 18 months, with ongoing updates to the annexes.
• Engagement of key stakeholders, local communities, and the public throughout the planning process.
• Number of mitigation actions prioritized and completed, as well as funding secured for implementation.
• Feedback and participation levels from affected communities, particularly vulnerable populations in the WUI.

20.7.14 Integration of Hazard Mitigation into County Plans

Lead	Partners	Hazards Mitigated	Funding Sources and Estimated Costs
KCOEM	All County Agencies	Avalanche Civil Disorder Cyber Incident Dam Failure Earthquake Flood Hazardous Materials Health Incident Landslide Extreme Weather Terrorism Tsunami Volcano Wildfire	County Budget

Vision

To ensure that hazard mitigation strategies are seamlessly integrated into all current King County plans, strengthening the community's resilience to disasters and reducing long-term risk to lives, property, and infrastructure.

Description

The King County Office of Emergency Management (KCOEM) will lead efforts to integrate hazard mitigation strategies into existing countywide planning processes. This will involve updating current plans—such as the Comprehensive Emergency Management Plan (CEMP), land use planning, transportation, and infrastructure development—so that mitigation actions are explicitly included and prioritized. By embedding hazard mitigation into these planning documents, KCOEM will enhance long-term resilience, reduce future disaster impacts, and ensure that mitigation strategies are a consistent part of local government and community actions. The integration process will engage stakeholders, incorporate data-driven risk assessments, and ensure that mitigation actions are incorporated into all planning phases, from preparedness to recovery.

2-Year Objectives	5-Year Objectives	Long-Term Objectives
• Conduct an inventory of all existing King County plans and identify opportunities for hazard mitigation integration. • Develop a framework for embedding hazard mitigation strategies into key county planning documents. • Work with local jurisdictions to align hazard mitigation with existing regional plans, including the Regional Hazard Mitigation Plan. • Integrate risk reduction measures into at least two major planning documents (e.g., transportation or land use plans). • Provide training and resources for	• Ensure hazard mitigation strategies are fully integrated into at least 75% of all major King County planning documents. • Establish a regular review process for incorporating updated hazard mitigation information into planning documents and procedures. • Collaborate with local governments and regional partners to incorporate mitigation into hazard-specific plans (e.g., floodplain management, wildfire prevention, heat preparedness). • Build capacity for communities to implement hazard mitigation actions	• Achieve widespread adoption of hazard mitigation strategies across all King County plans, ensuring a holistic approach to disaster resilience. • Create a long-term, sustainable framework for ongoing integration of hazard mitigation into new plans and projects. • Foster a culture of resilience where hazard mitigation is a standard consideration for all county planning and development activities.

county departments and local governments on incorporating hazard mitigation into their operations and planning.	through grants, funding programs, and technical support.	

Implementation Plan/Actions

• **Conduct an assessment of current plans**: Review King County's existing plans and identify gaps where hazard mitigation strategies can be integrated (e.g., CEMP, Comprehensive Plan, transportation plans, capital improvement plans).
• **Develop a hazard mitigation integration framework**: Create a standard framework for including hazard mitigation actions and policies in all relevant county plans, with clear guidelines and objectives for each department and jurisdiction.
• **Engage stakeholders**: Collaborate with local governments, community organizations, and other stakeholders to ensure that hazard mitigation strategies are reflective of community needs and priorities.
• **Update plans**: Integrate specific hazard mitigation actions and strategies into at least two major planning documents, and ensure that new planning processes include mitigation considerations.
• **Provide training and support**: Offer training and resources to King County departments and local governments on how to include hazard mitigation strategies in their planning processes, including best practices and available funding sources.
• **Track and review**: Implement a process for ongoing tracking, monitoring, and updating of hazard mitigation integration efforts to ensure continued alignment with county goals and evolving hazard risks.

Performance Measure

• Number of King County plans that integrate hazard mitigation strategies, tracked by specific document reviews and updates.
• Percentage of departments and jurisdictions that have adopted the hazard mitigation integration framework into their planning processes.
• Feedback from stakeholders, including community organizations and local governments, on the effectiveness and relevance of integrated mitigation strategies.
• Number of hazard mitigation actions implemented from countywide plans.
• Progress on reducing risk and enhancing resilience in specific hazard areas, measured through post-event analysis and risk assessments.

20.7.15 King County Flood Warning Center

Lead	Partners	Hazards Mitigated	Funding Sources and Estimated Costs
DNRP	NWS PHSKC KCOEM	Flood	County Budget

Vision

To ensure timely and effective flood warnings and response actions for King County residents, minimizing loss of life, property damage, and public health risks during flood events.

Description

The King County Flood Warning Center (FWC) provides critical flood monitoring, alerts, and decision support during flood events in King County. The FWC utilizes a combination of real-time flood monitoring tools, hydrologic modeling, and collaboration with local agencies and the National Weather Service to provide flood forecasts and warnings. It works closely with local jurisdictions and public health agencies to ensure communities have the necessary information to protect lives, property, and the environment. The center also supports public outreach, ensuring flood information is accessible, especially for vulnerable populations.

2-Year Objectives	5-Year Objectives	Long-Term Objectives
• Improve real-time flood monitoring and forecasting capabilities to enhance flood warnings. • Expand community outreach and flood awareness programs, ensuring residents understand flood risks and warnings. • Develop and distribute multilingual flood preparedness materials. • Strengthen coordination with local jurisdictions and agencies to ensure efficient flood response. • Continue improving flood mapping and risk assessment tools.	• Increase community trust and engagement with flood warning systems through outreach and educational programs. • Enhance the capacity of the FWC to issue timely, accurate flood warnings across all flood-prone areas. • Develop an integrated flood response plan that involves all local, regional, and state partners. • Provide equitable flood warning and preparedness materials for all King County communities, with a focus on underserved populations.	• Establish a fully integrated and automated flood warning system that can predict and respond to flood events across King County in real-time. • Build long-term resilience in communities, reducing vulnerability to flooding through education, infrastructure improvements, and emergency preparedness. • Expand floodplain management strategies to reduce future flood risks and enhance sustainable flood mitigation efforts.

Implementation Plan/Actions

• **Enhance flood monitoring capabilities**: Continue to upgrade and integrate flood monitoring tools, hydrologic models, and real-time data from streams and rivers.
• **Increase public awareness**: Provide ongoing public education on flood preparedness through workshops, outreach programs, and multilingual resources.
• **Collaborate with local and regional partners**: Coordinate flood monitoring and warning efforts with local governments, public health agencies, and the National Weather Service to provide timely, accurate information to communities.
• **Improve accessibility**: Develop and distribute flood warning alerts and preparedness materials in multiple languages to ensure accessibility for all residents.
• **Refine flood forecasting**: Invest in tools and resources to improve the accuracy of flood forecasting, integrating new technologies and data sources.

Performance Measure • Timeliness and accuracy of flood warnings issued by the FWC, measured by the lead time provided before flood events. • Increased public awareness and understanding of flood risks, as assessed through surveys and community engagement. • Number of communities reached through multilingual flood preparedness messaging. • Reduced flood-related impacts in communities, such as property damage or loss of life, as measured through post-event assessments and data analysis. • Enhanced coordination and response times among local, regional, and state partners during flood events.

20.7.16 Update Liquefaction Mapping in King County

Lead	Partners	Hazards Mitigated	Funding Sources and Estimated Costs
DNRP GIS	EMD USGS KCOEM	Earthquake	KC General Fund HMGP

Vision

Enhance community resilience in King County by updating and improving liquefaction hazard mapping, leading to better-informed land use planning, infrastructure development, and disaster preparedness in areas vulnerable to liquefaction during seismic events.

Description

Liquefaction, a process where saturated soil temporarily loses strength during an earthquake, poses a significant risk to buildings, infrastructure, and people in King County, particularly in low-lying areas. While previous mapping efforts have identified many areas at risk, updated and more accurate mapping, including new geotechnical data, advancements in seismic research, and changing land-use patterns, is needed to better understand the spatial distribution and intensity of liquefaction hazards.

The updated liquefaction hazard maps will inform land-use policies, zoning, building codes, emergency preparedness plans, and mitigation strategies, ultimately reducing the risk of property damage, loss of life, and economic disruption in the event of a significant seismic event.

2-Year Objectives	5-Year Objectives	Long-Term Objectives
• Conduct a comprehensive review of existing liquefaction hazard maps and identify areas requiring new data or more refined analysis. • Secure funding and develop partnerships with state, local, and federal agencies. • Complete geotechnical field studies in key areas of King County to update soil and seismic data. • Develop a draft of the updated liquefaction hazard maps for peer review.	• Finalize and publish the updated liquefaction hazard maps for King County. • Integrate updated maps into local land-use planning and development guidelines. • Conduct a series of outreach programs and workshops to educate local governments, developers, and the public about the updated maps and their implications. • Implement mitigation strategies based on the updated maps, including targeted infrastructure improvements and building code updates.	• Monitor the effectiveness of the updated liquefaction maps and mitigation measures in reducing risk to people, property, and infrastructure. • Expand the scope of the liquefaction mapping to cover areas outside of King County with potential future seismic risks. • Continue ongoing data collection and modeling to refine maps as seismic research advances. • Ensure continuous integration of updated maps into emergency management systems and protocols.

Implementation Plan/Actions

Year 1-2

- Coordinate with the Washington State EMD, USGS, and local jurisdictions to establish the scope of the project and secure funding.
- Identify critical areas of King County lacking detailed liquefaction data and prioritize them for field studies.
- Conduct geotechnical surveys and collect new data in high-priority areas (e.g., downtown Seattle, Bellevue, and South King County).
- Revise and update the preliminary liquefaction hazard maps.
- Review existing policies and zoning codes to incorporate updated hazard mapping requirements.

Year 3-5

- Conduct peer reviews of the updated maps with seismic experts and stakeholders to ensure accuracy and applicability.
- Finalize the updated liquefaction hazard maps and publish them online and in public forums.
- Integrate the updated maps into King County's GIS system and collaborate with local municipalities to update their land-use and building codes.
- Develop and implement an outreach strategy to inform developers, planners, and residents about the new data and its implications for construction and safety measures.
- Explore funding for infrastructure improvements in identified high-risk areas.

Ongoing

- Monitor seismic events and update maps as necessary based on new data and research.
- Periodically assess and refine mitigation measures to enhance community resilience.
- Maintain and update collaboration with state, local, and federal agencies to ensure continuous improvement in hazard mitigation efforts.

Performance Measure

• Completion of updated liquefaction hazard maps by the end of Year 2.
• Integration of updated maps into at least 80% of local jurisdictions' land-use policies and building codes by Year 5.
• Engagement with at least 500 stakeholders (e.g., community members, developers, emergency responders) through workshops, webinars, and outreach materials.
• 75% of identified high-risk infrastructure sites implement mitigation measures (e.g., retrofitting, land-use restrictions) within five years of map publication.

20.7.17 Expanding Roadway Access to Isolated Communities in Unincorporated King County

Lead	Partners	Hazards Mitigated	Funding Sources and Estimated Costs
DLS -Roads Fire Districts	KCOEM Eastside Fire and Rescue	Wildfire Extreme Weather	Existing Budget/BRIC/HMA Grants

Vision

To ensure that isolated communities in unincorporated King County have reliable and safe access routes for evacuation and emergency response, particularly during wildfire events and power outages. This strategy aims to enhance community resilience and improve public safety by reducing the risk of isolation during extreme events.

Description

Many isolated communities in unincorporated King County are vulnerable to wildfires and power outages due to limited or poorly maintained access roads. These roadways are crucial not only for evacuation but also for the delivery of essential services and the ability of emergency responders to reach affected areas. This strategy focuses on improving and expanding roadway access to these communities, ensuring that critical infrastructure can withstand and respond effectively to the challenges posed by wildfires, storms, and other natural disasters.

Key actions include road upgrades, clearing vegetation to create defensible spaces, and building alternative routes to avoid blocked roads during emergencies. The project will focus on both short-term improvements (such as road widening, emergency turnouts, and vegetation management) and long-term efforts (such as permanent road upgrades and redundancy in evacuation routes).

2-Year Objectives	5-Year Objectives	Long-Term Objectives
• Conduct a comprehensive assessment of road access to all isolated communities in unincorporated King County, identifying the most critical and vulnerable areas. • Prioritize roadways in high-risk wildfire zones and areas with limited access to power grid infrastructure. • Initiate vegetation management and clearance along key roads to improve accessibility during wildfire events and storms. • Establish agreements with fire districts, emergency medical services, and utility companies to facilitate coordinated response efforts during emergencies.	• Complete roadway upgrades (e.g., widening, resurfacing) for the highest-priority access routes to isolated communities, focusing on fire-prone and remote areas. • Develop alternative evacuation routes in at least 50% of identified communities to reduce the risk of blockage from wildfire or flooding. • Improve road resilience by reinforcing infrastructure (e.g., reinforcing bridges, culverts, and other critical structures) to withstand extreme weather events and wildfire risks. • Complete community engagement efforts to inform residents about emergency preparedness, evacuation plans, and available access routes.	• Achieve 100% access to all identified isolated communities with multiple, resilient, and well-maintained evacuation routes that are safe during wildfire, storms, and power outages. • Ensure that all access routes are equipped with necessary emergency signage, lighting, and traffic management systems for easy navigation during crises. • Fully integrate the road access improvements with the King County Emergency Response Plan to ensure coordination between first responders, residents, and emergency services.

		• Secure long-term funding and partnerships to maintain roadways, manage vegetation, and ensure consistent access for emergency response and recovery efforts.

Implementation Plan/Actions

Initial Roadway Assessment & Community Engagement:

- Complete a detailed analysis of current road conditions, identifying high-risk areas for wildfire or power outages.
- Consult with community members to understand local challenges and needs regarding road access and emergency response.
- Establish a prioritization framework for addressing the most urgent areas based on risk, accessibility, and population density.

Roadway Improvements:

- Begin widening key roads, particularly those serving remote areas, to allow for easier access for emergency vehicles, evacuation traffic, and utility crews.
- Install emergency turnouts, pull-offs, and strategic points for firefighting vehicles to ensure better response times and safety.
- Implement firebreaks and vegetation management along critical access roads to reduce the risk of road blockage due to wildfires or fallen trees.
- Improve road signage, emergency markers, and reflective materials to aid nighttime navigation during power outages or smoke-filled conditions.

Develop Alternative Routes:

- Identify and design secondary or backup evacuation routes that could be used if primary roads are compromised by wildfires, flooding, or other events.
- Construct or upgrade bridges, culverts, and other critical infrastructure to improve the durability of these alternative routes.
- Work with landowners and local stakeholders to secure rights-of-way and easements for new roads or alternate routes.

Coordination with Emergency Services:

- Work with local fire districts, emergency medical services (EMS), and law enforcement to create coordinated evacuation plans and response protocols.
- Train community members and emergency responders on the new road access options and the routes for evacuations.
- Establish communication protocols for when roads become impassable or when alternative routes are needed during a crisis.

Maintenance and Long-Term Sustainability:

- Develop a long-term plan for maintaining and upgrading roadways, including regular vegetation management, pothole repairs, and culvert maintenance.
- Seek federal, state, and local funding sources to sustain roadway improvements and ensure continued access for both regular use and during emergencies.
- Monitor changes in climate and infrastructure to adapt the roadway network to future challenges, such as more frequent wildfires or heavier storm events.

Performance Measure

- **Improvement in Access and Evacuation Times:** Measure the reduction in evacuation times and the ability of emergency responders to reach isolated communities compared to baseline data.
- **Road Condition Assessment:** Track improvements in the physical condition of roads, including road width, surface quality, and clearance levels for wildfire defense and emergency access.
- **Community Feedback and Engagement:** Monitor community satisfaction through surveys to assess the effectiveness of the improvements and how well residents understand and use the new access routes.
- **Emergency Response Metrics:** Measure the response times of fire, medical, and utility services to the upgraded areas, comparing pre- and post-upgrade metrics.
- **Frequency of Road Closures and Access Denials:** Track the reduction in instances of blocked or impassable roads during wildfire and storm events.

20.7.18 HVAC Upgrades for Extreme Weather

Lead	Partners	Hazards Mitigated	Funding Sources and Estimated Costs
FMD PHSKC	KCOEM	Extreme Weather	BRIC/FEMA/WAEMD

Vision

To enhance the resilience of King County facilities to extreme weather events by upgrading HVAC systems to ensure reliable temperature control, air quality, and energy efficiency, safeguarding public health and infrastructure, while reducing long-term operational costs.

Description

The purpose of this hazard mitigation strategy is to ensure that King County's facilities are equipped with HVAC systems that can effectively handle extreme weather conditions. These upgrades will address the increasing frequency of heatwaves, cold snaps, wildfires, and other weather-related events that can disrupt normal operations and threaten the safety and comfort of occupants.

These improvements include the installation of climate-resilient systems capable of maintaining optimal indoor conditions, even during power outages or extreme environmental conditions. The strategy will involve the integration of smart HVAC technologies, renewable energy sources (solar, battery storage), and emergency air filtration systems to protect public health in the event of poor outdoor air quality.

2-Year Objectives

- Conduct a comprehensive audit of all King County facilities' HVAC systems to assess current vulnerabilities to extreme weather conditions.
- Prioritize facilities based on usage, vulnerability to climate risks, and the population served, focusing on high-risk areas first.
- Implement immediate upgrades to HVAC systems in high-priority facilities (e.g., public health centers, emergency shelters, senior housing).
- Establish a task force to evaluate HVAC system designs, incorporating energy efficiency, sustainability, and climate adaptability.

5-Year Objectives

- Complete HVAC system upgrades for at least 75% of all county facilities in high-risk areas, including smart thermostats, emergency power backup, and air filtration systems.
- Install renewable energy-powered HVAC units or integrate battery storage systems in at least 30% of King County facilities.
- Improve air quality monitoring systems and ensure that HVAC systems can filter out smoke and pollutants from wildfire events in all key facilities.
- Develop a county-wide emergency HVAC operations plan for use during extreme weather events or power outages.

Long-Term Objectives

- Achieve 100% HVAC system resilience in all King County facilities, with real-time monitoring and automatic adjustments for extreme weather.
- Reduce the county's carbon footprint from HVAC operations by 40% through sustainable energy solutions, such as solar and geothermal systems.
- Establish King County as a regional model for climate-resilient public infrastructure, with HVAC systems that are adaptable, energy-efficient, and environmentally sustainable.
- Integrate HVAC resilience into broader climate adaptation strategies for King County.

Implementation Plan/Actions

1. **HVAC System Audit:**
   - Conduct detailed assessments of all existing HVAC systems in King County facilities to determine areas of improvement.
   - Identify facilities at highest risk based on location, function, and building age.
   - Establish a baseline for energy use, HVAC system age, and vulnerabilities.
2. **System Design & Selection:**
   - Research and select HVAC technologies that provide optimal resilience for extreme temperatures, air quality, and energy efficiency.
   - Focus on systems that are capable of utilizing renewable energy sources, especially solar or wind power, where feasible.
   - Develop a comprehensive retrofit plan for each facility based on audit findings.
3. **Upgrade Implementation:**
   - Begin upgrades in facilities with the greatest immediate need, such as hospitals, shelters, senior centers, and community hubs.
   - Install smart thermostats, backup power solutions (battery storage), and high-efficiency filters.
   - Include systems that can adjust to extreme weather patterns (e.g., high heat or low temperatures).
4. **Staff Training & Emergency Planning:**
   - Train maintenance staff and facility managers in HVAC system operation and emergency protocols.
   - Develop standard operating procedures (SOPs) for HVAC systems during power outages or extreme weather.
   - Integrate HVAC operations into King County's broader emergency response plans.
5. **Public Engagement & Communication:**
   - Provide community outreach regarding HVAC improvements, focusing on vulnerable populations that may be affected by extreme weather events (e.g., seniors, low-income residents).
   - Ensure all facility occupants are informed of HVAC system changes, particularly in terms of air quality and temperature regulation during emergencies.

Performance Measure

- **HVAC system performance during extreme weather events:** Measure the ability of upgraded systems to maintain comfortable and safe indoor environments during heatwaves, cold spells, or power outages.
- **Energy savings and sustainability metrics:** Track reductions in energy consumption and carbon footprint in facilities with upgraded HVAC systems.
- **Public health outcomes:** Monitor the incidence of heat-related illnesses, respiratory issues due to poor air quality, and other health impacts before and after HVAC upgrades.
- **Completion rates for HVAC system upgrades:** Measure the percentage of King County facilities with upgraded HVAC systems over the 2-year, 5-year, and long-term objectives.

20.7.19 KC Zone Program

Lead	Partners	Hazards Mitigated:	Funding Sources and Estimated Costs
KCOEM	Zone 1 & 3 Partner jurisdiction and special purpose districts and unincorporated county.	Avalanche Civil Disorder Cyber Incident Dam Failure Earthquake Flood Hazardous Materials Health Incident Landslide Extreme Weather Terrorism Tsunami Volcano Wildfire	~$220k

Vision

Overall, the role of the Zone Liaison is to promote, support, and facilitate regional coordination, communication, and collaboration, in an effort to unify and/or connect region-wide emergency management practices, with the aim of maximizing benefits from individual efforts and reducing redundancies.

Description

The focus of these regional efforts will be developed in partnership with King County Emergency Management and the zone partners, with input and advice from the Regional Emergency Managers group (the designated emergency manager for each city) and the Emergency Management Advisory Committee (EMAC).

2-Year Objectives	5-Year Objectives	Long-Term Objectives
• By the end of two years, the Zone Liaison will have achieved 75% participation in monthly meetings with all zone agencies, facilitated the completion of at least 24 zone-wide meetings, and supported six regional training or exercise initiatives. The Zone Liaison will also ensure timely situational updates and emergency activation responses, improving regional coordination and preparedness outcomes.	• Within five years, the Zone Liaison will have established a robust network of engaged zone partners, evidenced by 85% compliance with meeting and training objectives, and increased participation in preparedness initiatives across all partner agencies. This effort will enhance regional emergency management capabilities and ensure seamless collaboration during emergencies and planned events.	• The Zone Liaison will serve as a cornerstone for sustainable regional emergency management practices, fostering enduring partnerships and achieving measurable improvements in preparedness and operational readiness across all mission areas. Through consistent leadership and innovation, the Zone Liaison will help create a unified, resilient region capable of addressing evolving threats and challenges

Implementation Plan/Actions

- Facilitate Regional Coordination: Represent zone partners' interests at regional and state emergency management events, ensuring their needs and concerns are addressed in work plans and capability assessments.
- Maintain Situational Awareness: Regularly collect and distribute updates on training, exercises, planning efforts, and operational issues to King County Emergency Management and regional partners.
- Strengthen Relationships: Meet individually with each zone agency and organization monthly to foster collaboration, mentorship, and stakeholder engagement in preparedness efforts.
- Lead Preparedness Initiatives: Organize and facilitate monthly zone-wide meetings, lead training and exercise programs, and assist in the development of plans, policies, and tools to enhance regional capabilities.
- Support Emergency Operations: Act as a liaison during emergencies, ensuring effective communication and coordination between the zone, King County Emergency Management, and other partners.

Performance Measure

Facilitate Regional Coordination:

- Measure: Attend at least 90% of regional and state emergency management events and meetings annually.
- Measure: Submit quarterly reports demonstrating how zone partner needs and concerns are incorporated into regional work plans and capability assessments.

Maintain Situational Awareness:

- Measure: Provide at least biweekly situational awareness updates to King County Emergency Management, including information on training, exercises, and operational issues.
- Measure: Ensure situational updates are shared with all zone partners within 48 hours of receiving new information relevant to the region.

Strengthen Relationships:

- Measure: Conduct one-on-one meetings with at least 95% of zone agencies and organizations each month.
- Measure: Provide feedback from zone partners during quarterly reviews to demonstrate active engagement and relationship-building.

Lead Preparedness Initiatives:

- Measure: Organize and facilitate 12 monthly zone-wide meetings annually, with attendance from at least 80% of zone partners at each meeting.
- Measure: Lead or support at least three training sessions, exercises, or plan development initiatives per quarter, with participation from multiple zone partners.

Support Emergency Operations:

- Measure: Respond to emergency activation requests within one hour, with a 100% response rate during activated events.
- Measure: Provide a post-event report for each incident or event within 72 hours of its conclusion, highlighting actions taken and outcomes achieved.

20.7.20 Actively Manage Network Devices and Software

Lead	Partners	Hazards Mitigated	Funding Sources and Estimated Costs
KCIT	King County Risk Management	Cyber Incident	General Fund

Vision

To establish a secure, streamlined, and adaptive IT environment within King County by actively managing network devices and software. Starting with a controlled, known baseline, King County will minimize attack surfaces and enhance its ability to adapt to dynamic cybersecurity threats.

Description

This strategy involves conducting a thorough inventory of all network devices and software within King County's IT infrastructure. By identifying and removing unwanted, unneeded, or unexpected hardware and software, King County will significantly reduce its network's attack surface. Starting from a clean, known baseline allows for better control over the operational environment, making it easier to identify and mitigate security threats.

Once the inventory is complete, ongoing active management will be key. This includes managing devices, applications, operating systems, and security configurations to ensure systems are secure, scalable, and adaptable. Active enterprise management enables King County to respond effectively to emerging threats while streamlining administrative tasks and optimizing resource allocation.

2-Year Objectives	5-Year Objectives	Long-Term Objectives
• Complete a comprehensive inventory of all devices and software across King County's IT environment. • Remove at least 90% of unwanted, unneeded, or unexpected devices and software from the network. • Establish a baseline configuration for devices, applications, and security settings. • Implement a centralized management system to actively monitor and manage network devices and software. • Conduct regular audits to ensure compliance with the inventory and management processes.	• Achieve 100% accuracy in the inventory of devices and software across King County. • Fully integrate centralized management tools across all departments to streamline operations and improve response times. • Establish continuous monitoring systems for identifying and responding to changes or additions to the network that may introduce risks. • Reduce the number of security incidents related to unpatched software and unauthorized devices by at least 75%.	• Create a dynamic, scalable IT environment where all devices and software are continuously tracked, and the system automatically adapts to new threats. • Foster a culture of security awareness across all King County departments, where all personnel actively contribute to maintaining secure and controlled IT operations. • Achieve and maintain cybersecurity compliance with local, state, and federal regulations, particularly in areas related to system configuration and device management.

Implementation Plan/Actions

Conduct an Inventory of Network Devices and Software

- Utilize automated inventory management tools to catalog all devices, applications, and software currently in use across King County's network.
- Work with department heads to ensure all devices and software are accounted for and included in the inventory.

Remove Unwanted or Unnecessary Devices and Software

- Identify and eliminate any unauthorized or redundant devices and software that do not contribute to operational needs or security.
- Develop a decommissioning process for safely removing these devices from the network.

Establish a Known Baseline for Security Configurations

- Define and document a standard baseline for security configurations across devices, operating systems, and applications.
- Apply these configurations uniformly across all departments to ensure consistency.

Implement Centralized Management and Monitoring Systems

- Deploy centralized tools for managing and monitoring the security configurations of devices and software.
- Integrate these tools with existing cybersecurity measures for enhanced visibility and control.

Ongoing Active Management and Adaptation

- Continuously monitor and manage network devices, applications, and security configurations to ensure they remain secure and up-to-date.
- Adapt the management practices to address emerging threats and scale with changing needs.

Regular Audits and Compliance Checks

- Conduct periodic audits to ensure compliance with the inventory and active management protocols.
- Address any discrepancies or gaps identified during audits to maintain a secure environment.

Performance Measure

- **Inventory Accuracy**: Percentage of devices and software accurately inventoried and tracked within the system.
- **Reduction in Unauthorized Devices/Software**: Percentage reduction in unapproved or unnecessary devices and software on the network.
- **Compliance with Baseline Configurations**: Percentage of devices and systems configured according to the defined security baseline.
- **Incident Reduction**: Reduction in the number of security incidents linked to unauthorized devices, software vulnerabilities, or misconfigurations.
- **Audit Compliance**: Results of regular audits showing adherence to inventory and management policies.
- **Management Tool Integration**: Percentage of departments using centralized management and monitoring tools for device and software management.

20.7.21 Multi-Factor Authorization for King County Devices

Lead	Partners	Hazards Mitigated	Funding Sources and Estimated Costs
KCIT	King County Risk Management	Cyber Incident	General Fund

Vision

To strengthen King County's cybersecurity posture by prioritizing the protection of accounts with elevated privileges, remote access, and high-value assets through the adoption of multi-factor authentication (MFA) and the reduction of reliance on single-factor authentication systems.

Description

This strategy focuses on enhancing authentication security across King County's IT systems, particularly for high-risk accounts, including those with elevated privileges, remote access, and access to critical or sensitive assets. Single-factor authentication (SFA), such as password-based authentication, is vulnerable to a variety of threats, including credential theft, phishing attacks, and password reuse across systems.

To mitigate these risks, King County will implement multi-factor authentication (MFA) with a focus on using physical token-based systems (e.g., smart cards, hardware tokens) to supplement knowledge-based factors such as passwords and PINs. This will significantly reduce the chances of unauthorized access, ensuring that even if a password is compromised, access to sensitive systems and data remains secure.

The migration away from single-factor authentication to MFA will prioritize accounts that pose the highest risks, including administrative accounts, remote access accounts, and those tied to high-value assets.

2-Year Objectives	5-Year Objectives	Long-Term Objectives
• Implement multi-factor authentication (MFA) for all accounts with elevated privileges or remote access within the first year. • Complete a risk assessment to identify high-value assets and systems requiring immediate implementation of MFA. • Provide training for all IT staff and administrators on the secure use of MFA systems.	• Achieve 100% deployment of MFA across all user accounts with elevated privileges, remote access, and high-value assets. • Phase out the use of single-factor authentication across all non-administrative accounts. • Achieve a reduction in unauthorized access attempts and cyber incidents linked to credential theft by at least 75%. • Ensure compliance with federal and state cybersecurity standards and regulations for authentication systems.	• Establish King County as a leader in cybersecurity best practices, with MFA fully integrated across all IT systems and user access points. • Continuously evaluate and update authentication methods as new technologies and best practices emerge, maintaining the highest level of security. • Foster a cybersecurity-aware culture across King County where secure authentication practices are the norm.

Implementation Plan/Actions

1. **Identify High-Risk Accounts and Systems**
    - Conduct a comprehensive audit of King County IT systems to identify accounts with elevated privileges, remote access, and access to high-value assets.
    - Prioritize MFA implementation for these accounts based on their associated risks.
2. **Deploy Multi-Factor Authentication (MFA)**

- Select and implement physical token-based MFA systems (e.g., hardware tokens, smart cards, biometric systems) for high-risk accounts.
- Integrate MFA with existing authentication systems across King County's IT infrastructure.

3. **Migrate Away from Single-Factor Authentication (SFA)**
   - Gradually phase out single-factor authentication for non-administrative accounts, replacing them with MFA systems.
   - Provide clear timelines and training for all staff members transitioning to MFA.
4. **Training and Awareness**
   - Provide training sessions for all relevant King County staff on the importance of MFA and how to use the new systems effectively.
   - Increase awareness of common authentication risks, such as phishing and password reuse, and educate staff on avoiding them.
5. **Ongoing Monitoring and Evaluation**
   - Continuously monitor the effectiveness of MFA deployment, tracking system usage and incidents related to authentication breaches.
   - Regularly evaluate and update MFA protocols to keep pace with emerging threats and new technologies.

Performance Measure

- **MFA Deployment**: Percentage of high-risk accounts protected by MFA.
- **Reduction in Breaches**: Reduction in the number of unauthorized access incidents due to credential theft or misuse.
- **Staff Training**: Percentage of relevant IT staff and users who have completed MFA training and are actively using MFA.
- **Compliance Rate**: Percentage of King County systems compliant with the updated MFA policies.
- **Incident Monitoring**: Number of cybersecurity incidents linked to authentication vulnerabilities after MFA implementation.

20.7.22 Timely Software Updates from KCIT

Lead	Partners	Hazards Mitigated	Funding Sources and Estimated Costs
KCIT	King County Risk Management	Cyber Incident	KCIT Budget

Vision

To ensure King County's IT systems remain secure and resilient by applying all available software updates immediately, automating the update process wherever possible, and maintaining a high level of vigilance against threats, reducing the risk of exploitations and ensuring the integrity of county systems

Description

This strategy aims to implement a robust software update and patch management process to protect King County's IT systems from vulnerabilities. Cybersecurity threats, especially those related to unpatched software, are a significant risk to public safety and data security. Threat actors often take advantage of delays in patching, using exploits shortly after a patch is released—referred to as N-day exploits. The strategy emphasizes the importance of rapid, thorough software updates, using automation tools to ensure timely application of patches, and relying on authenticated vendor updates delivered through secure channels.

By automating the patching process and ensuring updates are applied promptly, King County will reduce the time available for threat actors to exploit vulnerabilities, thereby minimizing the risk of breaches or system failures.

2-Year Objectives

- Implement an automated patch management system across all critical King County IT systems.
- Apply 100% of available software updates within 24 hours of release, reducing patch application times significantly.
- Establish an authentication verification process for all vendor-provided software updates to ensure integrity.
- Conduct quarterly internal audits to assess the effectiveness of patch management.

5-Year Objectives

- Ensure that 100% of all county-wide systems are covered by the automated patch management system.
- Achieve a reduction in cyber incidents related to unpatched software vulnerabilities by 75%.
- Partner with vendors to streamline update delivery processes and integrate further security measures into patching protocols.
- Regularly update training for IT staff on the latest patch management tools and security trends.

Long-Term Objectives

- Establish King County as a leader in cybersecurity resilience within local government by ensuring all software systems are continuously updated and secure.
- Create a dynamic cybersecurity culture across King County departments, where proactive patching and security measures are ingrained in daily operations.
- Achieve zero successful exploitation of known vulnerabilities in County systems within 12 months of patch release.

Implementation Plan/Actions

Automate Software Updates

- Deploy patch management automation tools to ensure all critical systems automatically receive and apply updates.
- Work with key departments to ensure integration of automated patching into day-to-day IT operations.

Vendor Coordination and Authentication

- Set up a system to only accept vendor updates that are signed and transmitted over secure channels, ensuring the integrity of all patches.
- Work with vendors to streamline update delivery and verify authenticity of updates.

Patch Cycle Management

- Create and enforce a policy that software patches are applied within 24 hours of release for critical vulnerabilities.
- Develop a detailed patching calendar that aligns with known release cycles of major software vendors.

Monitoring and Reporting

- Monitor the status of updates across all systems and ensure compliance with patching timelines.
- Implement dashboards and alerts for IT staff to track update status in real-time.

Training and Awareness

- Provide continuous training for IT staff on best practices for patch management and cybersecurity.
- Raise awareness across departments about the importance of timely software updates.

Performance Measure

- **Patch Application Speed**: Percentage of software patches applied within 24 hours of release.
- **Automation Coverage**: Percentage of IT systems covered by the automated patch management system.
- **Incident Reduction**: Reduction in the number of cybersecurity incidents related to known unpatched vulnerabilities.
- **Audit Results**: Results of quarterly patch management audits, measuring compliance and effectiveness.
- **Staff Training**: Number of IT staff trained on patch management best practices and tools.

20.7.23 Creation of County Wide Recovery Plan

Lead	Partners	Hazards Mitigated	Funding Sources and Estimated Costs
KCOEM	DNRP PHSKC ECO FEMA	Avalanche Civil Disorder Cyber Incident Dam Failure Earthquake Flood Hazardous Materials Health Incident Landslide Extreme Weather Terrorism Tsunami Volcano Wildfire	General Fund

Vision

To create a comprehensive, resilient, and flexible county-wide recovery plan that effectively addresses the unique needs of all communities in King County, ensuring a swift and equitable recovery process after disasters. This plan will integrate community needs, enhance preparedness, and optimize resource allocation, providing clear guidance for a seamless recovery effort.

Description

The goal of this strategy is to update and enhance King County's County-Wide Recovery Plan, ensuring that it reflects current risks, best practices, and lessons learned from past disasters. The plan will improve the coordination between local municipalities, agencies, and partners, integrating the entire county into the recovery process. It will focus on an equitable, community-driven recovery approach, with particular attention given to vulnerable and underserved populations.

The updated plan will address key areas of recovery, such as housing, public health, infrastructure, utilities, and economic recovery, providing specific action items, timelines, and responsibilities. Additionally, the plan will be flexible to accommodate different types and scales of disasters, ensuring that King County can respond effectively to both common and rare events.

2-Year Objectives	5-Year Objectives	Long-Term Objectives
• Complete a comprehensive review of the current recovery plan and identify gaps or outdated sections. • Engage with at least 15 community organizations to incorporate their perspectives into the updated plan. • Conduct a series of public workshops and stakeholder meetings to gather input and feedback from King County residents and local leaders.	• Fully integrate recovery planning with King County's hazard mitigation strategies. • Establish a coordinated recovery task force composed of key agencies, local governments, and community representatives. • Develop a county-wide recovery resource network, including logistics, supplies, and personnel, that can be quickly activated during an emergency.	• Achieve a recovery plan that is adaptable, scalable, and inclusive, with a focus on the most vulnerable populations and critical infrastructure. • Ensure that King County's recovery processes are fully integrated with state and federal systems, enabling swift resource

• Develop and implement an updated recovery framework with clear action steps for each recovery phase (immediate, short-term, long-term). • Update the recovery plan to reflect new hazards, such as climate change-related events, and new recovery needs, such as mental health and economic recovery.	• Implement a training program for recovery personnel across King County, ensuring readiness for all disaster recovery phases. • Conduct a large-scale recovery exercise with local municipalities to test the updated plan's effectiveness.	allocation and coordination. • Foster a culture of continuous improvement through annual updates, community engagement, and post-disaster reviews. • Create a recovery plan that is recognized as a model for other counties across the state or region, with lessons learned shared widely.

Implementation Plan/Actions

Comprehensive Review and Assessment

- Conduct a detailed review of the current county-wide recovery plan.
- Identify areas where the plan is outdated, insufficient, or needs to be enhanced based on emerging threats (e.g., climate change).
- Engage emergency management experts, local municipalities, and community stakeholders to evaluate the plan's effectiveness.

Community and Stakeholder Engagement

- Host public workshops and focus groups to solicit feedback on the recovery plan from residents, local businesses, and community organizations.
- Collaborate with vulnerable communities to ensure the plan reflects their specific needs and concerns during recovery.
- Build partnerships with local utilities, transportation authorities, and non-profit groups to understand their recovery roles and challenges.

Plan Update and Enhancement

- Revise and update the recovery plan with current data, guidelines, and best practices for disaster recovery.
- Create clear, actionable steps for recovery in critical areas such as housing, public health, economic recovery, and infrastructure restoration.
- Integrate recovery strategies into King County's overall emergency management framework, linking recovery efforts to mitigation and preparedness activities.

Training and Capacity Building

- Develop training materials and exercises for county staff, recovery personnel, and partners, focusing on roles and responsibilities during recovery.
- Conduct workshops and simulations to test the effectiveness of the new recovery plan.
- Build a recovery team within KCOEM and local municipalities that will be ready to implement the plan in the aftermath of a disaster.

Testing and Drills

- Conduct multi-agency recovery exercises to simulate a real disaster recovery scenario.
- Identify any weaknesses or challenges in the recovery process and refine the plan accordingly.
- Ensure all recovery partners are well-versed in the plan's procedures and their individual responsibilities.

Performance Measure

- **Plan Completion**: Percentage of recovery plan sections updated and reviewed (e.g., housing, infrastructure, health).
- **Stakeholder Engagement**: Number of community members, organizations, and agencies engaged in the planning process.
- **Training Participation**: Number of recovery personnel trained on the new recovery framework.
- **Recovery Exercises**: Successful completion of recovery drills and exercises, with identified improvements incorporated into the plan.
- **Plan Activation Time**: Time taken to activate and implement the recovery plan after a disaster.
- **Post-Disaster Evaluation**: Feedback from the community and stakeholders on the recovery process, assessing satisfaction and areas for improvement

20.7.24 Wastewater Treatment Division Workforce Development Program

Lead	Partners	Hazards Mitigated	Funding Sources and Estimated Costs
DNRP – WTD	Local partners	Extreme Weather	King County Budget

Vision

To create a sustainable and diverse workforce for the clean water sector by providing comprehensive recruitment, mentorship, training, and career growth opportunities to entry-level candidates. The program ensures that individuals are equipped with the skills and knowledge necessary to thrive in the wastewater treatment industry while contributing to a more equitable and inclusive workforce

Description

WTD's Workforce Development Program focuses on recruiting, training, mentoring, and placing entry-level candidates into long-term careers in the clean water sector. The program supports individuals who are either building their skills or are new to the field by providing them with hands-on experience, site visits, and challenging assignments across different WTD work groups. Cohort members are hired in small groups and exposed to various areas within WTD, such as planning, engineering, project management, and construction management. The program's goal is to help individuals discover their passion and secure permanent positions within the organization. After completing the program, cohort members are encouraged to apply for open positions within WTD and will have an advantage due to their familiarity with the agency's operations and culture. Graduates typically transition smoothly into roles across different units, such as planning, engineering, and project management, and contribute to WTD's diverse workforce.

2-Year Objectives	5-Year Objectives	Long-Term Objectives
• Recruit and onboard 4 to 8 new cohorts of entry-level candidates each year. • Place 70% of cohort members into permanent positions within WTD by the end of their program. • Increase the diversity of the applicant pool by 20%. • Develop and implement mentorship programs for cohort members to support career growth.	• Expand the program to include additional work groups within WTD, such as operations and maintenance. • Achieve a 90% placement rate of cohort members into permanent positions within WTD. • Ensure that 40% of cohort graduates come from underrepresented communities in the clean water sector. • Develop partnerships with community colleges to offer accredited certifications in wastewater treatment for cohort members.	• Establish WTD's Workforce Development Program as a national model for clean water sector career training and inclusion. • Fully integrate workforce development initiatives into WTD's long-term staffing and succession planning strategies. • Ensure that all cohorts reflect the demographic diversity of King County and are prepared to meet the future workforce needs of the clean water industry.

Implementation Plan/Actions

Recruitment and Onboarding

- Launch targeted recruitment campaigns to attract entry-level candidates, especially from diverse and underserved communities.
- Provide extensive onboarding that includes tours of WTD facilities, introductions to various teams, and detailed orientation sessions.
- Organize site visits and team rotations for cohorts to gain exposure to different work groups within WTD.

Mentorship and Career Support

- Assign mentors to cohort members to guide them through their training and career development within WTD.
- Offer regular check-ins and professional development workshops to help individuals progress in their careers.
- Facilitate peer networking and collaboration opportunities within the cohort and across different WTD teams.

Training and Skill Development

- Provide cohort members with challenging, hands-on assignments that build relevant skills in areas such as engineering, project management, and construction.
- Offer continuous learning opportunities such as online courses, certification programs, and technical training to enhance career readiness.

Placement and Retention

- Actively track the progress of cohort members toward securing permanent roles within WTD.
- Create a streamlined internal application process for cohort members to apply for open positions within the agency.
- Maintain a strong relationship with graduates and provide ongoing support to ensure retention in the clean water sector

Performance Measure

- **Cohort Success Rate**: Percentage of cohort members successfully placed in permanent roles within WTD.
- **Diversity Metrics**: Increase in the diversity of cohort participants, including gender, race, and background.
- **Program Retention**: Retention rates of cohort members within WTD, measured over a 2- and 5-year period.
- **Graduation Rates**: Percentage of cohort members completing the program and transitioning into desired roles. **Employee Satisfaction**: Cohort members' satisfaction with mentorship, training, and career growth opportunities (survey results).

20.7.25 King Conservation District Wildfire Mitigation Program

Lead	Partners	Hazards Mitigated	Funding Sources and Estimated Costs
King Conservation District (KCD)	Eastside Fire and Rescue DNRP	Wildfire	KCD Budget

Vision

To reduce the risk of wildfire damage to homes and communities in King County, especially in the Wildland Urban Interface (WUI), through proactive risk assessments, strategic wildfire mitigation projects, and collaborative efforts aimed at enhancing community resilience.

Description

The King Conservation District's (KCD) Wildfire Mitigation Program provides wildfire risk assessments and mitigation planning to increase community resilience against wildfires. KCD partners with local fire districts, the Washington State Department of Natural Resources, and other organizations to assist homeowners and communities in the Wildland Urban Interface (WUI). By assessing properties, providing mitigation recommendations, and offering cost-share funding for implementation, KCD helps reduce wildfire risk and prepare areas vulnerable to wildfire events. KCD conducts individual and community-wide risk assessments, focusing on practical steps such as vegetation removal, roof maintenance, and forest health improvement. Through funding and planning assistance, KCD supports homeowners and communities to take preventative actions, including thinning, fuel management, and creating defensible spaces.

2-Year Objectives	5-Year Objectives	Long-Term Objectives
• Complete 200 wildfire risk assessments in King County, focusing on homes and communities within the WUI. • Begin 50 wildfire mitigation projects, providing cost-share funding for eligible homeowners and communities. • Engage at least 10 community organizations to help expand wildfire mitigation outreach.	• Complete 500+ wildfire risk assessments across King County's high-risk wildfire zones. • Successfully implement wildfire mitigation projects on 200 properties and community-owned forests. • Achieve a 25% reduction in wildfire risk within assessed areas as measured by post-project assessments.	• Establish wildfire mitigation as a key part of all residential and community planning in King County. • Ensure that all homes and communities in the WUI have access to wildfire risk assessments and mitigation resources. • Strengthen public-private partnerships to enhance wildfire resilience through expanded cost-share and technical assistance programs.

Implementation Plan/Actions

Wildfire Risk Assessments

- Conduct individual and community-wide assessments within the WUI.
- Focus on the 100-foot defensible space around each home and forest health assessments for community-owned forests.
- Provide homeowners and community associations with a list of mitigation recommendations based on the assessments.

Wildfire Mitigation Project Planning and Cost-Share

- Offer project planning assistance to homeowners and community associations.

- Provide cost-share funding, reimbursing 75% of eligible project costs for activities such as vegetation removal, gutter/roof maintenance, and fire break creation.
- Prioritize funding for projects that reduce wildfire risk to homes and improve community resilience.

Outreach and Community Engagement

- Develop and distribute informational materials to educate residents about wildfire risks and mitigation actions.
- Collaborate with local fire districts, the Red Cross, and other partners to reach underserved and at-risk populations.
- Host workshops and training sessions on wildfire preparedness and mitigation strategies.

Forest Health and Fuel Management Projects

- In community-owned forests, assess forest health and implement projects such as thinning, brush management, and fuel breaks.
- Work with local agencies and fire districts to coordinate larger-scale mitigation projects that benefit multiple properties and forested areas.

Performance Measure

- **Risk Assessment Completion**: Number of wildfire risk assessments completed annually.
- **Mitigation Projects**: Number of mitigation projects funded and successfully implemented.
- **Community Engagement**: Level of participation in outreach efforts (workshops, surveys, etc.).
- **Impact on Wildfire Risk**: Percentage reduction in wildfire risk within the targeted areas as measured through post-implementation evaluations.
- **Cost-Share Utilization**: Amount of cost-share funding distributed, and the number of households/communities receiving support.

20.7.26 Improving Emergency Management Public Outreach

Lead	Partners	Hazards Mitigated	Funding Sources and Estimated Costs
KCOEM	Local jurisdictions within the county	Avalanche Civil Disorder Cyber Incident Dam Failure Earthquake Flood Hazardous Materials Health Incident Landslide Extreme Weather Terrorism Tsunami Volcano Wildfire	King County Budget

Vision

To ensure that all residents of King County are well-informed and prepared to effectively respond to and mitigate the impacts of hazards, through comprehensive and targeted public outreach strategies. By enhancing public awareness and providing accessible resources, we aim to reduce vulnerability and improve community resilience.

Description

The King County Office of Emergency Management seeks to improve its public outreach efforts to raise awareness about local hazards, promote preparedness actions, and encourage mitigation strategies. By using a combination of media, community partnerships, educational initiatives, and social engagement, the strategy will ensure that residents of all backgrounds understand the risks they face and how to reduce them. This outreach initiative will focus on diverse communities, ensuring inclusivity and accessibility to the county's mitigation programs.

2-Year Objectives	5-Year Objectives	Long-Term Objectives
• Increase public engagement through digital campaigns and social media platforms. • Develop partnerships with 10 new community organizations to amplify hazard mitigation messaging. • Conduct 5 community preparedness workshops targeting underserved populations.	• Establish a countywide public education program integrated with schools, community centers, and local businesses. • Increase public awareness about hazard mitigation by 30% as measured through surveys. • Implement a mobile application for hazard alerts and mitigation resources. • Achieve a 15% increase in the adoption of preparedness plans among residents and businesses in King County.	• Create a culture of resilience where all King County residents are knowledgeable about hazards and preparedness. • Ensure that all at-risk neighborhoods have access to tailored hazard mitigation and preparedness information. • Make hazard mitigation a priority in every public and private sector planning effort.

Implementation Plan/Actions

Community Engagement Campaigns

- Launch digital media and social media campaigns to inform the public about mitigation practices.
- Use targeted outreach strategies for at-risk communities, utilizing culturally relevant content.
- Conduct public service announcements through local media.

Educational Outreach

- Create and distribute educational materials (flyers, posters, websites, brochures) to key stakeholders such as schools, libraries, and community centers.
- Develop and promote interactive tools (e.g., hazard scenario simulations) to educate residents on risks and mitigation actions.
- Host workshops and town halls focusing on hazard preparedness and mitigation.

Collaboration and Partnerships

- Partner with local businesses, schools, and non-profit organizations to expand outreach and engage more residents.
- Coordinate with local emergency services and public health officials to integrate hazard mitigation into public health campaigns.
- Engage influencers and local celebrities to help spread key messages on social media and at community events.

Data and Research

- Gather data through surveys and focus groups to assess the effectiveness of outreach efforts and areas needing improvement.
- Develop and share annual reports on the public's understanding of hazard risks and mitigation actions.

Performance Measure

- **Engagement Metrics**: Social media interaction rates, attendance at public outreach events, and engagement with online resources.
- **Survey Results**: Improvement in public understanding of hazard risks and mitigation actions through pre- and post-campaign surveys.
- **Participation Rates**: The number of residents who complete mitigation action steps, such as signing up for emergency alerts or attending preparedness workshops.
- **Outreach Reach**: Number of educational materials distributed, community organizations involved, and media coverage achieved.

20.7.27 Maintain LEPC in King County

Lead	Partners	Hazards Mitigated	Funding Sources and Estimated Costs
KCOEM	Local Fire Departments KCSO PHSKC	Hazardous Materials	KCOEM Budget

Vision

To ensure the continued protection of King County residents, workers, and the environment by maintaining a robust and effective Local Emergency Planning Committee (LEPC) focused on hazardous materials. The LEPC will provide proactive mitigation strategies, streamline emergency response coordination, and promote the safe management of hazardous materials throughout the county.

Description

The King County LEPC is dedicated to reducing the risks associated with hazardous materials in the community. This strategy seeks to maintain and enhance the effectiveness of the LEPC in response to hazardous materials incidents. The committee works collaboratively with government agencies, local businesses, fire and emergency responders, and the public to prepare for and mitigate the risks of hazardous materials.

Key activities of the LEPC will include:

- Developing and maintaining emergency response plans for hazardous materials incidents
- Organizing regular training for first responders and community stakeholders
- Maintaining an up-to-date inventory of hazardous materials in King County
- Ensuring public awareness and education about hazardous materials
- Conducting hazard assessments and implementing mitigation actions to reduce risk exposure

2-Year Objectives	5-Year Objectives	Long-Term Objectives
• Maintain a fully operational LEPC with diverse membership across sectors (government, private industry, first responders). • Complete a comprehensive hazardous materials inventory across King County. • Conduct a county-wide hazardous materials risk assessment and prioritize mitigation actions. • Increase public education campaigns focused on hazardous materials safety and emergency preparedness. • Provide at least two full-scale hazardous materials emergency response exercises for local responders.	• Establish a regional hazardous materials response network to ensure seamless collaboration across jurisdictions. • Develop and implement new hazard mitigation actions based on evolving hazardous materials risks (e.g., transportation routes, facility operations). • Achieve a 25% reduction in hazardous materials-related incidents through risk mitigation efforts. • Secure long-term funding mechanisms to sustain LEPC activities beyond initial federal and state grants.	• Incorporate new technologies (e.g., real-time data collection, advanced response equipment) into LEPC operations. • Expand the LEPC's scope to include emerging environmental threats, such as climate change impacts on hazardous material risks. • Develop a county-wide certification program for businesses and industries involved in hazardous materials handling.

Implementation Plan/Actions

- **Action 1: Maintain LEPC Membership and Leadership**
  - Ensure diverse participation from all relevant stakeholders, including local government, fire departments, health agencies, and industry partners.
  - Schedule quarterly LEPC meetings to review progress, address concerns, and discuss evolving hazards.
- **Action 2: Hazardous Materials Inventory and Risk Assessment**
  - Survey and document all facilities in King County that store or handle hazardous materials.
  - Conduct a risk assessment to evaluate the potential for chemical spills, accidents, and other hazardous materials incidents.
  - Prioritize the most critical locations for mitigation efforts.
- **Action 3: Emergency Response Plan Updates and Drills**
  - Update the King County hazardous materials emergency response plan annually.
  - Conduct regular training for first responders on the use of hazardous materials response equipment.
  - Organize annual full-scale exercises that simulate hazardous materials incidents for training purposes.
- **Action 4: Public Outreach and Education**
  - Develop educational materials for residents and businesses regarding hazardous materials risks and emergency procedures.
  - Launch a public awareness campaign on hazardous materials safety, especially in high-risk areas.
- **Action 5: Funding and Resource Development**
  - Identify new federal, state, and private funding opportunities to sustain the LEPC's efforts.
  - Explore partnerships with local industries to secure in-kind donations and resources for training and mitigation activities.

Performance Measure

- Successful execution of at least one full-scale hazardous materials emergency exercise per year.
- Completion of a hazardous materials inventory for 100% of King County facilities within 2 years.
- Achieving sustainability through securing long-term funding sources for LEPC activities by Year 5.

20.7.28 Strengthening and Maintaining Partnerships for Emergency Response and Coordination

Lead	Partners	Hazards Mitigated	Funding Sources and Estimated Costs
KCSO	KCOEM Fusion Center	Terrorism Civil Disorder	General Fund

Vision

To create a coordinated, resilient emergency response system by maintaining strong and effective partnerships between the King County Sheriff's Office, the King County Office of Emergency Management, and the Fusion Center, ensuring a rapid, unified, and data-driven approach to mitigating and responding to a wide range of hazards.

Description

The partnership between the King County Sheriff's Office, King County Office of Emergency Management, and the Fusion Center is vital for providing effective emergency response and mitigation strategies. This strategy aims to sustain and strengthen this collaboration by improving communication, sharing resources, and enhancing training and preparedness. The goal is to ensure a seamless response to emergencies, optimize resource allocation, and enhance public safety by addressing a wide array of threats, from natural disasters to public safety concerns.

2-Year Objectives	5-Year Objectives	Long-Term Objectives
• Formalize and enhance communication protocols between KCSO, KCOEM, and the Fusion Center for real-time data and situational awareness • Establish regular joint training exercises and tabletop scenarios involving all partners • Update and review emergency response plans and protocols for cross-agency collaboration • Strengthen information-sharing networks and systems between the agencies • Secure initial funding for technology improvements that enable faster, more secure data sharing	• Develop an integrated emergency response plan that incorporates all relevant agencies and ensures efficient resource deployment • Expand the Fusion Center's role in coordinating intelligence and public safety data across jurisdictions • Increase the frequency of joint exercises and develop more advanced scenarios • Achieve regional coordination agreements with neighboring counties and agencies for large-scale emergencies • Enhance cross-training programs to build mutual understanding of each agency's capabilities and limitations	• Fully integrate emergency response systems across King County with real-time data sharing and multi-agency collaboration • Establish a robust regional and statewide network of fusion centers for better intelligence and situational awareness • Ensure all staff at KCSO, KCOEM, and the Fusion Center are trained on advanced emergency response protocols and technologies • Strengthen public trust and cooperation through transparent emergency management efforts and clear public communication strategies • Increase efficiency in resource deployment during large-scale emergencies, reducing response times by 20%

Implementation Plan/Actions • Develop a comprehensive communication and data-sharing framework that outlines roles, responsibilities, and protocols during an emergency • Conduct bi-annual joint exercises and simulation drills between KCSO, KCOEM, and the Fusion Center, focusing on realistic scenarios, including natural and man-made disasters • Integrate data management systems between the KCSO, KCOEM, and Fusion Center to allow seamless flow of real-time information during emergencies • Regularly review and update emergency response plans to ensure they reflect changes in technology, population growth, and evolving threats • Advocate for and apply for state and federal funding to enhance technology and infrastructure for inter-agency coordination • Establish clear points of contact and dedicated personnel responsible for ensuring the continuity of communication and collaboration during emergencies • Create a public education campaign that outlines the roles of each agency in emergency response, fostering community awareness
Performance Measure • Number of joint training exercises conducted and the level of participation from all partners • Speed and accuracy of information exchange during emergencies, measured by response time and situational awareness • Increased integration of data systems, tracked by the implementation of new technology and successful data-sharing tests • Satisfaction surveys from participating agencies evaluating the effectiveness of coordination and response efforts • Secured funding for technology enhancements and collaborative infrastructure • Improved response times during actual emergencies, measured through after-action reports and evaluations

20.7.29 Implementation of 2024 King County Floodplain Management Plan

Lead	Partners	Hazards Mitigated	Funding Sources and Estimated Costs
DNRP	Flood Control District	Flooding Extreme Weather	

Vision

To reduce the vulnerability of communities, infrastructure, and ecosystems to flooding by implementing the King County Floodplain Management Plan, fostering resilience through sustainable land use, strategic mitigation, and enhanced floodplain management practices.

Description

The 2024 King County Floodplain Management Plan outlines a comprehensive strategy for flood risk reduction, environmental restoration, and improved community resilience. This mitigation strategy focuses on managing floodplains as dynamic ecosystems while enhancing the capacity to manage flood risks through collaboration and smart growth planning. The goal is to protect vulnerable communities and the environment from flood hazards, improve floodplain health, and provide a resilient, sustainable foundation for future generations.

2-Year Objectives	5-Year Objectives	Long-Term Objectives
• Complete a comprehensive floodplain risk assessment and mapping update for priority areas • Develop and implement a public education campaign about flood risk and preparedness • Initiate floodplain restoration projects in high-priority areas • Secure FEMA funding for flood mitigation infrastructure improvements • Collaborate with municipalities to align local planning policies with floodplain management goals	• Expand floodplain restoration efforts across King County's flood-prone regions • Complete the construction of at least three major flood mitigation infrastructure projects • Achieve a 15% reduction in flood risk exposure for critical infrastructure in high-priority zones • Integrate floodplain resilience measures into regional development and land use policies • Build community partnerships for ongoing public engagement in floodplain management	• Reduce flood risk for 50% of the county's flood-vulnerable communities • Ensure the restoration of 500 acres of floodplain habitat • Fully integrate floodplain management and resilience into regional land use and development planning • Achieve a 25% reduction in the economic impact of flooding to the local economy • Increase public awareness and preparedness for flood events by 30%

Implementation Plan/Actions

• Update flood risk maps and floodplain zoning regulations to reflect the latest data
• Identify and prioritize floodplain restoration sites, focusing on high-risk areas for both communities and ecosystems
• Develop and implement hazard reduction measures (levees, flood barriers, natural flood control systems) in high-priority flood zones
• Provide ongoing training for local governments and first responders on floodplain risk management and emergency preparedness
• Create a dedicated funding pool to support local governments' flood mitigation projects
• Facilitate community-based planning processes, ensuring that vulnerable populations have a voice in floodplain management decisions
• Expand the role of technology and data in flood monitoring and prediction

Performance Measure
• Reduction in flood risk to critical infrastructure (measured through floodplain risk assessments) • Acres of floodplain restored and improved • Number of local municipalities that have updated their floodplain policies and zoning laws • Percentage increase in community awareness and preparedness as measured by surveys and public engagement metrics • Amount of funding secured from federal and state sources for flood mitigation projects • Number of completed flood mitigation and infrastructure projects in high-priority areas

20.7.30 Mount Si Road Undergrounding Project

Lead	Partners	Hazards Mitigated	Funding Sources and Estimated Costs
Tanner Electric Cooperative	OEM DLS - Roads	Wildfire Severe Weather	$3.5 Million

Vision

To enhance energy resilience and mitigate wildfire and storm-related risks for the North Bend community by undergrounding critical electrical infrastructure along Mount Si Road, ensuring consistent, safe, and uninterrupted power supply to residents, businesses, and essential services.

Description

The Mount Si Road Undergrounding Project proposes the installation of approximately 1.63 miles of underground three-phase electrical distribution lines using Schedule 40 PVC conduit in North Bend, Washington. Initiated by Tanner Electric Cooperative, the project seeks funding to significantly improve the resilience of energy infrastructure historically vulnerable to wildfires, winter storms, and high winds.

The existing overhead distribution lines—exposed for over five to six decades—are a known source of power outages and fire ignition risks. Undergrounding will eliminate these overhead vulnerabilities, ensure consistent energy supply to 486 meters (approximately 1,290 residents), and support critical infrastructure such as local water tanks, communications booster stations, and private wells. The affected section currently relies on a radially fed circuit with limited access, which complicates repair and restoration during outages.

Underground infrastructure will provide virtually maintenance-free power delivery, increased longevity, and significantly reduced risk of outages. It will also prevent power shutoffs during red flag wildfire events when Tanner currently implements one-shot policies and delays re-energizing lines until full inspection by daylight.

2-Year Objectives	5-Year Objectives	Long-Term Objectives
• Complete project design and permitting • Secure construction contracts • Begin trenching and conduit installation	• Complete full underground conversion of the 1.63-mile section • Transition affected customers to the underground system • Decommission overhead lines and poles in project area	• Achieve near-elimination of weather-related outages in project zone • Reduce wildfire ignition risk from power lines • Ensure reliable service for critical utilities and community resilience during extreme events

Implementation Plan/Actions

- Finalize engineering design and secure environmental approvals
- Engage local stakeholders and residents for public input and support
- Coordinate with North Bend and utility partners for water and communications systems
- Procure and install underground conduits and cables
- Transition electrical loads to underground service and remove old infrastructure

Performance Measure

- Reduction in outage frequency and duration in the Mount Si Road area
- Elimination of power shutoff events during red flag warnings
- Decreased wildfire risk tied to electrical infrastructure
- Improved reliability metrics and maintenance savings over 10+ years

20.7.31 Plan for Post-Wildfire Community Recovery

Lead	Partners	Hazards Mitigated	Funding Sources and Estimated Costs
OEM	ECO DLS – Roads DNRP PHSKC	Wildfire	County Budget

Vision

Ensure King County is prepared to support equitable, coordinated, and efficient recovery from wildfires—particularly those that impact homes, public facilities, and infrastructure—through a dedicated planning framework that guides action, accountability, and access to recovery resources.

Description

Post-wildfire recovery is a complex and multi-faceted challenge. To improve outcomes for affected communities, King County will develop a **wildfire-specific annex** to the King County Disaster Recovery Plan. This annex will:

- Define agency roles and responsibilities during post-wildfire recovery
- Outline key actions for short- and long-term recovery
- Include protocols for accessing FEMA Public and Individual Assistance, SBA loans, and HUD-supported housing recovery programs
- Be reviewed and updated every five years or after major wildfire disasters

The annex will guide recovery following disasters that damage homes, infrastructure, and public facilities and will ensure that recovery efforts are inclusive, timely, and aligned with other county and regional resilience efforts.

2-Year Objectives	5-Year Objectives	Long-Term Objectives
• Convene key partners and begin development of the wildfire-specific annex • Identify recovery needs and equity gaps through stakeholder input • Draft and publish initial version of the annex as part of the broader Disaster Recovery Plan	• Operationalize the annex through partner training and plan exercises • Establish coordination protocols for post-wildfire funding and housing support • Update annex with new best practices and lessons learned from any wildfire events	• Institutionalize wildfire recovery planning as a core element of King County's emergency management • Improve recovery outcomes and speed for wildfire-impacted communities • Reduce long-term disparities in disaster recovery support and outcomes

Implementation Plan/Actions

- Collaborate with local, state, and federal partners to define post-wildfire recovery pathways
- Integrate the annex into the King County Disaster Recovery Plan
- Identify recovery funding mechanisms and align with existing support programs
- Build capacity among local jurisdictions and departments to support implementation
- Include equity-centered planning and community engagement throughout

Performance Measure

- Completion and adoption of the wildfire-specific annex
- Number of trainings or exercises conducted using the annex
- Time to initiate and coordinate recovery actions post-wildfire
- Amount of federal and state recovery funding accessed through the plan
- Stakeholder and community satisfaction with post-wildfire recovery support

20.7.32 Standardize and Promote Best Management Practices for Wildfire Mitigation

Lead	Partners	Hazards Mitigated	Funding Sources and Estimated Costs
DNRP -WLRD	ECO DLS Parks	Wildfire	County Budget

Vision

Reduce wildfire risk to homes, infrastructure, and evacuation routes in King County through coordinated and standardized best management practices that can be easily adopted and implemented by fire departments, agencies, and communities.

Description

Wildfires pose increasing threats to King County, particularly in Wildland-Urban Interface (WUI) areas. Evidence shows that mitigation is cost-effective—every dollar spent yields $4 in avoided future losses. To address this growing risk, King County will lead the development and promotion of standardized wildfire mitigation Best Management Practices (BMPs). These practices will be:

- Focused on home hardening, infrastructure protection, and evacuation planning
- Designed for integration into services provided by fire departments, local governments, and technical assistance providers
- Distributed to relevant partners and programs for implementation across the County

This effort will ensure consistent, effective wildfire preparedness and risk reduction countywide.

2-Year Objectives	5-Year Objectives	Long-Term Objectives
• Develop and finalize a countywide set of wildfire mitigation BMPs • Distribute BMPs to local agencies, fire departments, and partners • Begin incorporating BMPs into technical assistance services and programs	• Train partner organizations and service providers to implement BMPs • Integrate BMPs into relevant County plans and community wildfire education efforts • Monitor uptake and use across jurisdictions and agencies	• Establish BMPs as the standard wildfire mitigation approach in King County • Demonstrate reduced wildfire losses in areas where BMPs have been implemented • Strengthen community and agency capacity for long-term wildfire resilience

Implementation Plan/Actions

- Convene partners to co-develop wildfire mitigation BMPs
- Coordinate with existing wildfire programs and risk reduction strategies
- Create user-friendly materials and distribute BMP guidance
- Support training and technical integration through county departments and partners
- Monitor and evaluate adoption of BMPs over time

Performance Measure

- Completion and distribution of BMP guidance materials
- Number of agencies and partners adopting BMPs
- Number of properties or facilities implementing BMP-aligned practices
- Feedback from partners on BMP usability and effectiveness
- Reduction in property loss or evacuation disruptions in BMP-implemented areas

20.7.33 Expand Access to Cooling Locations for Communities

Lead	Partners	Hazards Mitigated	Funding Sources and Estimated Costs
ECO	DCHS OEM PHSKC	Severe Weather	TBD

Vision

Ensure equitable access to safe, welcoming, and community-trusted cooling locations throughout King County to protect high-risk populations during extreme heat events.

Description

Extreme heat poses serious health risks, especially for vulnerable populations. Community-based organizations (CBOs) are uniquely positioned to host culturally relevant and accessible cooling spaces. King County will work with CBOs and local jurisdictions to identify, equip, and support these facilities.

Support will include:

- Identifying and vetting potential cooling sites
- Assisting with upgrades and cooling-related resources
- Training staff from CBOs to operate cooling sites
- Connecting interested partners to the Resilience Hub model and resources

This approach builds long-term community capacity while addressing short-term extreme heat response needs.

2-Year Objectives	5-Year Objectives	Long-Term Objectives
• Identify and engage with CBOs and jurisdictions to develop a list of potential cooling sites • Provide technical assistance and small-scale resources for site readiness • Launch pilot cooling locations in priority neighborhoods	• Expand number of operational cooling sites across the county • Create a resource network linking cooling sites and Resilience Hubs • Develop long-term partnerships and shared protocols for heat events	• Establish a sustainable, community-led network of cooling locations countywide • Reduce heat-related health disparities in vulnerable communities • Integrate cooling location planning into broader climate resilience strategies

Implementation Plan/Actions

- Convene CBOs and jurisdictional partners for collaborative planning
- Map areas of greatest need based on heat vulnerability and population risk
- Support training and operational readiness of facility staff
- Leverage county and grant funds to support capital and operational upgrades
- Align with the Energize Program and Resilience Hub development efforts

Performance Measure

- Number of operational community cooling sites established
- Geographic coverage of cooling access in high-risk areas
- Number of individuals served during extreme heat events
- Community feedback and satisfaction with site accessibility and cultural relevance
- Reduction in heat-related health incidents in served areas

20.7.34 Expand the Use of Residential Flood Risk Mitigation Tools Countywide to Benefit Those Who Are Most Vulnerable to Flooding

Lead	**Partners**	**Hazards Mitigated**	**Funding Sources and Estimated Costs**
DNRP -WLRD	OEM FEMA FCD	Flooding	TBD

Vision

Expand access to effective, equitable residential flood risk mitigation tools across King County—such as buyouts and home elevations—to reduce the impacts of flooding for the most vulnerable and financially burdened property owners while also aligning with community priorities and environmental values.

Description

Flood mitigation tools like voluntary buyouts and home elevations are underutilized in King County due to barriers including geographic limitations, funding challenges, upfront homeowner costs, and variable interest. These constraints often leave the most vulnerable communities unprotected.

This strategy focuses on expanding voluntary residential flood mitigation programs countywide to better support at-risk property owners—especially those with financial need. King County will:

- Identify residential properties at highest risk from current and future flooding
- Prioritize assistance based on vulnerability and documented harm
- Expand mitigation efforts to additional river basins (beyond the Snoqualmie)
- Target repetitive loss areas including Sammamish, Skykomish, Green, Cedar, and Snoqualmie River Basins, and Vashon Island
- Seek federal and local funding to broaden the program's reach
- Align mitigation actions with farmland protection when applicable

2-Year Objectives	**5-Year Objectives**	**Long-Term Objectives**
• Identify high-risk flood areas and assess residential property vulnerabilities • Develop equity-based criteria for prioritizing mitigation support • Apply for federal and local grants to support program expansion	• Increase the number of homes participating in voluntary mitigation programs • Expand geographic coverage of home elevation efforts • Build partnerships with community-based organizations to improve outreach and access	• Reduce the number of repetitive loss properties in King County • Ensure that flood mitigation benefits are equitably distributed countywide • Establish a sustainable, well-funded, and flexible residential flood mitigation program

Implementation Plan/Actions

- Map and prioritize residential flood risk based on current and future projections
- Secure funding from the Flood Control District, FEMA, and other sources
- Expand community engagement, especially in historically impacted neighborhoods
- Coordinate with farmland protection efforts to avoid conflicts
- Implement mitigation actions through voluntary buyouts, elevations, or repairs

Performance Measure

- Number of homes mitigated through buyouts, elevations, or repairs
- Funding secured and leveraged for mitigation
- Reduction in repetitive flood loss claims
- Increased participation from vulnerable or low-income homeowners
- Equity outcomes tracked and reported

20.7.35 Identify and Seek Funding to Reduce Sea Level Rise and Flood Risks to On-Site Wastewater Infrastructure in Unincorporated King County

Lead	**Partners**	**Hazards Mitigated**	**Funding Sources and Estimated Costs**
PHSKC	DNRP SPU	Flooding Severe Weather	TBD

Vision

Protect public health and environmental quality by proactively addressing the risks that sea level rise and flooding pose to on-site wastewater infrastructure in vulnerable unincorporated areas of King County, with a focus on equitable outcomes.

Description

Sea level rise and increased precipitation-driven flooding present growing risks to on-site wastewater systems in unincorporated King County. Building on 2025 sea level rise assessments for Vashon and Maury Island, the County will identify areas most at risk—specifically on Vashon-Maury Island and in the lower Duwamish Valley adjoining South Park. Emphasis will be placed on identifying where equity-related needs are greatest, then working with partners to secure funding and implement infrastructure improvements.

2-Year Objectives	**5-Year Objectives**	**Long-Term Objectives**
• Conduct targeted assessments to identify high-risk locations • Engage community-based organizations and other partners for localized insights • Seek initial grant funding opportunities	• Secure funding and initiate design and implementation in priority areas • Begin infrastructure improvements in areas with highest vulnerability and equity needs	• Complete infrastructure resilience upgrades in all identified high-risk areas • Integrate long-term flood resilience and equity priorities into countywide wastewater infrastructure planning

Implementation Plan/Actions

- Identify priority locations using environmental data and community input
- Collaborate with partners to align on equity and infrastructure needs
- Apply for and secure external funding (grants)
- Implement infrastructure improvements through phased project delivery

Performance Measure

- Number of high-risk locations identified and assessed
- Amount of funding secured
- Number of wastewater systems improved or relocated
- Community satisfaction and participation levels in planning and implementation

20.7.36 WSDOT Avalanche Forecasting and Control Program

Lead	Partners	Hazards Mitigated	Funding Sources and Estimated Costs
WSDOT	NWS OEM WSP	Avalanche	State Budget

Vision

Maintain the safety and reliability of Washington's mountain highway corridors by proactively forecasting and controlling avalanches to reduce hazards for motorists, freight traffic, and recreational users.

Description

The WSDOT Avalanche Forecasting and Control Program includes two regional teams of full-time and seasonal avalanche professionals. These teams monitor mountain weather, forecast avalanche risks, and execute control operations using explosives, trams, and artillery. They work fall through spring to protect critical corridors like I-90 Snoqualmie Pass and US 2 Stevens Pass. The program combines active control (e.g., detonations) and passive infrastructure (e.g., berms, catchment basins) to manage avalanche hazards. Seasonal closures occur where safety cannot be maintained. Public education and enforcement help mitigate risks associated with recreational backcountry use. New technologies, such as drones and Remote Avalanche Control Systems (RACS), are currently under evaluation.

2-Year Objectives	5-Year Objectives	Long-Term Objectives
• Continue testing and evaluation of remote avalanche monitoring technologies like drones • Expand educational outreach to backcountry users • Improve mapping and public accessibility of Avalanche Atlas tools	• Integrate RACS technology in high-risk areas to reduce reliance on military surplus artillery • Reduce average road closure times by 10% through operational efficiency • Enhance collaboration with ski areas and law enforcement to reduce recreational intrusions into avalanche zones	• Achieve near-complete transition from manual to remote-controlled avalanche control in accessible zones • Eliminate injuries/fatalities due to recreational intrusion in avalanche zones • Maintain full accessibility on key corridors throughout winter, barring severe weather extremes

Implementation Plan/Actions

- Continue use and maintenance of cable trams, explosives, and artillery
- Expand deployment of passive infrastructure (e.g., diversion dams, catchment basins)
- Close roads temporarily during high-risk periods and perform control operations at night when possible
- Post avalanche zone warnings and enforce hitchhiking bans
- Collaborate with law enforcement and ski areas to manage backcountry user behavior
- Pilot and assess effectiveness of drones and RACS
- Update and maintain the Avalanche Atlas map interface for public use

Performance Measure

- Reduction in number and duration of road closures
- Number of avalanches successfully mitigated without incident
- Decrease in unauthorized recreational entry into avalanche zones
- Number of successful remote-control operations conducted
- Improvement in response time and forecasting accuracy

Chapter 21: Plan Maintenance

21.1 Monitoring and Updating

The King County Office of Emergency Management (KCOEM) hazard mitigation team will internally track mitigation strategies submitted by the county and participating annexes. All participating jurisdictions will convene on a biannual basis to provide progress updates on their respective strategies. These updates are solicited by the county for inclusion in the countywide annual report. As part of the 2025 update to the Regional Hazard Mitigation Plan, each participating jurisdiction agrees to convene its internal planning team at least once annually to assess progress and maintain accountability.

Tracking will be organized using a standardized format, as illustrated below:

ID	Jurisdiction	**Strategy**	**Vision**	**Lead Agency**	**Priority *(High, Medium, Low)***	Hazard(s)	Potential Funding Source(s)	Estimated Cost	Timeline (Ongoing, Short-Term, Long-Term)	Status (Not Started, In Progress, Complete)

In addition to biannual check-ins, working groups will be formed by identifying shared characteristics among strategies. These groupings may be based on approach (e.g., code updates, public education programs, ecological restoration), hazard type, or funding sources. These working groups will foster collaboration by enabling participants to share resources, exchange best practices, learn from one another's experiences, and better understand the capabilities and assets available across jurisdictions.

To enhance implementation, key partners and county departments will be invited to clarify processes and next steps. Additionally, KCOEM will work to build public-private partnerships by engaging nonprofits and corporations with aligned missions to help secure future mitigation funding.

As part of its leadership role in the countywide planning effort, KCOEM will also distribute federal Notices of Funding Opportunity (NOFOs). Proposals submitted by partners will be assessed according to the prioritization process identified in this plan and the county will, where possible,

support those partners submitting grant proposals. This will be a key strategy to implement the plan.

King County Office of Emergency Management (KCOEM) will schedule annual check-ins to evaluate and revise the identified hazards risk analysis along with each hazards impact and vulnerability analysis.

The next plan update is expected to be due in September 2030. All jurisdictions will submit letters of intent by 2028, at least two years prior to plan expiration. The county will lead the next regional planning effort, beginning at least 18 months before the expiration of the 2025 plan.

In addition to the updates for mitigation strategies, the expected publication of data from several programs may trigger an update.

- Publication of the Department of Homeland Security Regional Resiliency Assessment Program report
- Publication of the countywide landslide susceptibility map from Washington Department of Natural Resources
- Publication of the Wildland Urban Interface wildfire risk map from Washington Department of Natural Resources
- Publication of tsunami inundation data from Washington Department of Natural Resources

21.2 Integrating into Existing Planning Mechanisms

To ensure a comprehensive and cohesive approach to hazard mitigation, the data and insights from the RHMP will be seamlessly integrated into existing county, regional, and local plans and frameworks. These include comprehensive plans, emergency operations plans, regional strategies, and sustainability initiatives, all of which contribute to a holistic approach to risk reduction. This integration effort is already underway with the incorporation of hazard risk and vulnerability data into the 2025 update of the countywide planning processes.

Many of these plans have been updated simultaneously, allowing for the development of data and mitigation strategies to made in partnership other departments. As a result, several strategies are now reflected in multiple county plans, such as the Flood Management Plan and the Strategic Climate Action Plan. This approach ensures that mitigation actions are implemented and monitored across multiple channels, increasing their visibility and support across departments. By embedding these strategies in various plans, we help elevate their profile and facilitate more comprehensive execution.

It’s important to note that additional strategies may be added to this list throughout the lifecycle of both plans, as new opportunities for collaboration and integration arise. This continuous process ensures that the RHMP remains dynamic and aligned with evolving county goals and priorities.

21.3 Continued Public Involvement

To foster transparency, continuous improvement, and community collaboration, King County is committed to maintaining an effective communication strategy throughout the ongoing maintenance of the RHMP. Following biannual meetings dedicated to RHMP updates, KCOEM will leverage its official Emergency Blog and social media platforms as primary communication channels to keep the public informed. These platforms will provide timely updates on the status of mitigation actions, key developments, and upcoming initiatives.

Regular updates will not only highlight the progress of specific mitigation actions but also offer concise summaries of completed and ongoing efforts. In addition, whenever updates or addendums are introduced to the RHMP, King County will actively open channels for public input. This ensures that the community remains a vital and engaged participant in the planning process. Residents, local stakeholders, and other interested parties will be encouraged to provide comments, voice concerns, and offer valuable feedback on proposed changes to the plan.

Chapter 22: Plan Adoption

The King County Regional Hazard Mitigation Plan is submitted first to Washington State Emergency Management for review and then to FEMA for final review and preliminary approval. Each jurisdiction, along with the base plan, must meet all FEMA requirements outlined in the FEMA Local Hazard Mitigation Plan Review Guide. If requirements are found to not be met, the jurisdiction involved must revise the plan and resubmit. Once preliminary approval is secured, FEMA will send a notice of Approval – Pending Adoption.

The RHMP is adopted by each participating jurisdiction, primarily through a resolution passed by the council or commission responsible. The King County Council is expected to adopt this plan before the expiration date of 9/30/2025, following notice of approval, pending adoption from FEMA and Washington State Emergency Management. This plan will be effective on 10/1/2025 FEMA and will expire 5 years to the day, 9/30/2030.

King County
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King County Executive
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September 18, 2025

The Honorable Girmay Zahilay
Chair, King County Council
Room 1200
C O U R T H O U S E

Dear Councilmember Zahilay:

This letter transmits a proposed Ordinance that, if enacted, would approve and adopt an update to the King County Regional Hazard Mitigation Plan (RHMP). Adoption of this plan update by the King County Council, and approval by both the Washington Emergency Management Division (EMD) and the Federal Emergency Management Agency (FEMA), is required to ensure access to future federal mitigation project grant and federal Public Assistance Program post-disaster relief funding.

The King County Council adopted the County's initial RHMP in October 2004 by Ordinance 15038. Updates were made in December 2009 by Ordinance 16715, March 2015 by Ordinance 17996, and September 2020 by Ordinance 19160.

The current plan is due to expire on September 30, 2025, and I am asking the Council to expedite its review and approval of this plan so that we can maintain the County's ability to obtain certain disaster-related federal grant. Notably, FEMA instituted a pause on RHMP reviews in March of 2025. King County notified by the Washington State Emergency Management Division of FEMA's "approval pending adoption" in August.

The enclosed 2025 Regional Hazard Mitigation Plan is a full rewrite of the 2020 plan. The RHMP looks at the natural and human-caused hazards that can affect King County and develops strategies to reduce risk and protect people, property, the economy, the environment, and King County operations. The RHMP is our chance to reassess our assumptions about risk and vulnerability, and to identify our best opportunities to build a more resilient county. For this update, the planning team focused on developing comprehensive hazard mitigation strategies in order to expand on existing mitigation work,

and to more fully integrate equity, social justice, and the impacts of climate change to each identified risk profile.

This plan is written to meet or exceed the relevant elements of the *Emergency Management Standard* (ANSI standard) by the Emergency Management Accreditation Program (EMAP); this will help ensure that the County's current EMAP accreditation remains intact, and that King County can successfully pass reaccreditation in 2027.

The likelihood of future earthquakes in King County is inevitable, with a 100 percent certainty that one will occur eventually, however, predicting the magnitude and exact location is not possible. According to the U.S. National Seismic Hazard Model (NSHM), the King County region has between a 75 percent to greater than 95 percent chance of damaging shaking in the next hundred years. A disaster of this magnitude would affect every facet of life. Among other hazards, King County is inherently vulnerable to flooding, due to its distinctive geography and heavy precipitation patterns; as a result, flooding is an annual reality for the region. On average, major floods occur every two to five years, and projections indicate that both the frequency and severity of these events will likely increase due to the broader impacts of climate change. Surviving and recovering from incidents of all magnitudes require sustained investment in stronger buildings, infrastructure, and other assets. The RHMP includes a prioritized list of strategies and actions to reduce risk and build resilience.

The RHMP promotes programs and projects that build a foundation of resilience before, during, and after disasters. The plan's overarching goal is to create a framework that reduces the impact of and susceptibility to the identified hazards on people, property, and the environment, prioritizing historically underserved communities. Equity and social justice are embedded throughout the plan, shaping both risk assessments and mitigation priorities. The RHMP also aligns with other key King County initiatives, including the 2024 Flood Management Plan, 2024 Comprehensive Plan, and 2025 Strategic Climate Action Plan, to promote integration and cross-sector solutions to help break down planning silos.

The RHMP was developed in partnership with subject matter experts, local jurisdictions, King County departments, and the public. Representation on the planning team included experts in climate change, comprehensive planning, equity and social justice, floodplain management, geological hazards, homeland security, and emergency management. Public outreach was carried out through the King County Office of Emergency Management (OEM), through online surveys and in person events, with exposure to more than 3,000 individuals during plan development; the semi-annual ALERT King County test in September 2024 included a questionnaire as well, garnering close to 1,200 responses about hazards.

If your staff have any questions, please feel free to contact Brendan McCluskey, Director, King County Office of Emergency Management, at 206-205-4060.

Sincerely,



for

Shannon Braddock
King County Executive

Enclosure

cc: King County Councilmembers
ATTN: Stephanie Cirkovich, Chief of Staff, King County Council
Melani Hay, Clerk of the Council
Karan Gill, Deputy Executive, Chief of Staff, Office of the Executive
Dwight Dively, Director, Office of Performance, Strategy and Budget
Stephanie Pure, Council Relations Director, Office of the Executive
Lorraine Patterson-Harris, County Administrative Officer, Department of Executive Services (DES)
Brendan McCluskey, Director, Office of Emergency Management, DES

2025 FISCAL NOTE ATTACHMENT 3

Ordinance/Motion:
Title: 2025-2030 Regional Hazard Mitigation Plan
Affected Agency and/or Agencies: King County
Note Prepared By: Danielle Lucero
Date Prepared: 8/13/2025
Note Reviewed By: Justin Grover
Date Reviewed: 8/28/2025

Description of request:

The 2025-2030 Regional Hazard Mitigation Plan looks at each natural and human-caused hazard that can affect King County and develops strategies to reduce risk and protect people, property, the economy, the environment, and county operations. There are no fiscal impacts associated with the transmittal of the plan. Individual actions or strategies contained in the plan that require additional appropriation would require a separate budget action.

Revenue to:

Agency	Fund Code	Revenue Source	2025	2026-2027	2028-2029
			N/A	N/A	N/A
TOTAL			**0**	**0**	**0**

Expenditures from:

Agency	Fund Code	Department	2025	2026-2027	2028-2029
			N/A	N/A	N/A
TOTAL			**0**	**0**	**0**

Expenditures by Categories

	2025	2026-2027	2028-2029
TOTAL	**0**	**0**	**0**

Does this legislation require a budget supplemental? Yes/No

Notes and Assumptions:

King County
Department of Local Services:

Temporary Use Permit
Report Briefing

January 21, 2026

Today we will cover….

- Overview of Temporary Use Permits
- Alignment with Growth Management Act (GMA)
- Current Temporary Use Permit structure
- Activity & impacts
- Recommended changes



Temporary Use Permits (TUPs) - Overview

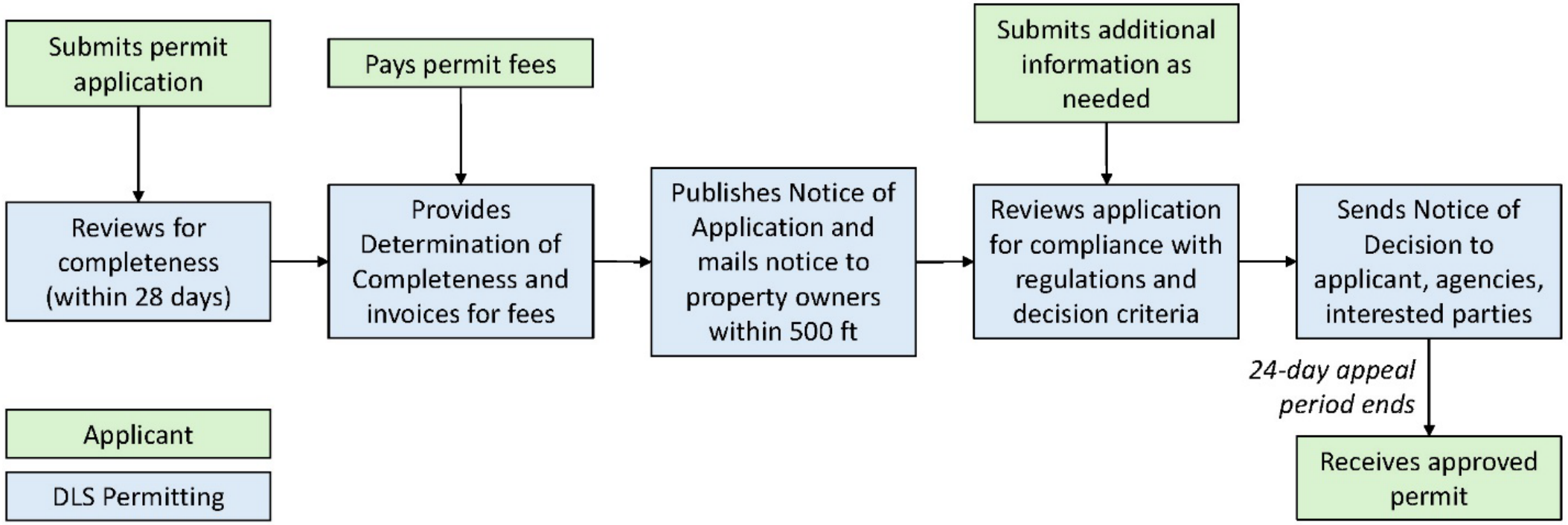
Temporary Use Permits (TUP's) allow a use for a limited duration or frequency that would otherwise not be allowed by the current zoning for a parcel.

- Department of Local Services - Permitting reviews applications for TUP's and issues permits
- Surrounding counties have similar approaches to managing activities such as: agritourism, event rentals, etc.
- Common uses: Wedding Venues, Music Venues, Special Events, Expansion of an existing Conditional Use Permit
- Special event permits may also be required on a case-by-case basis (ex: large tents for an outdoor wedding or entertainment venue)

Current Criteria and Conditions on New and Renewal TUP's

- TUP events are limited to a maximum of 60 days in a 365-day period
- Application must demonstrate how activity impacts will be lessened/ mitigated in the proposal
- TUP application process contains a public comment period
- TUPs issued for 30 or more days are required to meet additional parking and stormwater requirements
- An issued TUP may be renewed annually up to 4 times for a total of 5 years

TUP Review Process



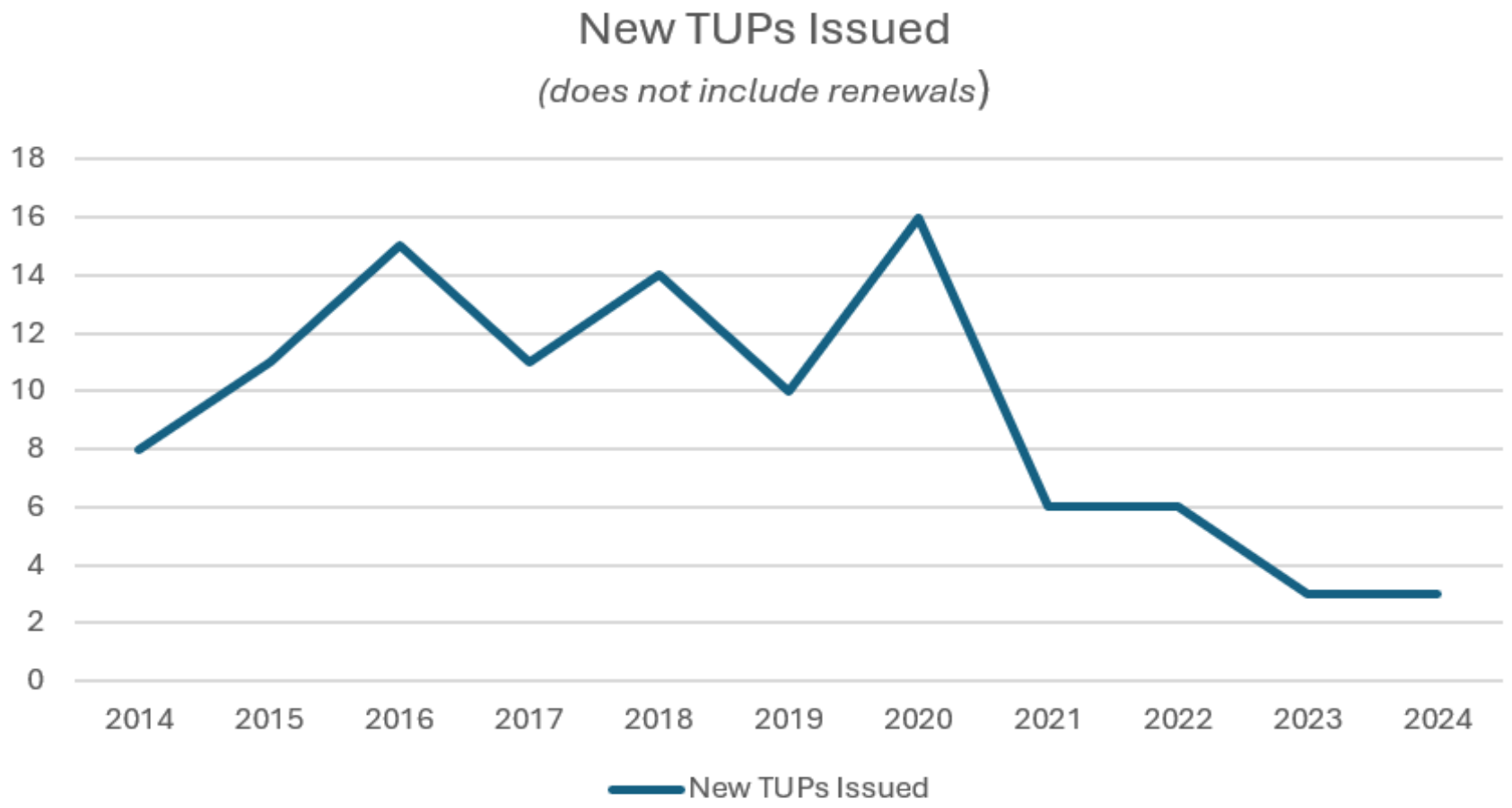
Growth Management Framework and Policy Alignment

- Must align with State and County planning frameworks
- Temporary uses must be compatible with policies guiding Rural Areas and Natural Resource Lands



TUP and Event Permit Activity (2014 - 2024)

- New TUP's issued 2014 – 2024
- Average # of permitted days/ TUP/ year ~40
- Number of currently active TUP's ~30



Complaint Trends and Resolution

- During the period of 2014-2024, DLS received 105 complaints related to events occurring on properties that would require a TUP
- Majority of the complaints were associated with events on properties where no TUP had been obtained
- Complaint resolution most frequently involves an investigation leading to an application being made for a TUP to explore temporary use of property for the activity (weddings, etc.)



Anecdotal Feedback on Temporary Use Permit Impacts

- Once a TUP has been obtained complaints tend to drop off
- Most reported complaints are related to traffic and noise
- Feedback impressions from staff led to recommendation to re-examine event frequency & duration limits
- Exempted events (Christmas tree lots, Carnivals, and others) should have limits on size (# of attendees)

Proposed Regulatory Changes for Consideration

- Consider reducing maximum potential number of days allowed per TUP
- Consider implementing restrictions on the frequency and clustering of events to minimize impacts
- Attenuate event size limits to align with site infrastructure and access/ egress capabilities
- Consider limiting size and scope of code exempt events (Christmas tree stands, Carnivals, etc.) to minimize impacts
- Update Code to reflect any change in requirements



Questions?