King County

1200 King County Courthouse
516 Third Avenue
Seattle, WA 98104

KING COUNTY

Signature Report

December 3, 2012

Motion 13774

Proposed No. 2012-0145.1 **Sponsors** Phillips

A MOTION acknowledging receipt of a report on the water quality improvement program in accordance with the 2012 Budget Ordinance, Ordinance 17232, Section 100, Proviso P2.

WHEREAS, the King County council in adopting the 2012 Budget Ordinance, Ordinance 17232, Section 100, wastewater treatment, Proviso P2, provides that of this appropriation, $250,000 shall not be expended or encumbered until the executive transmits a report to council on the water quality improvement program and a motion that acknowledges receipt of the report, and

WHEREAS, the executive has transmitted to the council with this motion the report on the water quality improvement program called for in the proviso, and

WHEREAS, the report on the water quality improvement program includes the following elements required by the proviso:

1. A status of the water quality monitoring program including a comprehensive review of the changes to water quality monitoring activities since 2009, a list of data sets that are no longer collected and analyzed and the rationale for discontinuing these activities, a list of new water quality data that is being collected and the reasons for the collection;

2. The rate impacts to restore or provide funds for additional water quality monitoring activities; and

3. Options for augmenting wastewater treatment division funding for water quality monitoring activities including fees, grants and contributions from other jurisdictions;

NOW, THEREFORE, BE IT MOVED by the Council of King County:

Receipt of the water quality improvement program report prepared in accordance

with the 2012 Budget Ordinance, Ordinance 17232, Section 100, wastewater treatment, Proviso P2, Attachment A to this motion, is hereby acknowledged.

Motion 13774 was introduced on 4/30/2012 and passed by the Metropolitan King County Council on 12/3/2012, by the following vote:

Yes: 7 - Mr. Phillips, Mr. Gossett, Ms. Patterson, Ms. Lambert, Mr. Ferguson, Mr. Dunn and Mr. McDermott
No: 0
Excused: 2 - Mr. von Reichbauer and Ms. Hague

KING COUNTY COUNCIL
KING COUNTY, WASHINGTON

Larry Gossett, Chair

ATTEST:

Anne Noris, Clerk of the Council

Attachments: A. Report on King County's Water Quality Monitoring Program

Report on King County's Water Quality Monitoring Program

April 2012

King County
Department of
Natural Resources and Parks
Wastewater Treatment Division

Alternate Formats Available

206-296-7380 TTY Relay: 711

Executive Summary

- This report responds to a proviso in the 2012 King County Budget calling for the Wastewater Treatment Division (WTD) of the Department of Natural Resources and Parks to describe its water quality monitoring program, including changes since 2009 and the rate impacts and other options to provide funds for additional monitoring activities.
- The goals of WTD's water quality monitoring program, as outlined by the Regional Wastewater Services Plan, include forecasting aquatic resource conditions that affect wastewater decisions, compliance with local, state, and federal permits, assessing risk to human health and the environment from wastewater treatment activities, and implementing a comprehensive water quality monitoring program of water bodies that could be impacted by WTD's activities. The monitoring program includes seven categories of activities: Lakes, Streams, Stream Flow and Temperature, Swimming Beach, Toxics and Contaminant Assessment, and Watershed Management Support.
- In 2008 and again in 2010, as part of division-wide efforts to control rate increases, WTD comprehensively reviewed its water quality monitoring program. Budget reductions implemented in 2009 and 2011 maintained the collection of the highest priority information to meet all regulatory requirements while maintaining the integrity and the overall goals of the program.
- The decrease in WTD's spending on its water quality program (from $5.6 million in 2008 to $3.85 million in the 2012 adopted budget) represents significant ratepayer savings. Restoring program funding to the 2008 level would result in an estimated 30-cent increase in the monthly sewer rate; restoring funding to the 2010 program level would result in an approximate 12-cent increase in the monthly sewer rate.
- WTD's water quality monitoring program directly addresses the environmental sustainability goal in the King County Strategic Plan to "safeguard and enhance King County's natural resources and environment." Water quality data measures the extent to which this goal is met and identifies any emerging issues or threats that need to be addressed. Water quality data also help to inform and prioritize investments in clean-ups; stormwater and combined sewer overflow controls, and other actions to protect and restore water quality and ecosystems, and to ensure that these and other management actions are effective.
- Other options for funding WTD's water quality monitoring activities appear limited, though WTD will continue to explore these where possible. WTD is well positioned to be a regional service provider of high quality monitoring and lab analysis services should an ongoing source of regional or state funding be established to support monitoring of broader watershed health.
- Needs change over time, and the monitoring program will continue to evolve to address new issues and priorities. It is important to continually evaluate the monitoring program and ensure that it is operated efficiently and effectively, is consistent with WTD's funding authority, is fulfilling the goals of the RSWP, and is addressing emerging issues.
- Based on the most recent review of monitoring needs conducted for this report and in preparation for development of the 2013-2014 rate proposal, WTD is recommending an additional $240,000 in monitoring to improve our understanding of two emerging issues for Puget Sound recovery and the regulatory environment for wastewater treatment: nutrient

loading from wastewater discharges and emerging contaminants. Funding for these priorities is reflected in the two-year wastewater rate proposed for 2013 and 2014. WTD is not recommending restoration of water quality activities reduced in 2008 through 2011 as part of the rate proposal.

Contents

1. Purpose and Scope

As a proviso to the 2012 King County budget ordinance 17232, the King County Council has required the Wastewater Treatment Division (WTD) to provide a report on:

1. "the status of the water quality monitoring program; including a comprehensive review of the changes to water quality monitoring activities since 2009, a list of data that are no longer collected and analyzed and the rationale for discontinuing these activities, a list of new water quality data that is being collected and the reasons for the collection"
2. "the rate impacts to restore or provide funds for additional water quality monitoring activities"
3. "options for augmenting wastewater treatment division funding for water quality monitoring activities including fees, grants, and contributions from other jurisdictions."

This report responds to this request. The document first provides a brief overview of WTD's water quality program. It then describes changes to the program since 2009, outlines rate impacts of providing additional funds for water quality monitoring, and concludes with a discussion of options for augmenting WTD funding.

King County performs water quality-related data collection, lab analysis, reporting, and other monitoring activities for a wide variety of purposes, using a range of funding sources. The scope of this document is focused on WTD's water quality monitoring and analysis activities performed by the Water and Land Resources Division (WLRD) in receiving waters (surface and ground waters) in and around King County. The components of this water quality program are described in Section 2. This document does not describe monitoring directly performed by WTD to support its wastewater treatment plants or industrial waste program, nor activities performed by the environmental lab in support of other WTD programs (such as influent and effluent monitoring at the wastewater treatment plants). It does not address stormwater monitoring, monitoring funded by Surface Water Management fees, or any other water quality monitoring undertaken by other county agencies and not funded by WTD.

2. Background and Current Status

The WTD's wastewater conveyance and treatment system extends through much of the King County region, with conveyance pipelines crossing or adjacent to nearly all major lakes and streams in the greater Lake Washington area. In conjunction with the construction, operation, and maintenance of this system, WTD, formerly Metro, has funded water quality monitoring programs since its inception. As articulated in the 1999 Regional Wastewater Services Plan (RWSP), the goal of WTD's water quality monitoring program is to provide water quality information needed to protect public and environmental health, and protect the public's investment in wastewater facilities and water resource management throughout the WTD service area. As part of implementing the RWSP, King County monitors water quality to:

- evaluate the impacts and benefits of actions that affect regional water quality and identify measures to meet and maintain water quality standards.
- forecast aquatic resource conditions that may affect wastewater decisions and identify

cost-effective alternatives to mitigate water quality problems and enhance water quality.

- participate with regional partners to identify methods, plans, and programs to enhance regional water quality and water resources.
- monitor, evaluate, and report as required by local, state, and federal permits.
- participate in developing water quality laws, standards, and programs to maintain and enhance environmental and public health.
- assess the risk to human health and the environment from wastewater treatment and conveyance activities and use this information in evaluating water pollution abatement options.
- implement a comprehensive water quality monitoring program of streams and water bodies that are or could be impacted by influent, effluent, sanitary system overflows, or Combined Sewer Overflows.[1]

WTD's receiving water monitoring program consists of seven major categories: Marine, Lakes, Streams, Stream Flow and Temperature, Swimming Beach Monitoring, Toxics and Contaminant Assessment, and Watershed Management Support. The program is nationally-recognized and fully supports WTD's mission to protect public health and enhance the environment. The current (2012 adopted) WTD Water Quality Program budgeted amount (transfer to WLRD) for these water quality monitoring activities is $3.85 million (see Table 1).

Water quality monitoring categories are described below:

Marine Water Quality Monitoring supports a comprehensive, long-term program that assesses water quality in the Central Puget Sound Basin. The Marine Monitoring Program helps ensure WTD is meeting its wastewater National Pollution Discharge Elimination System (NPDES) permit requirements and contributes to regional knowledge regarding the condition of Puget Sound and potential contamination sources. The current program collects and analyzes marine water samples near county treatment plant outfalls, at other locations in Puget Sound (to track background or "ambient" conditions), and at Puget Sound beaches, including beaches near outfalls. Parameters monitored include nutrient levels, fecal indicator bacteria, dissolved oxygen, temperature, salinity, water clarity, turbidity, plankton, and pH (acidity). Marine sediments are analyzed near outfalls, near areas of known contamination, and in background locations. Parameters monitored in marine sediments include physical characteristics, metals, and organic chemicals.

Lakes Water Quality Monitoring identifies impacts from the wastewater conveyance system and monitors the ambient condition and health of major lakes including Lake Washington, Lake Union, and Lake Sammamish to ensure that water quality remains high. Data collection began during the cleanup of Lake Washington in the 1960s. The long-term nature of the data is valuable for detecting water quality problems early, identifying trends in water quality and climate, and the overall health of this freshwater system. Data from lake buoys are also frequently used by the general public, news and weather organizations, and other agencies. The current program uses a variety of approaches and methods to track dissolved oxygen, pH, conductivity, water clarity, nutrient levels, bacteria, plankton, and temperature at various depths.

[1] http://your.kingcounty.gov/dnrp/library/wastewater/wtd/construction/Planning/RWSP/final_omp.pdf

Streams Water Quality Monitoring characterizes the conditions of streams in the WTD service area to determine if state and federal water quality criteria are being met, to detect water quality problems early by identifying long-term trends in the streams, and to find sources of pollution. Streams and rivers are monitored where sewer trunk lines cross them and where they are considered a potential or significant source of pollutant loading to a major water body. Currently, 20 WTD-funded monitoring stations provide data on 17 King County streams. Data collected (e.g., temperature, turbidity, dissolved oxygen, bacteria, sediment load, and nutrients) are incorporated into a Water Quality Index and also used by agencies and the public to track stream conditions. In addition, pollution source tracing studies are conducted to find sources of pollution for known water quality problems.

This category includes streams macroinvertebrate monitoring, which tracks long-term trends in water quality and watershed health through monitoring changes in the types of insects present in streams. More than focusing on physical or chemical components of water quality, this program uses stream-dwelling insects to assess the biological health of streams. Approximately 140 samples are collected annually. This work is valuable in detecting water quality problems early as biological impact trends over time can be associated with changes in water quality and/or changes in land use.

Stream Flow and Temperature data are essential factors in evaluating compliance with water quality standards. Stream flow and temperature monitoring continuously tracks stream flow and water temperature of streams in the WTD service area to: assess changes and trends in high and low flows; monitor compliance with water quality standards for temperature; and calculate pollutant loading to larger water bodies. Stream flow and temperature information is considered critical to protecting public safety and stream health. The data are used by WTD, as well as salmon recovery efforts (e.g., Water Resource Inventory Area (WRIA) 8 salmon recovery status), the King County Flood Control District (e.g., flows in tributaries to Lake Sammamish and the Sammamish River to evaluate transition zone issues), the King County Stormwater Section, and stormwater departments in local cities (e.g., for developing a stormwater retrofit plan for WRIA 9).

Swimming Beach Monitoring evaluates 20 freshwater swimming beaches in the wastewater service area during the warmest months to protect public health by identifying problems associated with human contact with sewage. From May through October, scientists routinely test water for fecal coliform contamination from humans, wildlife, and other sources, as well as naturally occurring toxic algae, which can be dangerous for pets or cause human intestinal distress. This data is used by Public Health – Seattle & King County, to ensure public health at beaches is protected.

Toxics and Contaminant Assessment activities support WTD in its effort to protect the integrity of the wastewater treatment process by reducing toxics in wastewater it receives from residences and businesses and also protect public health and the environment. These activities include contaminant risk identification, monitoring the concentration of chemicals present in aquatic life, and reporting of contaminant data associated with WTD treatment facility permits. These activities also include scientific support and expertise regarding chemicals of emerging concern, technical review of state and federal studies and documents relating to policies and regulations that may affect WTD's operations.

Watershed Management Support includes a variety of monitoring, analysis, and mapping activities that assist in characterizing watershed health in WTD's service area. These activities are useful for locating, designing, and mitigating for specific projects and discharge impacts, and are critical to understanding the water quality of watersheds, detecting problems and understanding the potential impacts of WTD activities. It also includes support for WTD's reclaimed water activities, such as support for the wetland enhancement discharge location at the Carnation Treatment Plant, as well as support for biosolids reclamation projects.

3. Chronology of Changes to Water Quality Activities Since 2009

WTD's comprehensive and highly successful water quality monitoring program has existed since the early 1960s and evolves in response to changing needs and fiscal constraints. In 2008 and again in 2010, as part of agencywide efforts to control rate increases and increase efficiencies, WTD reviewed existing programs for opportunities to use monitoring resources more effectively. The main objective in these efforts was to reduce costs while maintaining the integrity of the monitoring program by continuing to collect the highest-priority information. This allowed WTD to fulfill the goals of the program described in the RWSP, meet environmental permit requirements, and support other program drivers such as the King County Strategic Plan. All elements of the WTD Water Quality Monitoring Program were considered in light of the following overall objectives:

- Maintain essential monitoring support needed for regulatory compliance
- Maintain the ability to determine the current water quality status of Puget Sound, major lakes, and streams in King County
- Maintain the ability to describe and track water quality changes over time
- Maintain the ability to relate changes in conditions to land use or climate change where and when possible
- Maintain the ability to examine how current conditions or trends may affect pollutant loading to Puget Sound
- Maintain the ability to design and conduct focused water quality assessments that lead to recommendations for water quality and environmental improvements.

The following chronology reviews the changes to the WTD Water Quality Monitoring Program since 2009. Table 1 summarizes changes in expenditure outlays for the various program elements since 2008 and illustrates the changes in spending for WTD's monitoring program activities over time by major component. As described below, reductions to WTD water quality monitoring activities occurred at two phases: in 2009 and in 2011. These changes primarily reduced monitoring frequency or locations in order to protect the integrity of the water quality monitoring program. They were made at the time of significant WTD rate increases, and represented only one of many strategies WTD undertook to control rate increases while maintaining a high level of service.

Table 1 - WTD Water Quality Monitoring Program[1] - Summary of Changes, 2008-2012

	2008 Actual[2]	2009 Actual[2]	2010 Adopted	2011 Adopted	2012 Adopted
Marine Water Quality	1,226,074	1,333,661	1,449,148	1,357,096	1,396,852
Lakes Water Quality	1,641,122	1,123,796	1,100,000	727,059	732,916
Streams Water Quality (includes Macroinvertebrate Sampling)	1,263,803	759,483	940,774	630,560	657,324
Stream Flow and Temperature	415,286	251,254	270,432	270,492	279,135
Swimming Beach	340,998	213,030	286,000	286,000	297,054
Toxics and Contaminant Assessment	194,227	206,781	229,705	220,941	223,983
Watershed Management Support	531,169	251,434	266,230	262,099	265,488
	5,612,679	**4,139,439**	**4,542,289**	**3,754,247**	**3,852,752**

Notes

[1] Defined as water quality monitoring and analysis activities performed by the Water and Land Resources Division for WTD (see text).

[2] Actual expenditures were used for 2008 and 2009, as adopted budget figures are not available broken out by these categories. Therefore, the differences between 2009 and 2010 are the result of changes due to inflation as well as differences in reporting methods. The WTD Water Quality Monitoring Program maintained all elements between 2009 and 2010.

2009

WTD's sewer rate increased from $27.95 in 2008 to $31.90 in 2009 (14.1 percent). As part of deliberations for the 2009 rate, WTD monitoring program spending was evaluated using the criteria described above, and reduced by about $1.5 million from levels in 2008.

The following summarizes significant changes by program element:

Lakes water quality monitoring (Lakes Union, Washington, Sammamish)

Routine lake water quality monitoring stations were reprioritized and reduced from 25 to 9 (Figure 1). The remaining stations are in Lake Sammamish (two stations), Lake Union/Ship Canal (three stations) and Lake Washington (four stations). While a larger number of stations provided more detailed water quality information, the remaining stations were considered adequate and appropriate for monitoring current lake status and long-term trends, the primary goals of this activity. The spending on lakes monitoring activities in 2009 was about $517,000 below 2008 levels.

Routine monitoring for toxic cyanobacteria (or blue-green algae, which can be harmful to humans and aquatic life in general) was discontinued at offshore lake monitoring stations, though maintained at 17 sites associated with the swimming beach monitoring program. Cyanobacteria information from the offshore stations is not considered critical and data would still be collected at sites important due to potential for human contact (swimming beaches). The metals monitoring element of the routine offshore lake monitoring stations was also discontinued. While monitoring of metals is useful to assess whether levels are increasing, monitoring to date had not demonstrated that metal levels were changing significantly, and thus metals monitoring was considered a lower priority than other water quality monitoring activities that have been in place for longer periods of time.

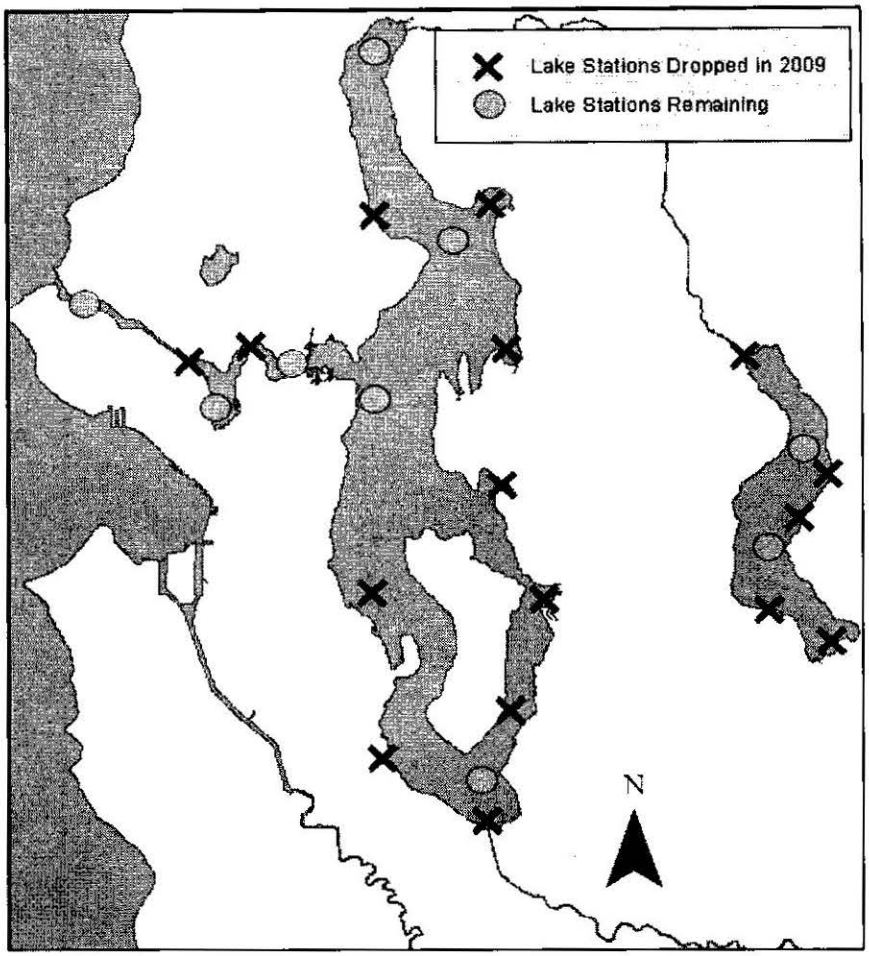

Figure 1 – Routine lake monitoring locations dropped from program in 2009 and stations currently maintained.

Streams water quality monitoring

Routine stream water quality monitoring stations were reduced from 58 to 20 (Figure 2). The number of rivers and streams sampled was reduced from 31 to 21. The retained monitoring stations were generally those with the longest-term data sets, to maximize an ongoing ability to track changes over time, and were generally located at the mouths of streams, and therefore are able to capture water quality conditions from the entire watershed at a single site. This strategy is effective for tracking overall conditions in the watershed. However, the reduction in the number of stations decreases the ability to discriminate discrete pollution sources to some degree. Spending on streams monitoring activities was reduced by about $504,000 from 2008 levels.

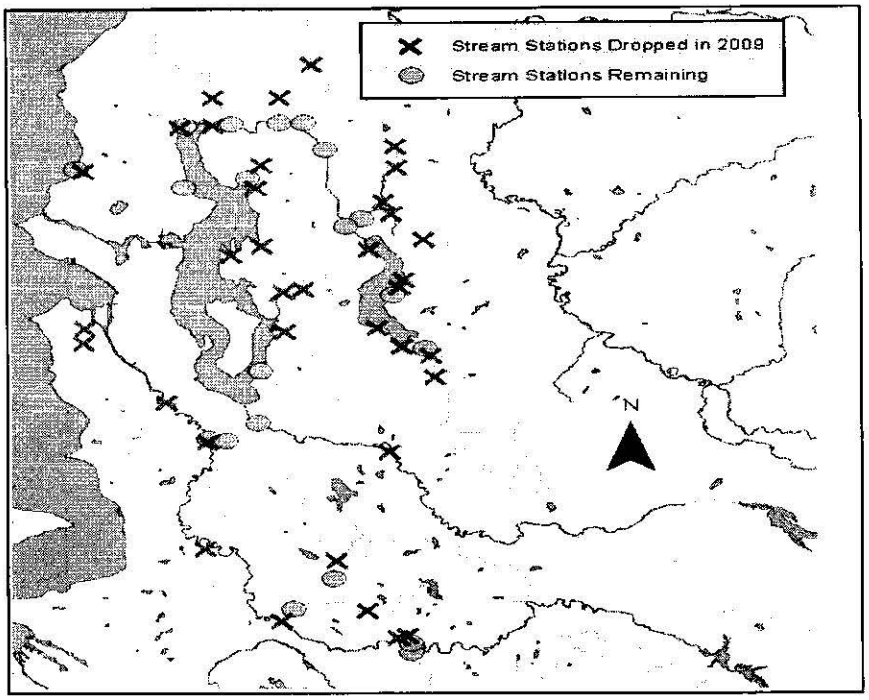

Figure 2 – Routine stream water quality monitoring locations dropped in 2009 and stations currently maintained.

Stream flow and temperature monitoring

River stream flow and temperature monitoring frequency was decreased in 2009. This reduction was accomplished by decreasing the number of site visits from the number recommended by the United States Geological Survey staff (eight visits per year) to six visits per year, and by decreasing the amount of stream flow and temperature data analysis and reporting. This reduction allowed for maintenance of all of the monitoring sites, although with an overall smaller body of data. Spending on these monitoring activities was reduced by about $164,000 from 2008 levels.

Swimming beach monitoring

Swimming beach monitoring was decreased in 2009 by reducing the number of different types of bacteria tested in each swimming beach water quality sample. Until 2008, three different types of bacteria were tested in each water quality sample to provide comprehensive information on potential public health risks. Starting in 2009, only one type (fecal coliform bacteria) was tested for, since this type is the one predominantly used by Public Health – Seattle & King County to assess whether a beach should be closed.

Watershed management and support

Prior to 2009, WTD funds were used to support a wider variety of watershed management support activities. For example, a major effort for WTD at the time had been to develop a response to Endangered Species Act (ESA) issues and participate in ESA-related planning efforts, as the ESA had the potential to affect WTD's facilities and treatment system. Further development of the County's approach to ensuring ESA compliance and increased understanding of the potential impact of wastewater treatment and conveyance on ESA-listed species helped to

refine watershed monitoring needs, and allowed funding to be reduced by about $280,000 from 2008 levels.

Marine water quality and toxics contaminant assessment

The Marine Water Quality Program elements generally remained constant over this period. Minor changes observed (Table 1) were due to inflation and spending fluctuations.

2010

WTD's basic sewer rate remained constant in 2010. The WTD Water Quality Monitoring Program maintained all 2009 elements in 2010. Changes between 2009 and 2010 in Table 1 are due to inflation, and differences between actual amounts (shown in 2009) and adopted budget amounts (shown in 2010). Adopted budget amounts for 2008 and 2009 are not available using these more recent categories, so actual expenditures were used in this report for those years.

2011

In the process of developing the 2011-2012 sewer rate, WLRD and WTD again assessed the priority of water quality monitoring program elements in light of efforts to control WTD rate increases, using similar evaluation criteria as used in 2009. The 2011 WTD Water Quality Monitoring Program adopted budget was reduced from 2010 levels by about $788,000. (In addition, WTD reduced a further $178,000 from monitoring activities to support WTD's industrial waste program). Changes in 2011 are summarized below.

Marine water quality monitoring

Routine marine shoreline water quality stations were reduced from 32 to 24 (Figure 3). Sites that were eliminated were nearer other stations, had limited human recreational use, and/or had demonstrated limited water quality concerns. Reducing the number of stations decreased the detail of shoreline water quality information, though the program continued to meet all NPDES permit requirements in 2011.

Monitoring for the presence of metals in clams was eliminated in 2011. The program was determined to be of lower priority because few people consume clams from King County shorelines and collected data demonstrated that metals concentrations in clam tissues at Puget Sound beaches were generally low. While separate from the ongoing monitoring program, it should be noted that WTD is participating on extensive assessments of toxic contamination associated with cleanup of the Lower Duwamish Waterway.

The Marine Water Quality Program in 2011 was reduced $92,000 from 2010 levels.

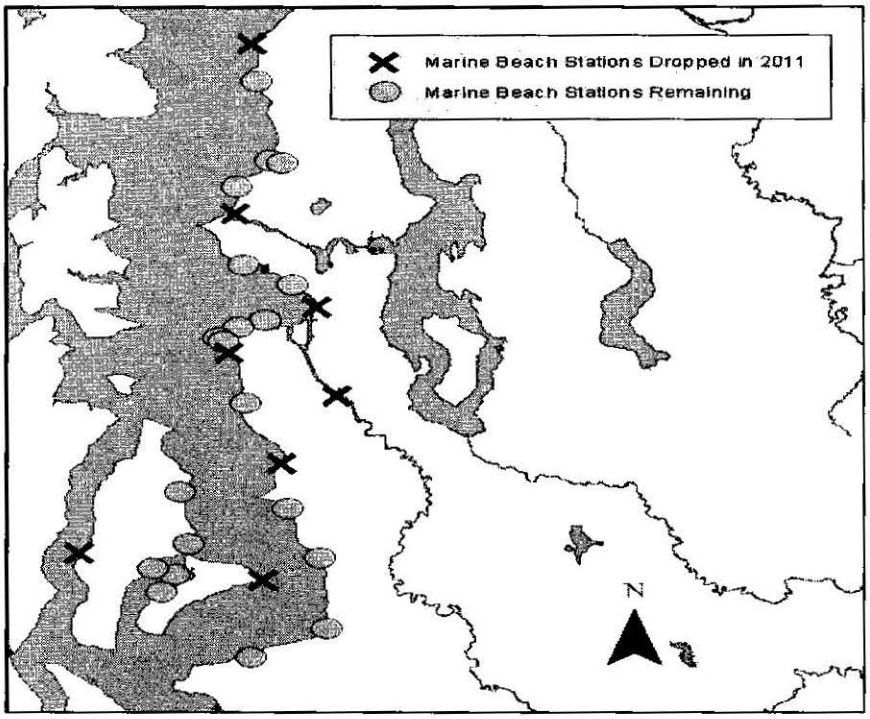

Figure 3 – Marine beach water quality monitoring stations dropped in 2011 and stations currently maintained.

Lakes water quality monitoring (Lakes Union, Washington, Sammamish)

The maintenance frequency on three temperature monitoring stations (thermistor chains) was reduced from four site visits per year to one site visit per year. Thermistor chains are maintained in Lake Washington, Lake Union, and upstream of the Ballard locks. Thermistor chains continuously monitor temperature at multiple depths; this information is useful in tracking temperature stratification in lakes. These reductions resulted in a loss of some temperature data in lakes Washington and Sammamish due to delays in identifying and fixing sensor problems, but this information is a low priority compared to the programs that were retained.

Annual lake sediment quality sampling (20 samples per year) was discontinued in 2011. This program was discontinued because lake sediment quality monitoring, while useful for assessing accumulation of toxic chemicals in sediments over the years, is a low priority compared to lake water quality monitoring, which tracks lake water quality changes twice per month and allows for statistical calculations of long-term trends.

Annual fish tissue chemistry monitoring of 20 fish tissue samples per year was discontinued in 2011. This program was discontinued since it was considered a lower priority than the lake water quality monitoring retained because gathering this data was costly, this monitoring activity had only been in place for a few years, and the information was not essential for current regulatory compliance. A consumption advisory for Lake Washington fish remains in effect due to high levels of chemical contamination.

Routine zooplankton monitoring was also discontinued in 2011. Like other programs that were discontinued or reduced, the program was considered a lower priority than the water quality elements that were retained. While potentially useful to understanding food webs and fish health, this information was not considered as valuable compared to other monitoring activities in

providing comprehensive information on streams and water bodies that could be impacted by WTD activities.

Routine water quality and phytoplankton monitoring frequency was also reduced from 20 to 19 times per year.

The Major Lakes Program in 2011 was reduced $373,000 from 2010 levels.

Streams water quality monitoring

Annual stream sediment quality monitoring (20 sites per year) was discontinued in 2011. This program was discontinued since it was already too streamlined to reduce further, and stream sediment quality monitoring, while useful, was considered a low priority compared to streams water quality monitoring, because of the cost of the program and because streams water quality provides a better indicator of current overall watershed health.

Wet weather (storm events) stream water quality monitoring (four events per year) was discontinued in 2011. This program was discontinued since it was considered a low priority compared to the routine streams water quality monitoring, because of the high cost of the program and because the information was not essential for WTD regulatory compliance.

Annual monitoring support to investigations into coho salmon prespawn mortality with Seattle Public Utilities, the National Oceanic and Atmospheric Administration, and other partners was discontinued. Other agencies continue to cover this work, although at a lower level. Additional support for coho salmon prespawn mortality studies was considered a lower priority compared to streams and other water quality monitoring activities that provide valuable information to the region and WTD. The streams water quality program for 2011 was reduced $310,000 from 2010 levels.

Stream flow and temperature monitoring

In 2011, $16,000 of the WTD cost of the Stream Flows and Temperature monitoring program was transferred to the King County Flood Control District. There were no reductions in services or data since the activity was funded by another agency.

New water quality monitoring funded by WTD in 2011

In 2011, the WTD capital budget allocated $1.2 million to the Lower Duwamish Pollution Source Identification Tracking project to conduct monitoring to support pollution source control activities along the lower Duwamish Waterway. While not an ongoing monitoring program like those described above, source control is receiving increasing attention as a component of toxic sediment cleanup, and understanding source control is a high priority for WTD's sediment management program. Elements of this work include air deposition monitoring, sewer outfall source characterization, sediment monitoring at cleanup sites and outfalls, and polychlorinated biphenyl concentration studies.

2012

The WTD Water Quality Monitoring Program maintained all 2011 elements in the 2012 budget.

4. Rate Impacts to Restore or Provide Funds for Additional Water Quality Monitoring Activities

Reductions in monitoring activities since 2008 have focused on saving ratepayers money while still maintaining the integrity of the monitoring program and meeting high priority needs. As discussed in Section 3, these reductions were identified through a rigorous and thorough evaluation and prioritization process, as part of an ongoing division-wide effort to increase efficiency and control rate increases. The reductions have led to a smaller and more focused monitoring program that maintains program integrity and meets all regulatory requirements.

Figure 4 illustrates the changes in monitoring program funding since 2008. As a general rule, every $100,000 in additional operating (ongoing) activities represents a 1.2-cent increase in the monthly sewer rate. By that standard, the difference between the 2008 budget (inflated to 2012 by 3 percent per year) and the 2012 adopted budget is saving ratepayers about 30 cents per month. The difference between the 2010 budget (inflated to 2012) and the adopted 2012 budget represents a savings of about 12 cents on the monthly sewer rate.

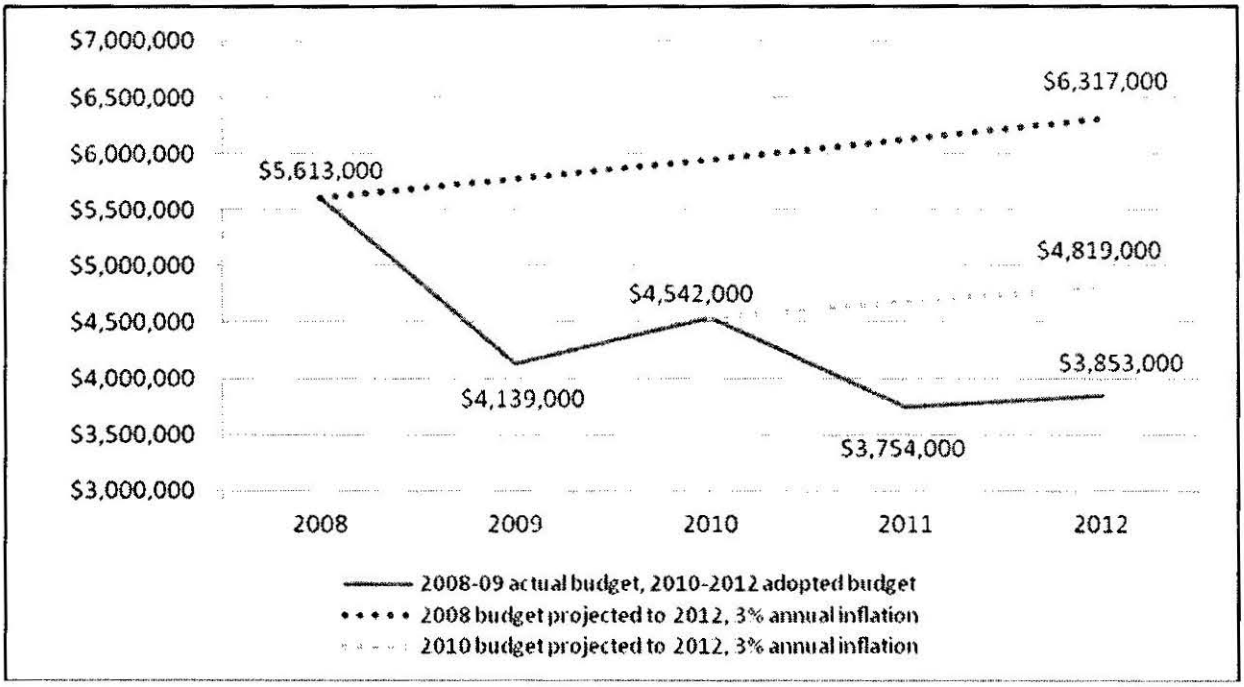

Figure 4 - Changes to the WTD Water Quality Monitoring Program since 2008 (includes projected costs of historical programs adjusted for inflation). Amounts are rounded to the nearest thousand.

WTD believes that financial stewardship is a high priority and that water quality monitoring should continue to be prioritized to meet regulatory obligations and regional commitments associated with the RWSP, within funding constraints. However, monitoring priorities continue to evolve, and if funds become available in the near term, WTD has identified a list of potential additional monitoring activities that includes new needs as well as some potential reinstatements. Exhibit A to this report reflects an internal assessment by WTD and WLRD of what would be most useful to WTD and the region to help maintain and enhance regional water quality, should a policy decision be made to allocate more funding for water quality monitoring. Some but not all monitoring activities reduced in previous years are identified as potential candidates for

reinstatement, depending on the value that particular activity would provide. Criteria used to rank these activities include:

- General usefulness of the activities to WTD's operations and capital program
- Linkage to WTD's mission to protect public health and the environment
- The need for diagnosing/tracking important water quality issues
- How directly the monitoring meets the goals of the RWSP, the King County Strategic Plan, and the King County Comprehensive Plan
- The likelihood that the activity will directly support corrective actions by WTD and others.

5. Options for Augmenting Funding Beyond WTD

The region benefits from WTD-funded monitoring programs, and the proviso has requested some discussion of whether other sources can contribute to their cost. While limited, there may be some options for augmenting funding for WTD's monitoring program with other sources including additional fees, grants, and contributions from other jurisdictions. However, alternate sources also face challenges, uncertainties, and limitations, as described below.

Although progress is being made at a regional scale to coordinate monitoring needed for compliance with municipal stormwater permits, and there have been discussions in WRIA 7, 8, and 9 about potential watershed-based funding mechanisms, there is no ongoing regional or state funding source for long-term monitoring of lakes, streams, and Puget Sound with the broader objective of protecting watershed health. If a new regional or state funding source were to be established, King County would be well positioned to provide high-quality monitoring and lab analysis services.

In addition, King County and other jurisdictions perform monitoring for other purposes, including complying with municipal stormwater permits. Monitoring is often dictated by permit requirements. While there may be benefits to evaluating whether overlaps and potential cost savings exist at a greater regional scale and, if so, how costs could be distributed among multiple programs, such an effort would require a significant investment on the part of permit agencies, particularly the Washington State Department of Ecology and the Environmental Protection Agency. Overlaps do not exist within King County between municipal stormwater NPDES permit monitoring (funded by Surface Water Management fees) and the Water Quality Monitoring Program funded by WTD. In fact, these two programs are complementary and their service areas only partly coincide.

Grants also offer some potential to augment WTD's monitoring program. WLRD has successfully obtained several federal and state grants to conduct specific studies, such as demonstrating the effectiveness of stormwater best management practices, monitoring wadeable streams in WRIA 8 to relate hydrology and land use to watershed health, and assessing the effectiveness of King County's Critical Areas Ordinances. However, grants are highly variable, unpredictable, and generally dedicated to specific problems or projects. Given these limitations, they are less likely to be useful for ongoing monitoring programs, including trends monitoring. In addition to significant matching and overhead requirements for the County, ongoing financial pressures at the federal and state level suggest that future grant opportunities may diminish rather

than increase. However, King County will continue to seek funding from grants when appropriate to carry out its mission, including augmenting WTD's monitoring program.

A final possible source of support for WTD water quality monitoring may be contributions from other jurisdictions. King County has inter-local agreements in place for certain specific monitoring activities, such as stream water quality monitoring for Mercer Island and small lake monitoring and stewardship with multiple cities. Other jurisdictions around Lake Washington and Lake Sammamish have access to and benefit from monitoring data conducted in these lakes, but have not expressed willingness to cost-share this work beyond contributions they make as component agency customers within the wastewater service area and their existing monitoring programs.

6. Conclusion

WTD is proud of its existing water quality monitoring program, a significant investment that meets its needs and benefits the entire region. Adjustments made to the monitoring program between 2008 and 2012 were based on a comprehensive assessment of monitoring needs to efficiently carry out goals of the RWSP and regulatory requirements while minimizing wastewater rate increases.

Needs change over time, and the monitoring program will continue to evolve to address new issues and priorities. It is important to continually evaluate the monitoring program and ensure it is operated efficiently and effectively, is consistent with WTD's funding authority, is fulfilling the goals of the RSWP, and is addressing emerging issues. For example, WTD allocated an additional $1.2 million to Lower Duwamish Pollution Source Identification Tracking in 2011. Based on the most recent review of monitoring needs conducted for this report and in preparation for development of the 2013-2014 rate proposal, WTD is recommending an additional $240,000 in monitoring to improve its understanding of two emerging issues for Puget Sound recovery and the regulatory environment for wastewater treatment: nutrient loading from wastewater discharges and emerging contaminants. These monitoring activities are the top two priorities described in Exhibit A, attached to this report. Funding for these priorities is reflected in the two-year wastewater rate proposed for 2013 and 2014. WTD is not recommending restoration of water quality activities reduced in 2008 through 2011 as part of the rate proposal.

Exhibit A: Prioritized List of Additional Monitoring Options

Rank	Program	Activity	New-N Restore-R Expand-E	Rationale	TOTAL
1	Marine	Enhance the scope and precision of marine phytoplankton monitoring to improve tracking of changes to marine food web and water quality. Monitoring would be expanded using high-precision laboratory equipment to quantify the amount and type of phytoplankton.	E	Phytoplankton serves as the base of the marine food chain, and is sensitive to the amount of nitrogen in Puget Sound. Too much nitrogen can cause water quality problems. This information will help monitor potential impacts of wastewater discharge on marine organisms and marine water quality, important to the Wastewater Treatment Division (WTD) and the region.	$90,000
2	Toxics	Conduct monitoring surveys of existing and emerging contaminants in atmospheric deposition, stormwater, streams, rivers, lakes, groundwater, marine water, sediments, and fish tissue.	N	Existing and emerging contaminants may represent some level of ecological risk, even though thresholds of risk have yet to be determined. Quantifying the current presence/absence of such contaminants in the environment and their sources will help WTD to understand whether actions are needed, including implications for WTD.	$150,000
3	Lakes	Add sediment core and surface sediment monitoring in lakes Sammamish, Washington, and Union/Ship Canal to test changes in chemical accumulation over time and to assess chemical accumulation in different habitats.	N	Chemical loading to Lake Washington has varied over the years based on changing land use and waste management practices, and changes in chemical regulations that may affect WTD. Sediment core studies allow for tracking these changing rates and are useful in assessing overall chemical loading and mass balance in and out of the lakes. Concurrent surface sediment monitoring allows for assessing recent chemical loadings to the lakes.	$130,000
4	Toxics	Lab method development and preparation to support monitoring surveys of new and emerging contaminants. This would include work to bring new/additional methods on line for endocrine disrupting compounds, personal care products (DEET, sun screen), drugs (opiates, anti-inflammatories), and perfluorinated compounds.	N	Existing and emerging contaminants may represent some level of ecological risk, even though thresholds of risk have yet to be determined. Quantifying the current presence/absence of such contaminants in the environment will help discriminate between sources originating in WTD's waste stream and those originating elsewhere. In addition to method development, training and set up costs for new instrumentation would be needed. The capital cost of instrumentation is not included here, but would be reflected in the King County Environmental Laboratory Capital Asset Management activities.	$100,000

Exhibit A: Prioritized List of Additional Monitoring Options						
5	Stream Flow and Temperature	Restore stream flow and temperature gauging sites, and increase maintenance frequency to the frequency recommended by the United States Geological Survey.	R	Stream flow and temperature gauging provides important baseline data for calculating pollutant loadings and analyzing watershed health within WTD's service area. This restoration will improve geographic coverage and data quality of this program.	$55,000	
6	Lakes	Restore annual tissue chemistry monitoring to track chemical accumulation from the water into the food web.	R	Fish in Lake Washington currently have some of the highest levels of chemical contamination in Washington and the Washington State Department of Health has issued a fish consumption advisory for the lake. This data will inform updates to the consumption advisory, track changes in accumulation over time, and inform management actions for reducing fish contamination. This is important to WTD's mission to protect public health and the environment.	$93,000	
7	Marine	Increase the frequency of routine offshore water quality monitoring to twice per month from once per month for February through November.	E	Ocean dynamics cause water quality to change quickly, especially during the phytoplankton bloom season (early spring through fall). Adding the second water quality sampling run will increase understanding of these complex dynamics, which will be useful in assessing the relationship between nitrogen and phytoplankton in Puget Sound. This information will help improve the understanding of wastewater discharge impacts to marine water quality.	$250,000	
8	Streams	Restore monthly water quality monitoring at 20 stream sites previously monitored.	R	Routine water quality monitoring allows for tracking overall stream health and long-term changes over time. Results may be used to assess compliance with water quality standards and to prioritize management actions to restore water quality. Additional stream sites will improve our geographic coverage and allow us to react more quickly to potential water quality problems (whether due to WTD or other sources) and understand background conditions to ensure WTD operations and discharges throughout a watershed are environmentally protective.	$130,000	
9	Streams	Expand pollution source identification monitoring to encompass a basin-scale approach for assessing sources of multiple parameters.	E	Pollution source identification investigations are initiated to trace sources of water quality pollution. Activities are done in cooperation with WTD staff, stormwater staff from the local jurisdiction, and Public Health staff to ensure that controls are implemented. The expanded source identification monitoring contributes directly to improvement in water quality, and ensures that resources that WTD (and other parties) spend on management actions are needed and cost-effective.	$86,000	

Exhibit A: Prioritized List of Additional Monitoring Options						
10	Marine	Increase marine beach monitoring frequency from monthly to weekly from May to October for selected beaches.	E	Marine beaches are heavily used during summer months. The enhanced weekly monitoring program would allow for a quicker identification of beaches that might pose health risks due to high bacteria levels. WTD has several marine outfalls, so has a strong interest in ensuring public health and environmental quality are protected in marine areas.	$150,000	
11	Streams	Restore the stream sediment chemistry monitoring program to track changes in pollution over time and to characterize stream basins.	R	Metals and organic chemicals are difficult to detect in surface waters, but accumulate in sediments. This program tracks changes in sediment quality over time, and assesses differences in sediment quality within and between stream basins. This information benefits WTD because it can be used to find pollution sources, inform pollutant loading calculations, and assess effectiveness of control activities.	$68,000	
12	Marine	Identify and monitor reference sites for marine benthos (bottom dwelling organisms).	N	Benthos community health provides a more direct indicator of whether contamination is affecting marine biotic populations. Reference sites are needed to allow for improved assessment of benthos community health near WTD outfalls.	$45,000	
13	Marine	Add monitoring for biomarkers of chemical exposures in Elliott Bay and Puget Sound fish, rotating annually between different biomarkers, species, and locations.	N	This monitoring program would test blood, livers, and sex organs of fish for biomarkers of exposures to Polycyclic aromatic hydrocarbons and endocrine disrupting compounds. These compounds may cause harm to fishes but are rarely assessed. It is important to the region's environmental quality that such impacts be understood, so that solutions can be developed if needed.	$120,000	
14	Streams	Restore participation in water quality studies into coho prespawn mortality in urban stream with the National Oceanic and Atmospheric Administration (NOAA), United States Fish and Wildlife Service, Washington Department of Fish and Wildlife (WDFW), and City of Seattle.	R	Excessive coho prespawn mortality has been observed by NOAA scientists in multiple urban streams in King County. King County has contributed detailed water quality monitoring activities to assist in identifying the chemical(s) causing prespawn mortality. Identification of the chemical(s) causing prespawn mortality will assist in developing appropriate management actions to eliminate this phenomenon, and help ensure that any potential actions needed by WTD are truly needed and cost-effective.	$140,000	
15	Lakes	Restore zooplankton monitoring in large lakes as part of the routine lake monitoring program.	R	Zooplankton are small animals in the water column near the base of the food chain. Zooplankton populations are sensitive to changes in phytoplankton populations and water quality conditions. This monitoring is useful as a method for tracking changes in the food web over time with important consequences for juvenile Chinook	$40,000	

Exhibit A: Prioritized List of Additional Monitoring Options						
				and sockeye salmon in our lakes, important to regional prosperity and overall environmental quality.		
16	Streams	Conduct a survey of streams in King County and elsewhere to identify reference sites, and track reference site conditions over time.	N	Reference sites are necessary to discriminate between change that has occurred due to urbanization and change due to climate or other factors to ensure WTD's activities remain environmentally protective.	$75,000	
17	Lakes	Restore thermistor (temperature sensor) chain operation and maintenance schedule in Lake Washington to assess water temperature from the top to bottom of the lake, and add one thermistor chain to Lake Sammamish.	E	Thermistor chains provide continuous temperature measurements throughout the water column, which is important for tracking temperature impacts on fish (salmonids) as well as overall water quality conditions. Restoring the operations and maintenance frequency of the Lake Washington and ship canal thermistor chains will allow for more reliable data collection and fewer missing data due to sensor malfunction. Adding a chain in Lake Sammamish will allow for detailed temperature tracking in that lake, which may assist in regional efforts to protect at-risk kokanee salmon.	$16,500	
18	Lakes	Restore the volunteer monitoring program to track water quality in 10 small urban lakes.	R	Many small lakes within the wastewater service area previously were monitored for water quality but haven't been tested since 2006 when this monitoring program was eliminated. This would restore this monitoring program to the 10 lakes that were previously monitored. This monitoring uses lakeside residents as volunteers to assist with the monitoring, promoting lake stewardship and increasing the likelihood of achieving and maintaining water quality standards in a broader part of WTD's service area.	$100,000	
19	Stream Flow and Temperature	Enhance Sammamish River Valley groundwater monitoring; conduct monitoring of reclaimed water application sites.	E	Sammamish River Valley waters are heavily managed, and soon reclaimed water from Brightwater is likely to be used for irrigation in the valley. This monitoring program will collect groundwater level data and groundwater quality data, to assess whether conditions are improving or declining over time. This information would be used to assess impacts and benefits of reclaimed water in the Sammamish River Valley.	$76,000	

Exhibit A: Prioritized List of Additional Monitoring Options					
20	Marine	Restore monthly water quality at 8 sites along the Puget Sound shoreline.	R	Marine beaches are heavily used during summer months. Restoration of monitoring at 8 additional beach sites would provide expanded beach monitoring coverage to protect public health at locations where no monitoring currently occurs. WTD has several marine outfalls, so has a strong interest in ensuring public health and the environmental quality are protected in marine areas.	$95,000
21	Marine	Add annual fish tissue monitoring for toxic chemical accumulation in Elliott Bay and Puget Sound.	N	Fish tissue in Elliott Bay has historically been sampled by WDFW to assess chemical bioaccumulation levels. This program is at risk of being dropped due to state budget restrictions. This data is useful as the end target of clean-up activities in the Duwamish River, which is a key activity for WTD as it participates in the Lower Duwamish Waterway cleanup effort.	$118,000
22	Stream Flow and Temperature	Provide stream gauging support to other jurisdictions within the WTD service area, and provide data repository for all stream gauging data within the service area.	N	Flow monitoring is difficult without proper training, and most jurisdictions do not have experts on-hand for conducting this work. This effort would be a cost-effective way for scaling up King County's data set of stream flow data, which is useful for assessing watershed health, calculating pollutant loadings to larger water bodies (to ensure cost-effective solutions are developed), and for stormwater management.	$40,000
23	Streams	Restore the collection of stream water quality samples during rain events to assess impacts on stream water quality.	R	Rain events typically result in increased runoff of pollutants from the land surface into streams. Monitoring stream water quality during these rain events allows for tracking worst-case conditions in the streams. This information is useful for planning stormwater and land use management activities, and to understanding stream contributions in storms compared to combined sewer overflows or other sources.	$122,000
24	Marine	Enhance marine phytoplankton monitoring by collaborating with the University of Washington and/or NOAA to have researchers/students identify and quantify phytoplankton samples collected by King County.	E	Phytoplankton serves as the base of the marine food chain, and is sensitive to the amount of nitrogen in Puget Sound. WTD is the largest discharger of nitrogen into Puget Sound, and the Washington State Department of Ecology is currently considering developing a Total Maximum Daily Load to address dissolved oxygen concerns in South Puget Sound that are impacted by nitrogen inputs. As a significant anthropological source of nitrogen to Puget Sound, it is in WTD's interest to ensure that the best available science is used to inform future management or regulatory action.	$100,000

Exhibit A: Prioritized List of Additional Monitoring Options					
25	Lakes	Expand routine water quality monitoring frequency to 24 times per year.	E	Twice monthly water quality monitoring provides greater resolution on lake water quality issues and concerns, especially as lake conditions may shift rapidly. This will enable WTD to have a more current and detailed understanding of lake water quality conditions and to be more confident that ongoing and future activities are fully environmentally protective.	$75,000
26	Marine	Develop marine zooplankton monitoring program to characterize base of the food web and track changes over time.	N	Marine zooplankton are small animals that float in Puget Sound and serve as the food source for larger fishes and other marine biota. This monitoring program would assess the status of the marine zooplankton community and track its changes over time, which are sensitive to nitrogen inputs to Puget Sound. There is a general concern for nitrogen inputs to Puget Sound, and it is in WTD's interest to understand phytoplankton conditions in areas of Puget Sound near its facilities.	$75,000
27	Marine	Add benthic invertebrate monitoring to routine marine sediment quality monitoring program.	N	Benthic invertebrate monitoring can be cost-effectively added concurrently when sediment chemistry samples are collected, on either a two-year or five-year cycle. Benthos community health provides a direct indicator of whether contamination (from a variety of sources, and of concern to WTD) is having an effect on marine biotic populations. This will help inform WTD's sediment management program.	$32,000
28	Streams	Expand volunteer monitoring of prevalence of coho prespawn mortality into 3 more urban streams.	E	Excessive coho prespawn mortality has been observed by NOAA scientists in multiple urban streams. Tracking prespawn mortality is labor intensive, but will be necessary to understanding the extent of the problem and whether progress is being made to solve it. King County is currently running a volunteer monitoring program in Miller/Walker Creeks (funded by the local cities) to track prespawn mortality. This would expand volunteer monitoring to two more urban streams within the service area. Identification of the extent of prespawn mortality will assist in developing and evaluating appropriate management actions to eliminate this phenomenon.	$62,500
29	Streams	Inventory stream riparian habitat and update on a routine basis.	N	Stream riparian habitat is critical to stream basin health, yet no inventory of this resource is available. This information would be useful for developing riparian restoration plans, which are an important component of overall watershed health.	$50,000

Exhibit A: Prioritized List of Additional Monitoring Options					
30	Watershed	Expand the salmon watcher program to cover the entire WTD service area; and expand monitoring to include more frequent visits, prespawn mortality, and different species.	N	The salmon watcher program is currently funded by King Conservation District grants and is limited to the Water Resource Inventory Area 8 (greater Lake Washington watershed). Expansion of the program to more of WTD's service area would allow for enhanced citizen-scientist data collection to track salmonid populations over time, a desired result of regional efforts to maintain and improve water quality.	$160,000
31	Watershed	Inventory land use / land coverage, compare to historical land use / land cover, and update on a routine basis.	N	Land use / land cover is an effective tool for tracking the effectiveness of zoning and land use regulations. This information is also useful for identifying future habitat restoration/protection opportunities, helpful in assessing the impacts of future WTD facilities, and identifying mitigation opportunities.	$20,000
	Total Potential Additions / Restorations				**$2,864,000**
	Prioritization based on				
	- General usefulness to WTD's operations and capital program				
	- Linkage to WTD's mission to protect public health and the environment				
	- The need for diagnosing/tracking important water quality issues				
	- How directly the monitoring meets the goals of the RWSP, King County Strategic Plan, King County Comprehensive Plan				
	- The likelihood that the action will directly support corrective action by WTD and others				
	This list contains a mix of monitoring activities that are new, activities that are expansions of current activities, and activities that are restorations of activities reduced in 2009 and 2011.				
	It should be noted that some activities that were reduced over the past few years do not appear on this list, as they are not as high a priority as those indicated here.				