

November 24, 1986
0216B:BB:clt

INTRODUCED BY: Lois North

PROPOSED NO. 86 - 700

ORDINANCE NO. 17893

AN ORDINANCE adopting the updated Preliminary Assessment of Water Supply and Fire Protection Issues in King County and designating East King County as a Critical Water Supply Service Area, amending Ordinance 7578 and K.C.C. 13.28.010.

PREAMBLE:

On December 16, 1985, the King County council passed Motion 6407 adopting the Preliminary Assessment of Water Supply and Fire Protection Issues in King County, herein after referred to as the Assessment.

The Assessment has been updated to reflect facts concerning water supply issues in East King County.

East King County water purveyors have asked King County to designate the East King County geographic area as a Critical Water Supply Service Area.

The updated Assessment must be accepted by the King County council.

RCW 70.116 requires local legislative enactment of Critical Water Supply Service Area designations. Initial designations were enacted by the county council by Ordinance 7578.

BE IT ORDAINED BY THE COUNCIL OF KING COUNTY:

NEW SECTION. SECTION 1. The updated Preliminary Assessment of Water Supply and Fire Protection Issues in King County is hereby accepted.

SECTION 2. Ordinance 7578 and K.C.C. 13.28.010 are hereby amended to read as follows:

Areas Designated. Pursuant to Chapter 70.16 RCW, the King County council hereby declares the areas of South King County, Skyway, ((and)) Vashon, and East King County, as critical water supply areas (as preliminarily mapped in the Preliminary

1 Assessment accepted by Motion 6407 and Ordinance _____.) The
2 county executive shall notify the Department of Social and Health
3 Services, State of Washington, and form water utility coordinating
4 committees pursuant to RCW 70.116.040 for the purpose of preparing
5 coordinated water supply plans for the declared areas.

6 INTRODUCED AND READ for the first time this 24th day of
7 November _____, 1986.

8 PASSED this 22nd day of December 1986.

9 KING COUNTY COUNCIL
10 KING COUNTY, WASHINGTON

11 Audrey Gruyer
12 Chair

12 ATTEST:

13 Geoff A. Peterson
14 Deputy Clerk of the Council

15 APPROVED this 31ST day of DECEMBER, 1986.

16
17 Raeel Fard
18 King County Executive

Preliminary **A**ssessment
of
Water **S**upply
and
Fire **P**rotection
Issues
in
King **C**ounty

KING COUNTY

DEPARTMENT OF PLANNING AND COMMUNITY DEVELOPMENT

UPDATED
NOVEMBER, 1986

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Chapter 1

INTRODUCTION

This Preliminary Assessment was prepared pursuant to the provisions of Chapter 70.116 RCW (Public Water System Coordination Act of 1977), WAC 248-55, and King County Motion 5701. A Preliminary Assessment is meant to be an overview of domestic water supply issues and provides general information on existing and potential conditions. If there are water problems, a decision to proceed or not to proceed with further studies to examine the problems in detail and recommend solutions is in order. A Preliminary Assessment is a review to evaluate the need for in depth studies.

This document was prepared from readily available data and discussions with many individuals knowledgeable in the areas of water supply, water resources, and fire protection. Because this is a reconnaissance of issues, it relies to a large extent on opinions, undocumented information, and partial review of data (sometimes incomplete data). There are limits to this methodology. However, in the interest of time and given the purpose of this study, it was felt such an approach was appropriate.

Under the provisions of RCW 70.116 the King County Council has the option of reviewing the Assessment and using it as the basis for declaring all, or parts of the County a Critical Water Supply Area (CWSA). RCW 70.116 also gives the Secretary of the Washington State Department of Social and Health Services (DSHS) the authority to declare a CWSA after reviewing the Assessment. A CWSA is a geographic area which has problems with water supply because of inadequate quantities of water, unsuitable water quality, unreliable service, or lack of coordination among the area water purveyors. One or all of these conditions may be sufficient cause to declare a CWSA.

If a Critical Water Supply Area is declared, the Council (or Secretary) appoints a Water Utilities Coordination Committee (WUCC) charged with the responsibility of defining the specific boundaries of the area and advising the Council of its findings. After the Council completes action on the designation of the Critical Water Supply Area, preparation of a Coordinated Water Supply Plan (CWSP) can begin. The plan is prepared under the direction of the WUCC. DSHS participates in the preparation of the CWSP and may provide up to 50% funding.

The completed plan is subject to Council approval within 60 days of its submittal. If the Council fails to act within the 60 days, the CWSP is considered approved. Following Council action, the Plan is sent to DSHS for action.

The Preliminary Assessment was prepared with the assistance of a number of individuals and agencies. A Preliminary Assessment Advisory Committee, consisting of representatives from a broad range of constituencies and agencies, was formed to advise staff in the preparation of this report. Their time and effort to support this project has been invaluable. The Committee did not prepare or supervise the preparation of the report and is not responsible for errors or omissions.

Advisory Committee:

Peter Beaulieu, Puget Sound Council of Governments

James Miller, City of Seattle Water Department

Alan Rowe, State Department of Social and Health Services

Dwight B. Van Zanen, Representing County Fire District Chiefs

Ralph Colby, King County Utilities Technical Review Committee

Cynthia Sullivan, King County Councilmember

John Sawyer, Representing King County Water Districts

Don Blanchard, Representing County Fire District Commissioners

Geoffrey Ethelston, City of Bellevue

Don Meyer, Representing King County Water Districts

Sydney Munger, Metro

Ken Olson, City of Tacoma Water Department

John Phillips, Representing County Private Water Purveyors

Rod Sakrison, Washington State Department of Ecology.

The Preliminary Assessment data was collected and the report prepared by Robert Tull, Gene Peterson, Jacquelyn Lynch, Betsy Minden, Howard Roll, Jim Ishimaru, Amy Stolov, and Rusty Moore.

Chapter II

RECOMMENDATIONS

Critical Water Supply Area Designations

The following areas should be designated Critical Water Supply Areas (CWSA). Coordinated Water Supply Plans should be developed as mandated by the Public Water System Coordination Act:

1. Vashon Island CWSA designation will facilitate the further research and monitoring. A management program is needed to preserve and protect limited groundwater resources.
2. South King County CWSA designation will facilitate the development of a long term water supply strategy to coordinate growth with the supply needs of the many Class 1 water systems in the area.
3. Skyway CWSA designation will facilitate development of a plan to coordinate improved water supply and service for the large number of water purveyors in this small area.
4. Eastside CWSA designation will facilitate the development of long-term supply plans, provide a forum to discuss supply conflicts, allow satellite management of smaller, failing water systems, and provide for coordinated water supplies in a rapidly growing area.

Ground Water Management

5. King County should develop a County-wide groundwater quality protection program. The program should include:
 - A. Groundwater supply and recharge area identification.
 - B. Study and evaluation of groundwater problems and current groundwater protection practices.
 - C. Designation of areas for special study under HB 232 and HB 1138.
 - D. Recommendations for a strategy to coordinate and implement groundwater protection programs which will rectify current groundwater quality problems, include groundwater protection as a goal in community plans, and improve

groundwater quality monitoring.

6. King County needs to review current groundwater withdrawal practices and develop a comprehensive strategy to coordinate to the extent of its powers the present and future use of the County's limited groundwater resources.

Regional Water Supply Management

7. King County should coordinate a strategy (with the participation of water districts, municipalities and small water purveyors) to address local supply problems among the purveyors.

8. The County should help establish logical service areas for existing major purveyors. Within these service areas new systems should not be allowed.

9. King County should encourage Class 1 water systems to make service available to small water systems within their Comprehensive Plan area.

10. King County should actively participate in existing and future regional forums (e.g. the Puget Sound Council of Governments Water Resources Committee) to address regional water supply and water quality issues.

Coordination with DOE

11. The County should participate in DOE programs to define criteria for setting maximum net benefit and minimum instream flows.

Amendments to King County Development Codes

12. King County should amend King County Code Title 19, Subdivisions to require that plats with more than four lots connect to existing Class 1 and 2 water supply systems if the plat is located in the logical service area of an existing Class 1 or 2 water system.

13. King County should amend its short subdivision requirements to require installation of a water system by the developer prior to final approval of a short plat.

14. New developments (other than subdivisions) should be required to become part of an existing purveyor's system when they are within the purveyor's logical service area.

15. King County should require the formation of Satellite

Management, Maintenance and Sampling Systems for areas where more than two small water purveyors exist. Either nearby Class 1 water systems or an administrative body formed by the smaller water purveyors would be responsible for monitoring water quality and insuring reliable service and maintenance for the group of purveyors.

Improvements to Water Quality Protection

16. King County should participate in the State Department of Social and Health Services (DSHS) program to develop new standards for monitoring toxic chemicals that threaten water quality.

17. Water quality information needs to be exchanged among various agencies (King County, DSHS, and DOE) to determine where water quality problems are developing and how best to prevent them. King County should ask DSHS to take the lead in setting up an information exchange system.

18. King County needs to budget additional staff for the King County Department of Public Health so that it can fulfill its responsibility for regulating small water systems (monitoring and enforcing water quality standards and surveying water systems for general maintenance and operation practices).

Fire Service Master Plan

19. King County should prepare a Fire Service Master Plan. Fire service and land development need to be coordinated at a County-wide level. Fire service standards should be developed for use in review of new development.

20. Road and access policies and standards should be improved by the County to assist in the County's efforts to ensure adequate emergency assistance and fire fighting response.

21. King County should revise development standards for building type, location, and land use to provide more effective coordination with fire service operations.

22. Solutions to the problems of substandard fire hydrants requires a forum which encourages all affected parties to work together. King County should convene a committee of fire and water districts with hydrant problems and take the lead role in solving the problem.

23. The County needs to adopt regulations that require fire hydrants, or other fire protection devices when hydrants/fireflows are not provided.

Chapter III

WATER SERVICE

Water service in King County is provided by over 1,500 organizations of varying size and capability. The large number and broad distribution of these water systems result in coordination, supply, management and water quality problems. Remedies to existing water service problems include Critical Water Supply Area designation, development of water resource management strategies, regulatory changes regarding water service, and the creation of satellite management systems for groups of small water systems.

Water Systems

Water systems in King County are operated by municipalities, water districts, companies, or associations. A public water system is any water system other than an individual well serving an individual home. The Washington State Department of Social and Health Services (DSHS) regulates water systems with the assistance of the King County Health Department (KCHD). DSHS and KCHD monitor water quality and inspect water facilities for compliance with existing regulations. DSHS divides public water systems into four classes based on size of the system and type of service.

Class 1 systems include most cities and water districts and serve 100 or more permanent connections.

Class 2 systems serve between 10 and 99 connections or a transitory population of 300 to 900 people.

Class 3 systems serve facilities such as parks and recreation sites with a transitory population of 25 to 299 people.

Class 4 systems serve 2 to 9 homes or a transitory population of less than 25. These systems usually consist of a number of neighbors who share a well. Class 4 systems include all water systems that do not fall into Classes 1, 2 or 3.

Over 98% of the County's population receives water service from the 87 Class 1 water systems. In contrast, the over 1,300 Class 4 systems provide water service to about .6% of the County's population (see Table 1). While most of the population is served by Class 1 water systems, Class 4 systems account for the majority of water systems.

Table 1

WATER SYSTEM STATISTICS

CLASS OF SYSTEM	NUMBER OF SYSTEMS	TOTAL POPULATION	% POPULATION BY SYSTEM
1	87	1,335,255	98.0%
2	129	15,348	1.0%
3	80	n.a.	0.4%
4	1,299	8,229	0.6%
Totals	1,595	1,358,832	100.0%

n.a. : Not Available

Source: Department of Social and Health Services,
Water Facilities Inventory, 1984.

Note: These figures do not include unregistered systems or
systems created since November 1984.

The large number of small water systems (Class 2, 3 and 4: 1,500 systems) compound the problems DSHS and KCHD have in monitoring water quality. As explained more fully in the chapter on Water Quality, small water systems are less likely to monitor for water quality. Due to their large number, small water systems are expensive (in terms of staff and time) to regulate and the quality of their water is often unknown. Each new well is a potential source of groundwater contamination.

The large number of small water systems is of concern because smaller systems have trouble providing reliable service. In addition, the provision of service to an urban or a growing area is complicated when a number of uncoordinated small water systems exist. The size of small water systems makes it more difficult to provide water when groundwater sources are low than for larger systems. They generally lack advanced equipment, technology and sufficient personnel to meet water system and provide maintenance.

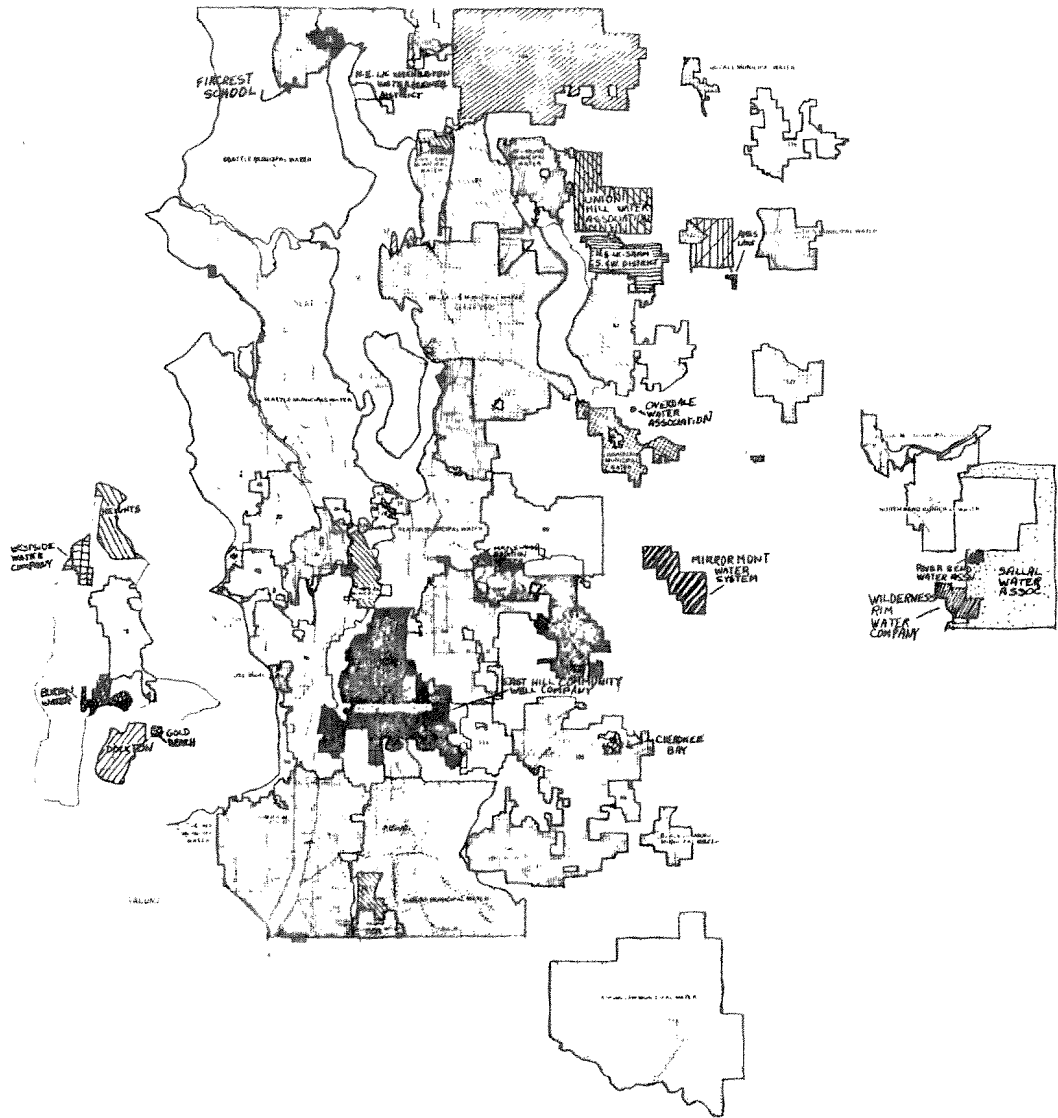
The large number of small water systems in an urban or a growing area results in service area conflicts and difficulty in efficiently providing new service to a growing population. Map Nos. 1, 2, and 3 show the location of Class 1, 2, 3, and 4 water systems in King County. Map No. 4 illustrates the number and location of groundwater sources for Class 1, 2, and 3 water systems in King County. A comparison of these maps illustrates the extensive overlap between the four classes of water systems in King County. Additionally, there are large numbers of individual private water supplies in the area of Class 1 public water systems. These private wells effect the inventory, assessment, coordination, groundwater quality and water availability of the public water supply. The irregular distribution of Class 4 water systems is an indication that careful planning for efficiency, maximum reliability, and accommodation for future growth does not occur. The proliferation of small public water systems resulted in part from King County planning policies.

Small water systems in Rural Areas were supported in the 1964 King County Comprehensive Land Use Plan in an attempt to restrict development. It was believed that larger water systems in rural areas facilitate development and eventually result in urban/suburban zoning changes. Some Community Plans also restrict the extension of Class 1 water systems into rural areas.

King County land use policies also promote Class 3 and 4 water systems through water service requirements for short plats and formal subdivisions. King County Code, Title 19 Subdivisions, does not require development to connect to existing Class 1 or 2 water systems. King County's review of water availability certificates and water service agreements does not include consideration of the number of water systems created. Before formal subdivisions receive final approval, King County requires water service installation. For some developments, building a connection to an existing water district is more expensive than developing a new system. In other developments, annexation to water districts may take more time than building new wells. The developer may choose to install a new water system rather than build an extension to the nearest district.

Short subdivisions are not required to have water installed before approval. Developers often designate Class 4 water system wellsites rather than build water main extensions to the site. The King County Health Department has until recently, approved small water systems based on ability to serve, health requirements and other factors rather than the number of small water systems. The Washington Department of Ecology (DOE) in granting water rights for Class 3 and 4 water systems withdrawing more than 5,000 gallons per day (gpd) also does not consider the proliferation of water systems in its decision.

Class 1 Water System Service Areas



11

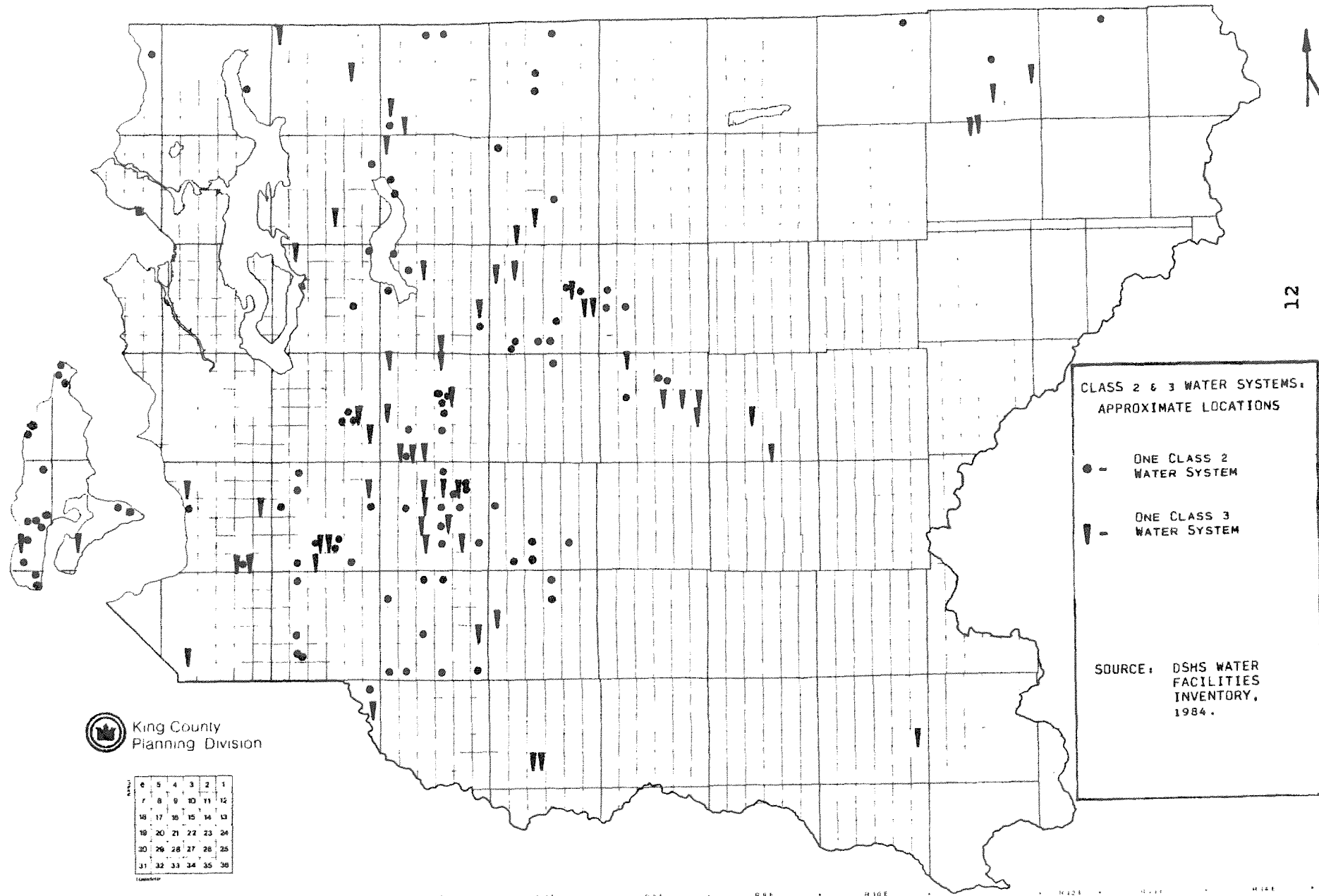
**Class 1 Water Systems:
Service Areas**


All boundaries approximate.

SOURCE: KING COUNTY
PLANNING DIVISION
AND SURVEY OF
WATER DISTRICT
COMPREHENSIVE
PLANS, 1984.

MAP No. 2

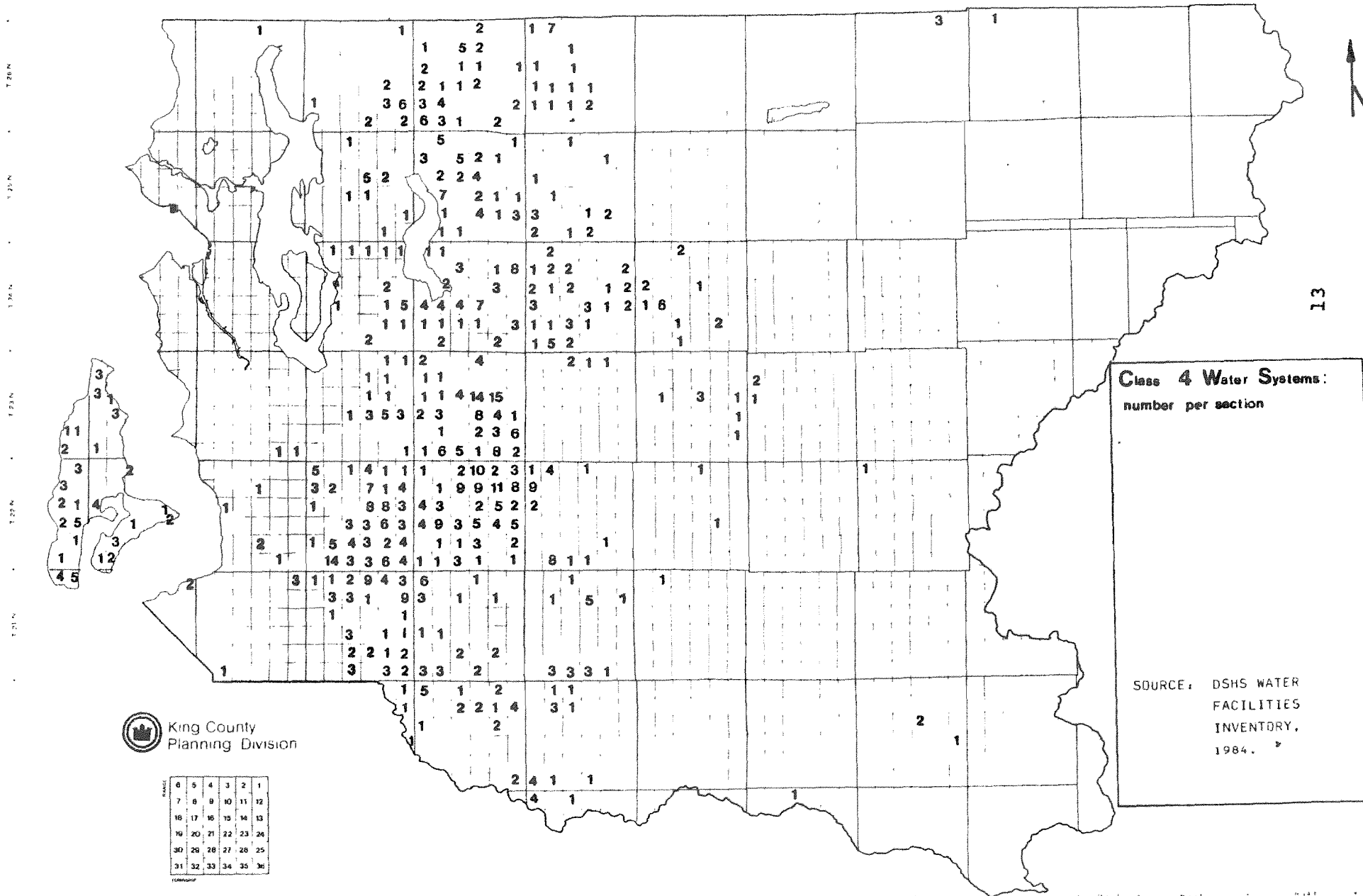
Class 2 & 3 Water Systems



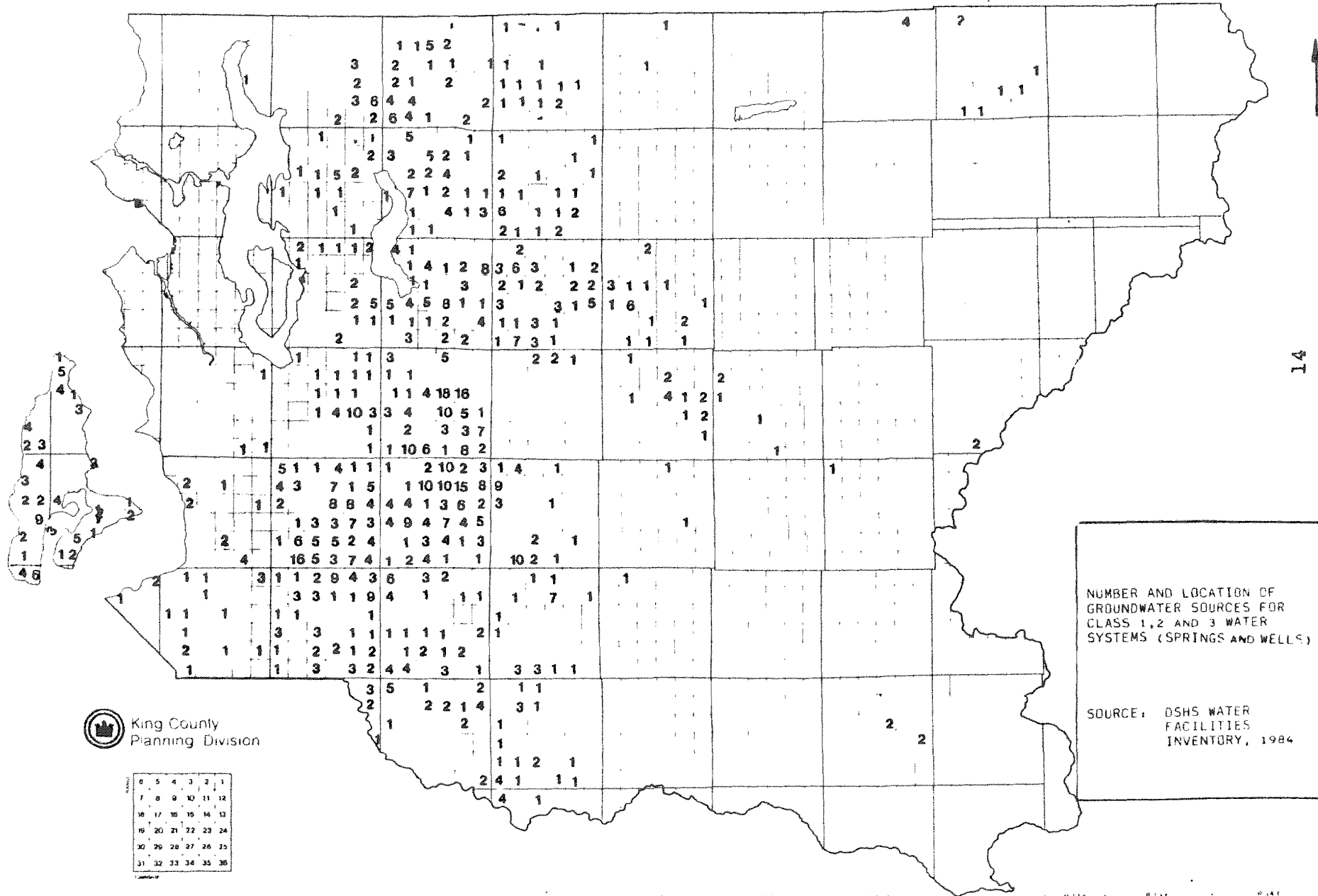
 King County
Planning Division


MAP No. 3

Class 4 Water System



Number and Location of Ground Water Sources for Class 1, 2 and 3 Water Systems



 King County
Planning Division

Regulations controlling the number or location of small water systems at the State or County level are not adequate. Consequently, many small water systems have developed in both urban and rural areas. The rapid growth of King County in the last twenty years also contributed to the proliferation of small water systems. Some small water systems which initially developed in rural areas were surrounded by larger water districts when urban growth expanded.

Water system reliability depends on qualified personnel to manage and run the system, and an efficient distribution network including adequate storage, pumping, and water transmission capabilities.

According to DSHS, qualified waterworks operators are vital to the effective management, protection, and operation of public water systems. The public health and the cost effective operation of a public water system is directly linked to the quality of the system's operations. The State of Washington has a mandatory certification requirement for waterworks operators. In 1979 a Mandatory Waterworks Operator Certification Program administered by DSHS went into effect. The Mandatory Certification Program is applicable to Class 1 water systems in King County. As part of the Preliminary Assessment Class 1 water districts were surveyed in 1984 to assess the number of certified personnel: a factor related to water system reliability. Of the 75 Class 1 districts surveyed, 17 or 23% did not employ certified personnel. Table 2 lists the Class 1 water systems without certified operators. Forty-four of the Class 1 water systems surveyed reported problems related to water system reliability.

Table 2

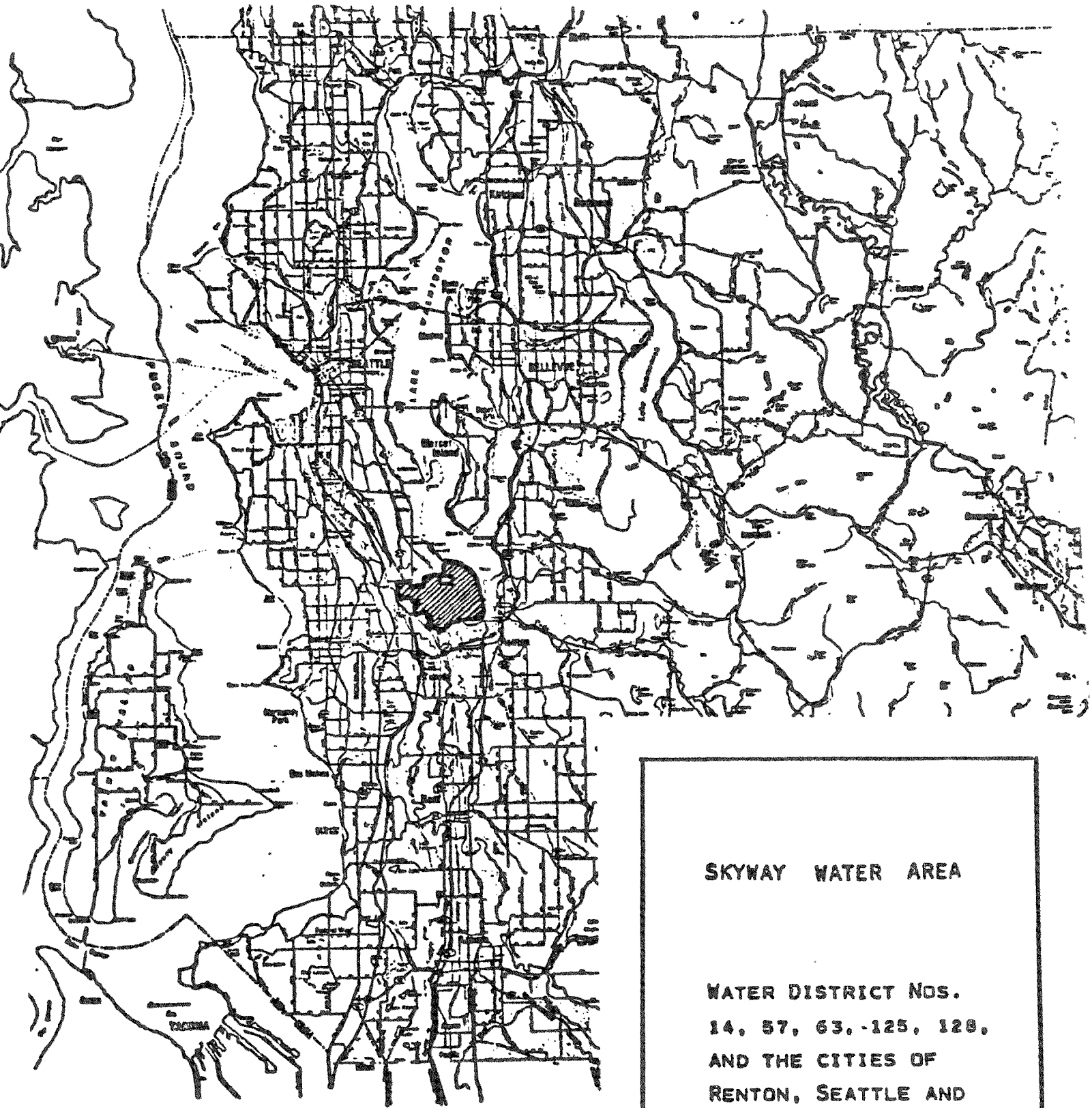
CLASS 1 SYSTEMS WITHOUT CERTIFIED PERSONNEL

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=====
Algona Water Department           Shorewood Apartments
Alpental Inc.                    Skykomish Water Dept.
Black Diamond                    Snoqualmie Falls Golf Course
Cedar River Sewer and Water District Westside Water Assoc.
Cherokee Bay Community Club      KCWD # 94
Enumclaw Golf Course             KCWD # 107
Fircrest School                  KCWD # 122
Mercer Crest Water Assoc.

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*Source: Water Certification Administration, DSHS, 1984.



SKYWAY WATER AREA

WATER DISTRICT NOS.
14, 57, 63, -125, 128,
AND THE CITIES OF
RENTON, SEATTLE AND
TUKWILA.

Skyway Critical Water Supply Area Designation

Skyway (Map #5) initially developed during the late 1930's and 40's. Most water systems were built by developers to serve their plots. The proximity of the City of Seattle Cedar River supply line provided easy access to an "unlimited" municipal supply. Water districts, private companies, and informal Co-ops were formed to manage the systems. Many systems were inadequately sized (by today's standards) and remain so today.

In recent years several attempts at coordinated planning have been made. The City of Renton, in conjunction with Water District No.14 and Water District No. 63, has constructed a 1.5 million gallon tank.

Water District No. 128 is the result of the consolidation of three small water districts. Water District No. 57 has indicated that it will merge with W.D. No. 63. The City of Tukwila is working on an agreement to transfer services south of the Green River to W.D. No. 125. W.D. No. 128 recently expanded by acquiring the King County sewer system for the area.

This and other activities show the desire of the utilities to solve boundary problems and to prepare a unified water plan.

Several meetings between the districts were held in June 1985 and the consensus was to request that King County declare the area a Critical Water Supply Area so that planning assistance funds to prepare a coordination plan could be made available.

Additionally, several service difficulties in Skyway raise legal questions. A coordinated planning effort would provide some legal research and perhaps legislation to help resolve these problems.

Local Water Supply Management Coordination

King County does not adequately consider the implications for water service in its land use planning and development approvals. This occurs for three reasons. First, there are too many public water systems in King County to keep track of. Secondly, existing regulations promote creation of new water systems and compound the evaluation problem, and thirdly the County has inadequate tools for preventing and correcting service area conflicts between purveyors.

King County should coordinate the development of a strategy with the participation of water districts, municipalities, and small water purveyors to address local supply problems among and/or between the purveyors and the County. A coordinated strategy would help in areas where local problems have not progressed to the degree where a Critical Water Supply Area designation is appropriate. King County should also more closely monitor progress of water districts in submitting Comprehensive Plans and solving problems related to reliable service.

Reducing the Number of Future Water Systems

King County passed in June of 1984 an amendment to the King County Board of Health Rules and Regulations 9, (Section 7, Subsection 8) that requires new developments needing a public water source to connect to a Class 1 or 2 public water system if the boundary of the land is within 350 feet of an existing main, the lands are within the Service Area of the water system, and the Class 1 or 2 water system has an approved comprehensive plan. Under this regulation, new developments cannot form Class 3 or 4 systems or connect to an existing Class 3 or 4 system if the requirements for connection to the Class 1 or 2 water system can be met.

While the Board of Health regulation change will reduce the number of Class 3 and 4 water systems, similar changes to Title 19, Subdivisions, could result in the reduction of new Class 1 and 2 water systems. Title 19 could require formal subdivisions connect to existing available Class 1 and 2 water supply systems rather than create their own.

Changes to King County Code Title 19 could also require water service be installed by the developer of short subdivisions (installation is currently required for formal subdivisions only). This requirement would prohibit a developer from designating the short plat be served by a community well rather than an existing water district. Since water service installation is not now required, the developer generally opts to designate a well site at close to zero cost rather than to extend a nearby water district's main to the property, a costly procedure. If water installation was required, the developer would be more likely to provide extension to the nearest water main than to construct a well.

Expansion of Large Water District Service Areas

Expansion of the logical service areas of Class 1 and 2 water systems would enhance the effect of the regulations proposed above. With expansion of logical service areas and plans to serve new areas, the number of new Class 1, 2, 3 and 4 water systems would be limited by the regulations requiring connection to

existing Class 1 and 2 water systems. King County should establish new logical service areas for water districts based on costs, hydraulics, and facilities available. King County should further expand on existing and propose regulations to disallow the creation of new water systems in the newly established logical service areas of existing Class 1 and 2 water districts.

Satellite Management Systems

In areas where small water systems are in close proximity, the water systems should be merged for the purposes of management, maintenance and sampling. Nearby Class 1 water systems could establish a satellite management, maintenance, and sampling system to serve smaller districts. Satellite management systems would be responsible for monitoring water quality and insuring reliable service and maintenance. The geographic boundaries of the satellite systems would be regulated by the County. Where no large systems exist nearby, smaller water systems could create their own administrative body to manage the satellite system.

Chapter IV

WATER RESOURCES

As the population of King County expands, there is increasing competition for the surface and groundwater resources remaining in the County. More than 85% of King County's population relies on surface water, while the remaining population uses groundwater. As water demand increases, groundwater grows more important as a primary supply source and as a supplement to surface water supplies.

As the use of water for drinking, fish and wildlife habitat, economic development, and recreation increases, there is increasing pressure on the Washington State Department of Ecology (DOE) to allocate water resources for a particular purpose. Conflicts involving administration problems in allocating water, unauthorized water use, water system allocations differing from actual use, and inaccuracy in some water source measurements reduce maximum use of water resources.

GROUND WATER

Groundwater Use

Almost 15% of King County households (approximately 198,000 people) rely solely on groundwater. One percent of this groundwater is from Class 2, .4% from Class 3, .6% from Class 4, and 13% from Class 1 systems. Almost all Class 2, 3, and 4 water systems use groundwater exclusively. Class 2, 3, and 4 water systems provide water service to about 24,000 people. This figure is strictly a rough estimate because the number of water systems, especially Class 4s, are not well documented.

More than 50% of the Class 1 water systems in the County are entirely dependent on groundwater or use groundwater in conjunction with surface water supplies. Some water suppliers currently relying on surface water are investigating the development of supplemental groundwater sources, e.g. the Seattle Water Department's Highline Wellfield.

Groundwater Location

Because there is insufficient knowledge about subsurface geology in King County, a great deal of uncertainty exists concerning the location of aquifers and recharge areas. Small amounts of groundwater can be found almost everywhere in the subsurface. Large aquifers, capable of supplying municipal water system demands, are widely dispersed and difficult to locate. Even with extensive research and planning, many municipal water supply drilling efforts are unsuccessful.

Groundwater Depletion

Although groundwater depletion is currently not a large problem in King County, groundwater sources could be depleted if groundwater supply protection programs are not implemented. Serious aquifer water level decline currently exists west of Kent in Water Districts #54 and #56. Water District #54 experienced a 66 foot drop in static water level from its primary source between 1967 and 1981. Water District #56 (Cold Brook Spring water supply) had a maximum average flow of approximately 1300 gallons per minute (gpm) in 1939. In 1982, after a major project to rehabilitate the spring's production, the maximum average weekly flow was only 620 gpm. Both water districts are currently monitoring water level decline and have developed interties to supplement their own water resources.

Groundwater Recharge Area Location

Little is known about the location of recharge areas in King County, except for Vashon Island (where there was a recent study of groundwater resources). It is believed that some major recharge occurs on the Boise Ridge slopes east of Enumclaw and on the Duwamish slopes near Auburn, but in general there is no inventory of recharge areas in the County. Recharge areas do not necessarily lie above or near the aquifers they supply. Identifying recharge areas is a complex and specialized process that requires much information.

A Committee composed of resource people from the Washington State University Research and Extension Center, Washington Conservation Commission, and United States Department of Agriculture Soil Conservation Service performed a preliminary examination of the location of type 1 soils (alluvium and glacial drift) and the use of those areas in King County with Type 1 soils. Type 1 soils are of concern because pollutants can pass rapidly through them and pollute the underlying groundwater. Type 1 soils often lie in aquifer recharge areas and, according to the Committee, special measures are required to protect them.

The Committee recommended King County identify the location and extent of Type 1 soil aquifer recharge areas in the County. The Department of Ecology (DOE) and the United States Geological Survey have formed a cooperative program to identify groundwater resources and recharge areas in Washington State. King County should participate in the program to establish a plan for groundwater identification in the County.

WATER RIGHTS

In Washington State, water use is based on the appropriation of water rights. Water is recognized by the State as a limited resource managed in the public interest. Suppliers of municipal water and hydroelectric power must plan for the future as demand continues to increase due to population growth. Many interests compete for the County's limited water resources. Fisheries resources are very important in King County and depend on the maintenance of adequate river flows to allow spawning and growth. Recreational interests include fishing, boating, and other outdoor activities. The State also considers Federal authorizations of water involving flood control and use of waterways for navigation.

DOE examines the value of all these interests when evaluating an appropriation of a water resource. The current water appropriation system developed from a number of State laws enacted over the years to regulate water for the public good.

Washington State Water Right Laws

The earliest settlers made claims to water resources abutting their property through a simple procedure of public notice. Basic to the validity of water claims was the principle of reinspecting all previously established water claims. Most water claims remain in effect.

In 1917, the Surface Water Code of Washington (RCW 90.03) was adopted. This law formalized the process of establishing water claims. The permit system, now administered by DOE, requires registration of the amount, duration, and season of water withdrawn. DOE bases current water right permit allocation on the principles used in the historical appropriation of water resources. The date of application for a water right establishes the owner's seniority with respect to other water rights. The owner of junior water rights may not divert water that interferes with a senior right.

In 1967, the Washington State Legislature outlined circumstances under which abandoned or unused water rights would revert to the State for future appropriation. In 1969 the Legislature required all persons claiming any water right other than those appropriated through the Surface Water Code of 1917 to file for water rights with the DOE by 1974. Failure to do so would result in relinquishment of the historic right. The Water Resources Act of 1971 permitted an undetermined future use of water to be considered a beneficial use of water resources. In 1979, minimum flows of water for recreation and fisheries use were considered appropriations of water rights.

Groundwater resources are primarily regulated by the Groundwater Code of 1945. Reasonable and correlative uses were the basis of valid groundwater use prior to the adoption of this law. Rights existed by virtue of ownership of the land irrespective of impacts on neighboring property owners' groundwater supplies. Groundwater rights must now be acquired through DOE under conditions similar to surface water.

Problems with Water Right Allocation

Due to the nature of water supply measurement and the difficulty in recording all uses of groundwater, water right allocation cannot be entirely accurate. Problems in determining ground water supplies include the uncertainty in water supply measurement, actual water availability differing from the amount appropriated, undocumented water use and unauthorized water use.

The system of water rights allocation assumes that water resources are measurable. The task of estimating supplies of surface water is relatively easy. Although technology has improved the accuracy of measuring groundwater, there is still uncertainty in computation of groundwater source supplies. Without full knowledge of the available supply of water, these resources cannot be fairly or efficiently allocated.

The current system of allocating groundwater rights is based on a 24-hour pumping test for new wells. If neighboring wells are not affected by the addition of another well, the water right is approved. If a number of affected water right owners are not fully using their rights, the DOE may inadvertently allocate more water rights than the available water sources can supply. Owners of junior water rights may be unable to pump all of the water appropriated if owners of senior rights decide to use their full allocation.

Most older wells are quite shallow, less than 300 feet. As development occurs in the rural areas of King County, additional wells are needed to provide water. Increasingly, these newer wells are drilled to greater depths. New, deeper, wells can change the water level of aquifers or create depressions in the water level. Owners of senior water rights may be forced to deepen their wells to maintain their water yields or yield their water rights. When the current water available differs from the amount allocated, it becomes increasingly difficult to allocate new water rights.

DOE has established administrative guidelines for senior water right holders to protect their water right. Junior water right owners may need to reduce their withdrawal amount so that the senior water right is preserved.

Groundwater right applications are not required for residential and industrial uses of less than 5000 gallons per day (gpd). Most Class 4 water systems are therefore exempt. Surface water right applications for single-family residential withdrawals less than 5,000 gpd, stock watering, and non-commercial irrigation for less than 1/2 of an acre are also not required to obtain water rights. The cumulative effect of these undocumented uses on instream flows, groundwater table levels, and approved water uses are not known. The allocation of future water is difficult to determine when existing uses are unclear.

Unauthorized uses of water result from illegal well drilling, the diversion of surface water, and illegally tapping existing water lines. DOE does not have adequate staff to regulate the illegal use of water. Currently, violations are cited only if reported by the public. Illegal uses of water are generally unknown, and present another element of uncertainty in the allocation of water.

Comprehensive Groundwater Withdrawal Strategy

King County needs to perform a review of current groundwater withdrawal practices, to develop a comprehensive strategy to ensure that wells exempted from DOE certification are safe and reliable, and to improve documentation; to the extent of its powers of water use.

Federal Water Rights

The Federal Government administers water rights for flood control and navigation purposes through the U.S. Army Corps of Engineers. Indian treaty water rights are also protected by the Federal Government. The U.S. Army Corps of Engineers maintains rights on the Cedar River to fulfill water level requirements at the Hiram M. Chittenden Locks located on the Lake Washington Ship Canal and at the Howard Hanson Dam on the Green River. The Muckleshoot and Tulalip Tribes maintain treaty rights on many rivers in King County. Federal Indian treaty rights require that instream flows and fisheries resources be maintained at or near historic levels and that Indians be allowed to fish in native fishing grounds. Federal water rights take precedence over State and local water rights and require careful consideration when determining water allocations.

Maximum Net Beneficial Water Uses

The Water Resources Act of 1971 (Chapter 90.54 RCW) directs the DOE and other State agencies to insure that waters of the State are protected and utilized for the greatest public benefit. DOE water resources program has a decision making process for future water resource allocation and use. Allocation of water among potential users for different uses is generally based on the principle of providing the people of Washington State with the maximum net benefit of water use. Beneficial uses as defined by the Act include: domestic use, stock watering, industrial, commercial, agricultural uses, hydroelectric power production, mining, fish and wildlife maintenance and enhancement, recreation, thermal power production, preservation of environmental and aesthetic values, and all other uses compatible with the enjoyment of the public water in the State.

Since all the demands for water uses cannot be met, conflicts for water use exist among government agencies, businesses, and individuals. The decision making process for granting water rights is extremely difficult. Presently, DOE is attempting to define the criteria and procedures by which maximum net benefits will be established. The interpretation of the concept of maximum net benefits will play a major role in the granting of future water rights. The following discussion of Seattle's surface water use provides an example of how water rights allocations affect water supply.

Seattle Surface Water Use

The City of Seattle diverts water from the Cedar River and the south fork of the Tolt River. The Tolt River source provides an average annual supply of 52 mgd out of the total 150 mgd water rights the City has on the Tolt. Seattle withdraws approximately 117 mgd from the Cedar River. The diversion structure on the Cedar has a maximum capacity of 220 mgd. Seattle is currently limited to a maximum diversion of 150 mgd due to size of other existing facilities, lockage flow requirements, and Washington (DOE) established minimum instream flows. Maps 6, 7, and 8 illustrate existing and maximum annual average yields of major water diversions for new water sources in King County.

Seattle recently applied for a total water rights claim of 300 mgd from the Cedar River, based on the future expansion of its facilities. A preliminary study by the U.S. Army Corps of Engineers, however, indicated that a future total yield of only 170 mgd may be available due to the increased need for lockage water by the year 2000.

Competition for Water Rights

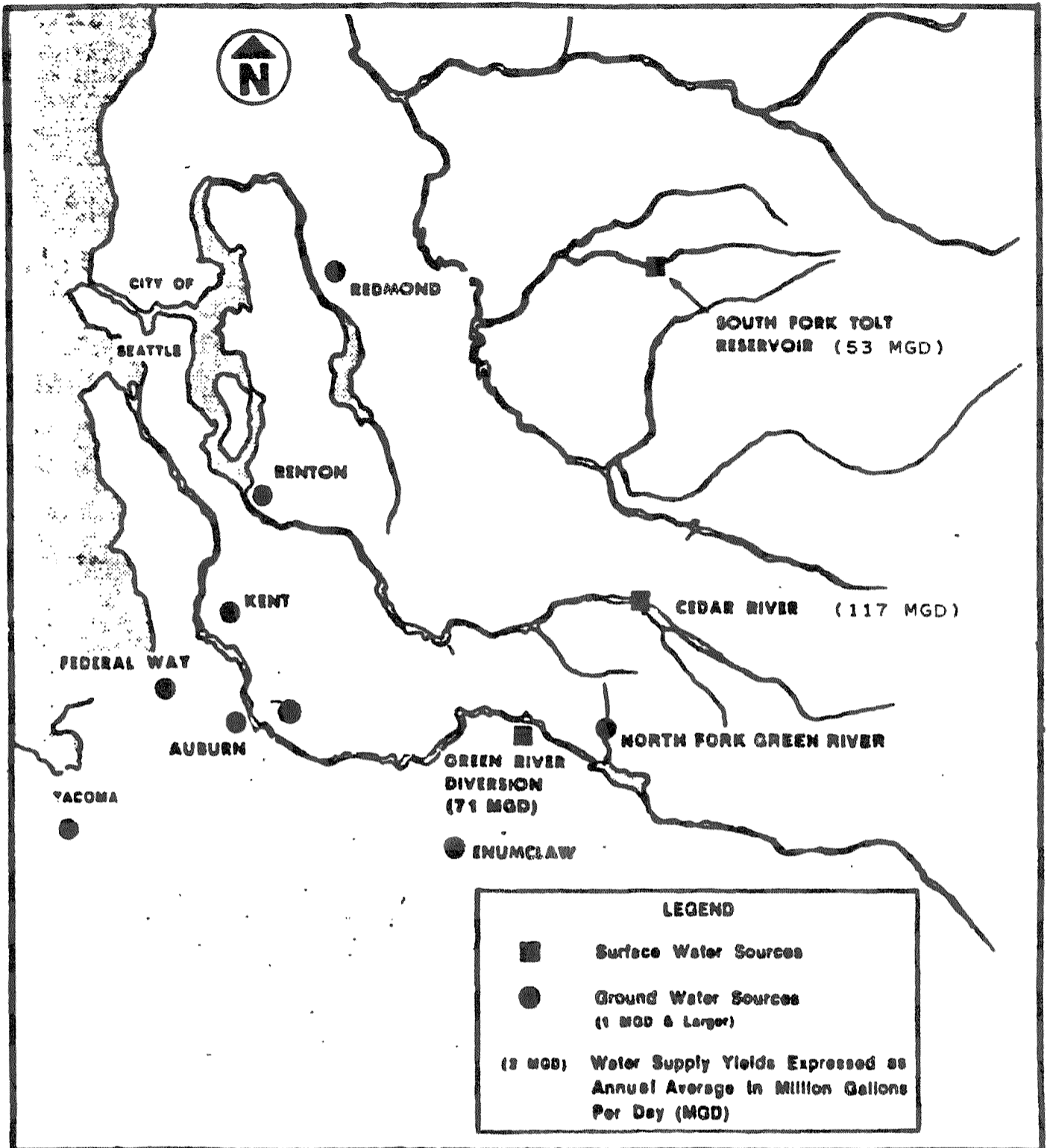
RCW 90.54 and 90.22 requires DOE to establish minimum instream flows, lake levels, and tributary closures for the preservation and protection of environmental values, wildlife, recreation, and navigational uses. Minimum water flow requirements place conditions on the withdrawal of water during low river flow periods. Presently, there are no clear guidelines for establishing minimum instream flows. The conflicts resulting from minimum instream flow requirements can lead to lengthy litigation.

To reduce lengthy appeals and general controversy, DOE is beginning a program to clarify the criteria for establishing instream flows. This program will specify how flood control, fisheries, recreation, and other uses will be factored into the process.

County Participation in DOE Water Right Definitions

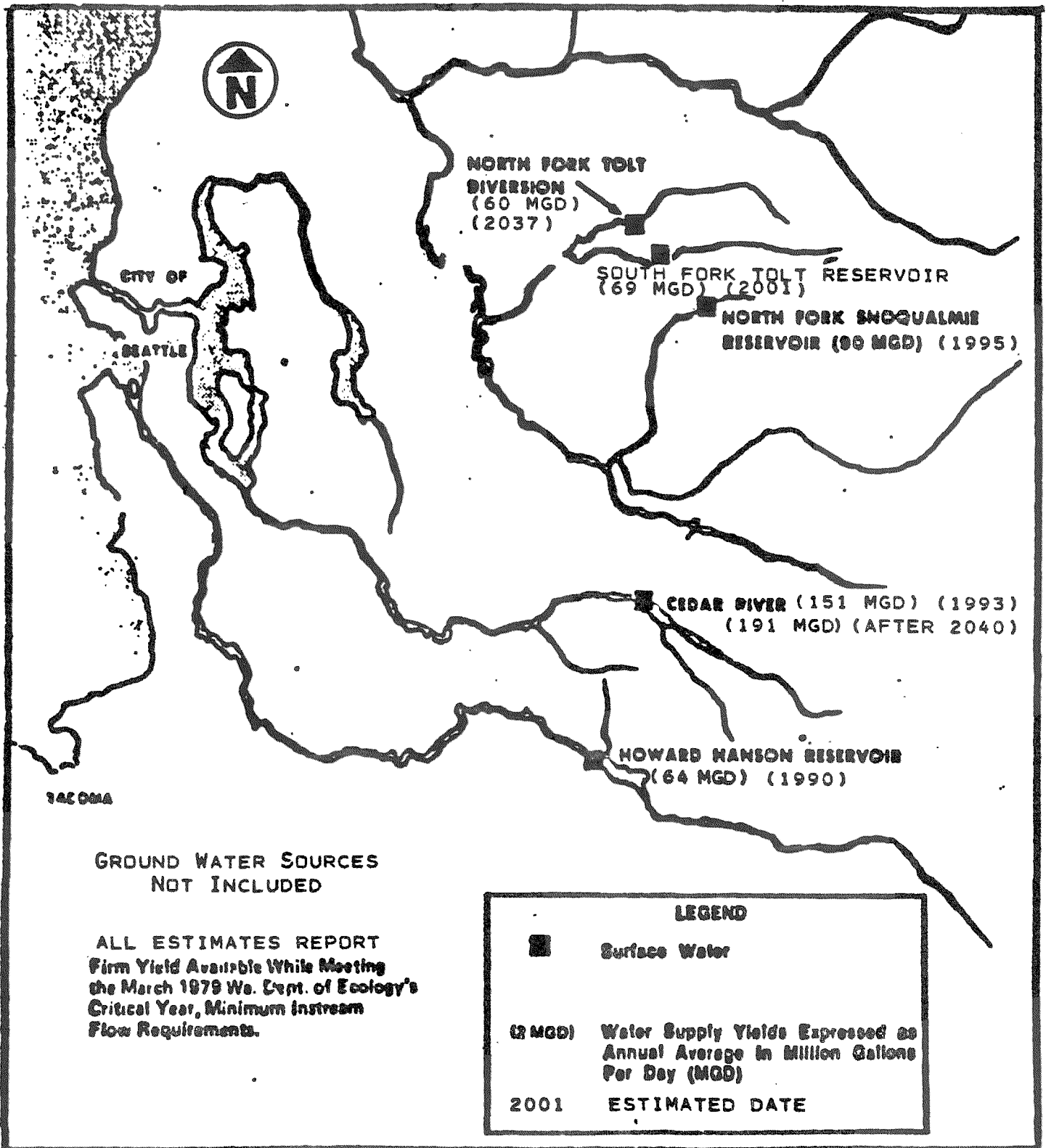
Clarification of the maximum net benefit concept and the procedure for establishing instream flows will determine the amount of water diverted in the County and affect County planning of future water resources. King County should participate in DOE programs to define criteria for setting maximum net benefits and minimum instream flows.

Major Existing Surface Water Supply Sources and Yields



SOURCE: REGIONAL WATER SUPPLY AND DEMAND BACKGROUND PAPER, PUGET SOUND COUNCIL OF GOVERNMENTS. DECEMBER, 1984

Estimated Maximum Average Annual Future Surface Water Supply Sources and Yields



SOURCE: REGIONAL WATER SUPPLY AND DEMAND BACKGROUND PAPER, PUGET SOUND COUNCIL OF GOVERNMENTS, DECEMBER, 1984

NOTE: ONLY THE NORTH FORK TOLT OR THE NORTH FORK SNOQUALMIE WATER SUPPLY WILL BE DEVELOPED.

Chapter V

WATER SUPPLY

Reliable water service depends on two factors, a consistent source of water supply and a well maintained distribution network to deliver water to the customer. In general, King County has adequate water supply to meet customer demand. There are, however, a number of areas where water supply shortages are projected to occur in the future if new sources of supply are not developed. King County involvement in regional water management plans needs to address future water supply problems.

DISTRIBUTION AND STORAGE

In order for a water district to provide a safe water service, the system's distribution network must be well-maintained and incorporate adequate storage and fireflow capabilities. An important part of a district's process to provide safe water service and guide its expansion and maintenance is the development of a current comprehensive water plan. A survey was made of 44 Class 1 water purveyor comprehensive plans to determine the extent of water system deficiencies in King County (see Table 3). The smaller Class 2, 3, and 4 systems were not included due to the general lack of a comprehensive plan or other supporting data.

The survey found that 29.5% of the districts had substantial transmission and distribution line maintenance problems. Examples include Water District 75 and the City of Kirkland. 36.4% of the districts did not have adequate equalizing storage and 61% did not have adequate fire/emergency standby storage. Districts characterized by storage problems include the City of Renton and Issaquah. Of the districts surveyed, 81.8% had substandard fireflow capabilities in at least one area. The inadequate fireflow was due mainly to undersized distribution mains. Undersized distribution mains are typical in areas whose grid networks are inefficient because the system is serving an outlying area or trying to operate around a smaller Class system within its district. Most water system comprehensive plans included recommendations that would bring district facilities up to established system standards within the next 10 years.

Table 3

CLASS 1 WATER SYSTEM DEFICIENCIES

WATER SYSTEM DEFICIENCIES	NUMBER	PERCENT
Systems with Plans >= 5 years old	16	36.3 %
Systems without Approved Plans	3	6.8 %
Systems with Expired Plans	1	2.3 %
Systems with Pending Plans	3	6.8 %
Systems with Approved Plans	37	84.0 %
Systems with Distribution/Transmission Maintenance Problem	13	29.5 %
Systems Without Backup Power (Known)	3	6.8 %
Insufficient Pumping Capacity	8	18.0 %
Inadequate Equalizing Storage (3 of those rely on Seattle)	16	36.4 %
Undersized Main > 20% of Total Network (Estimate)	11	25.0 %
Distribution Replacement > 10%/year (Estimate)	3	6.8 %
Problems Caused by Dead End Mains e.g. Low Pressure	7	15.9 %
Inadequate Valving	1	2.3 %
Inadequate Standby Storage Fire/Emergency (3 have no storage, rely on Seattle) (1 relies on well flow)	27	61.4 %
Inadequate Fire Flow (At least one area)	36	81.8 %
Due to Storage	2	4.5 %
Due to Dead ends	3	6.8 %
Due to Undersize mains	34	77.3 %
 Total Number of Systems Inventoried	 44	

Source: Survey of 44 Class 1 Water District Comprehensive Plans
Public Utilities Section King County Planning and Community
Development Department, 1985.

SUPPLY AND DEMAND

As the population of King County continues to grow, water demand is approaching existing supply capacities in many areas of the County. In the short term, purveyors are developing additional wells and interties to increase supply reliability. But in the long term, a number of areas of the County will need major new sources of supply to meet future demand.

In order to develop a rough idea of which areas of the County are reaching their water supply capacities, water demand projects were examined for four major areas of the County. These regions include Vashon Island, the South King County Region, the proposed Eastside Independent Service Area, and the Seattle Service Area. Seattle Water Department (SWD) estimates of future average water consumption were used for all projections except Vashon Island. An explanation of the Seattle Service Area is provided for general information.

Vashon Island Critical Supply Area

Based on peak water demand projections, Vashon Island is the only area of King County that is facing an immediate water supply problem. Projections of 1984 average peak day demand for the six Vashon Class 1 water purveyors show that three purveyors do not have adequate water supply to meet estimated peak demand (See Table 4).

Estimated average peak demand for the entire Island, based on Puget Sound Council of Governments (PSCOG) population forecasts, shows that peak day demand for the Island will exceed present supply by approximately 50,000 gallons per day (gpd) by the year 1990. And by the year 2000, average peak day demand will exceed 1984 Island supply by almost 250,000 gpd (see Graph 1).

Table #5 indicates the nature of the long term water supply problems for Vashon Island. In the year 2000, demand will exceed existing supply by about 250,000 gpd. Though the supply figure is an underestimation, it is clear that there will be increasing problems on meeting peak day demands.

Many purveyors on the Island have experienced water shortages during the summer of 1985. Thus it is clear that Vashon Island needs to develop additional wells, import water, increase conservation measures or reduce future demand. King County also needs to further regulate future land development to make it compatible with water supply limitations.

Table 4

VASHON ISLAND ESTIMATED 1984 SUPPLY POPULATION AND DEMAND

Purveyor Name	1984 DSHS Supply (gpd)	Estimated 1984 Permanent Population	Average Daily* Demand (gpd)	Average Peak Daily* Demand (gpd)
Burton	233,280	1,040	124,800	262,080
Dockton**	85,800*	715	85,800	180,180
Gold Beach	252,000	250	30,000	63,000
Heights	302,400	1,715	205,800	432,180
KCWD # 19	986,400	2,895	347,400	729,540
Westside	391,680	524	62,880	132,048
Totals	2,129,160	7,139	856,680	1,799,028

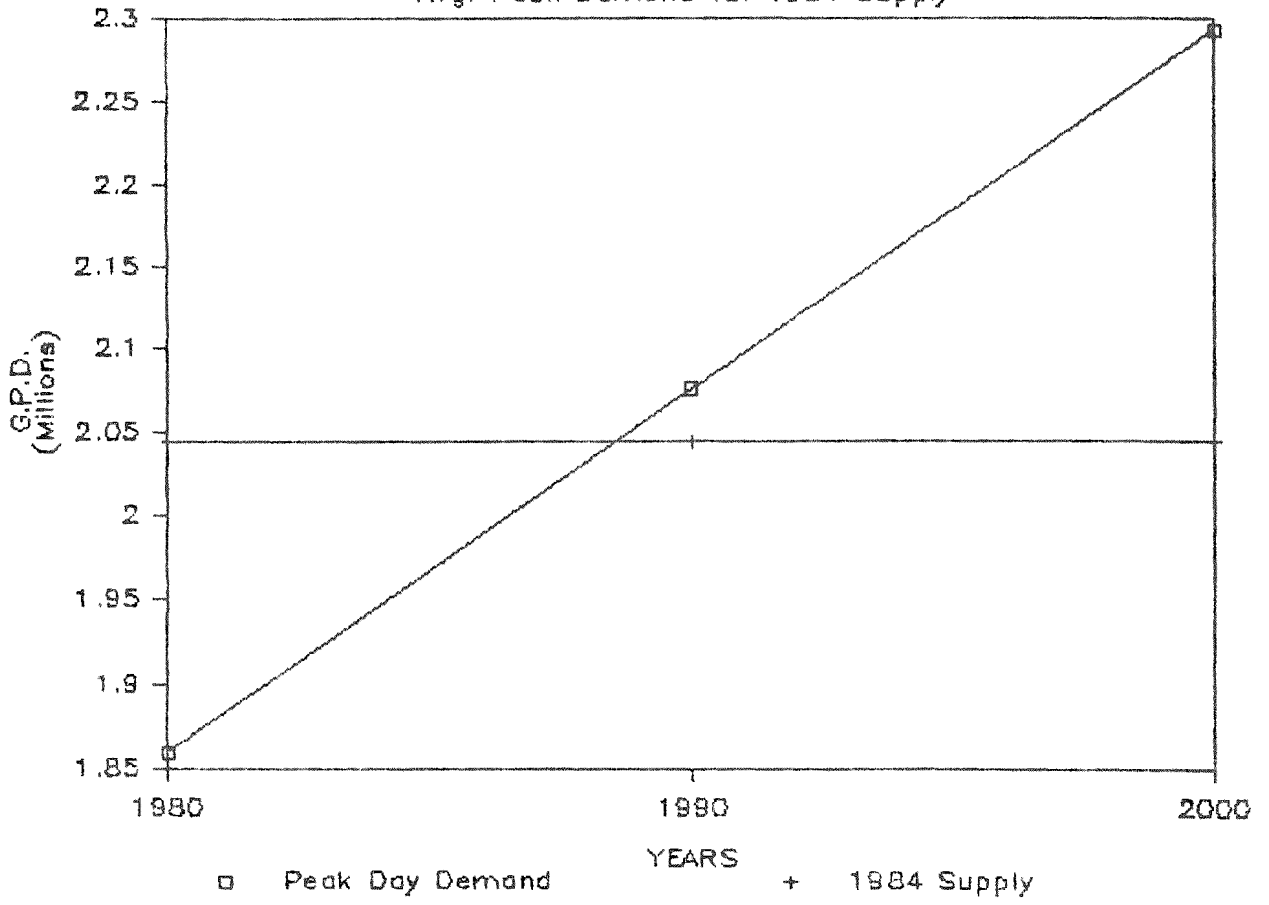
Based on 120 gpcd average demand and an average daily peak factor of 2.1.

*Note: No supply data was available. It was assumed the system could meet average daily demands.

Source: DSHS Water Facilities Inventory, 1984 and Puget Sound Council of Governments Small Area Forecast Projections for Population and Employment, 1984

VASHON ISLAND

Avg. Peak Demand vs. 1984 Supply



SOURCE: DSHS WATER FACILITIES INVENTORY, 1984
AND PUGET SOUND COUNCIL OF GOVERNMENTS
SMALL AREA FORECAST PROJECTIONS FOR
POPULATION EMPLOYMENT.

Table 5

VASHON ISLAND SUPPLY AND DEMAND PROJECTIONS

YEAR	PSCOG POPULATION	AVERAGE DEMAND (GPD) @ 120 GPCPD	PEAK DEMAND (GPD) @ 252 GPCPD	1984 CLASS 1 SUPPLY DSHS CAPACITY (GPD)*
1980	7,377	885,240	1,859,000	2,043,360
1990	8,238	988,560	2,075,976	2,043,360
2000	9,099	1,091,880	2,292,948	2,043,360

*1984 DSHS Class 1 total supply of water is under-estimated because the capacity of two wells is unknown.

Source: DSHS Water Facilities Inventory, 1984. and Puget Sound Council of Governments (PSCOG) Small Area Forecast Projections for Population and Employment, 1984.

Public concern over the Island's water resources is not new. In December 1983, the Vashon/Maury Water Resources Study was published in response to these concerns. Some of the findings of the study have been criticized, but there is general agreement on a number of important points. The study established that there is no off-island source of groundwater recharge, and thus there is a limit to the Island's water resources. Groundwater recharge areas should be protected to promote recharge from island precipitation. Population growth and water resource use should be carefully managed to prevent development of water quality problems on the Island.

The study recommended, based on an estimated groundwater capacity of 1.31 million gallons per day (mgd), that the Island's population be limited to prevent depletion of the groundwater and prevent water quality problems. Additional studies are needed to further evaluate the water resources and development potential of the Island. But it is apparent, from the water demand projections and study results, that there is a peak water supply problem on Vashon Island.

The water supply problem is compounded by the large number of small purveyors that are scattered over the Island. The majority of these purveyors are Class 4 systems and have limited revenues and financing capabilities to fund the extensive additional monitoring and research that will be needed to plan effectively for the management of the Island's water resources and future growth.

The Vashon Community Plan has been revised to incorporate recommendations from the water resources study. As previously mentioned, there is a great deal of uncertainty concerning the estimates of the Island's groundwater capacity and recharge potential. In order for comprehensive planning for Vashon Island to continue, information from further monitoring and research studies will be required. It is recommended that Vashon Island be made a critical water supply area.

South King County Critical Water Supply Area Designation

In South King County, the water supply demand management and services problems related primarily to the following: the need to protect and manage groundwater resources, develop a coordinated approach to supply development, storage, and transmission, and develop a conjunctive surface and groundwater supply system to meet Puget Sound Council of Governments projected requirements for the area.

The Regional Water Association has already completed the essential step of organizing the major water purveyors. The Regional Water Association initiated step has been in cooperation with King County, Puget Sound Council of Governments, Seattle, and Tacoma. This initiative is consistent with the King County Comprehensive Plan. Its success will be enhanced if King County declares the South King County area a Critical Water Supply Area.

King County should declare the South King County Area a Critical Water Supply Area. In doing so, problems with new Class 3 and 4 systems can be addressed, and a cooperative effort between the Regional Water Association and the fire districts can address the issues of fire protection raised in the Fire Service chapter through improved water system service and reliability.

South King County Critical Supply Area

Problems initially identified include limited groundwater resources, continued development of Class 3 and 4 systems, and potential impact of urbanization on groundwater quality. These problems create a potential for inability to meet future water demands. The Coordinated Water System Plan will assist the utilities in developing an effective and efficient way to address these needs. This will occur through design of system interties, petitioning water supply reservation, joint source development, and by ensuring that the Association's water utility plans are consistent with the County Land Use Plan.

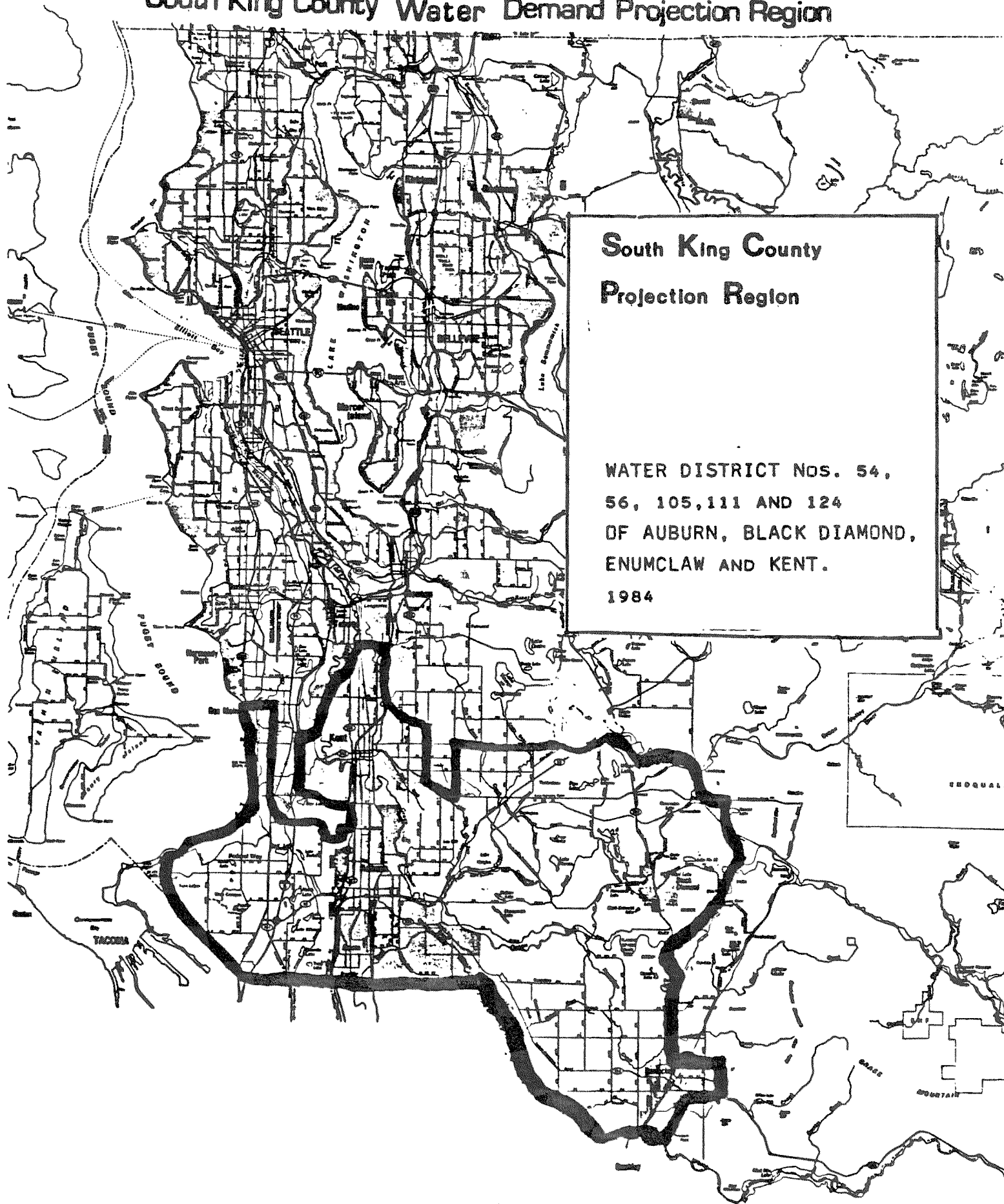
In Southeast King County north of Enumclaw, east of Maple Valley, and south of Issaquah, there are more than 336 small water systems and at least 14 Class 1 water systems. Many of these water systems (largely unsupervised and without comprehensive plans) have poor design and water quality, inadequate water quantity, and coordination problems in accommodating new growth. Currently, there is a building moratorium on development within the Kanasket, Kangley, and Ravensdale water system areas because they are in violation of WAC 248-54, the health regulations. Designation of this area as a part of the South King County Critical Water Supply Area will improve water system regulation and provide a means for improvement in needed areas.

According to average peak day demand projections, the South King County region (see map 8) will have an area-wide supply deficit of approximately 5 mgd by the year 1990. This deficit will increase to about 45 mgd by the year 2000, if no new sources of water supply are developed (see graph 2).

1982 study by URS Engineers for the South King County Water Association predicts development of additional groundwater can meet peak demand until approximately the year 2000. After the year 2000, the region's groundwater resources will be fully developed, and new major water sources will be required to supply South King County's needs. As these predictions are only estimates, the exact timing for a new supply will depend on the water purveyor's ability to develop existing groundwater.

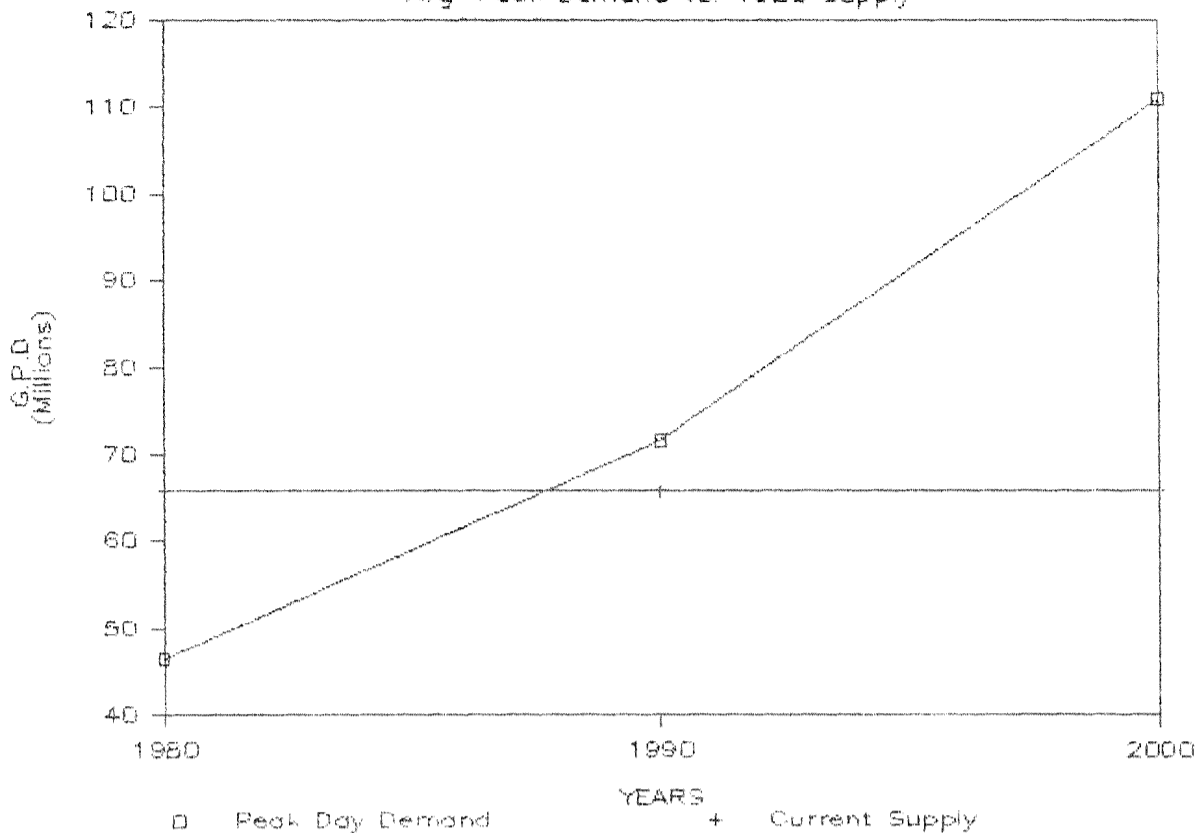
This new source of water would most likely be available from Tacoma or Seattle. Most of South King County lies in Tacoma's planned service area. Tacoma's proposed Pipeline #5 would run through South King County and could provide water from the Green River.

South King County Water Demand Projection Region



SOUTH KING COUNTY REGION

Avg. Peak Demand vs. 1980 Supply



SOURCE: SEATTLE 1985 DRAFT COMPLAN; SEATTLE COMPREHENSIVE REGIONAL WATER PLAN, SEATTLE WATER DEPARTMENT, 1985. PUGET SOUND COUNCIL OF GOVERNMENTS SMALL AREA FORECAST PROJECTIONS FOR POPULATION AND EMPLOYMENT, 1984.

The Seattle service area presently extends as far south as Water District #75. Seattle's proposed Cedar River Pipeline #5 will draw water from Lake Youngs and transmit it to a proposed Midway Reservoir. An intertie could connect Seattle's Cedar River Pipeline #5 with Tacoma's Green River Pipeline #5. If this system is constructed, Seattle water could be available to South King County purveyors. But because of uncertainties in Seattle's plans, it is not clear when or how much Seattle water might be available.

According to its 1985 Comprehensive Plan (COMPLAN), Seattle will engage in planning to serve the South King County area if, and only if, Tacoma cannot supply this area, and service by Seattle is requested by the area. The South King County Critical Water Supply Plan may be influenced by a future Seattle-Tacoma intertie study and decision to be made by Seattle and Tacoma. The Seattle COMPLAN includes this intertie.

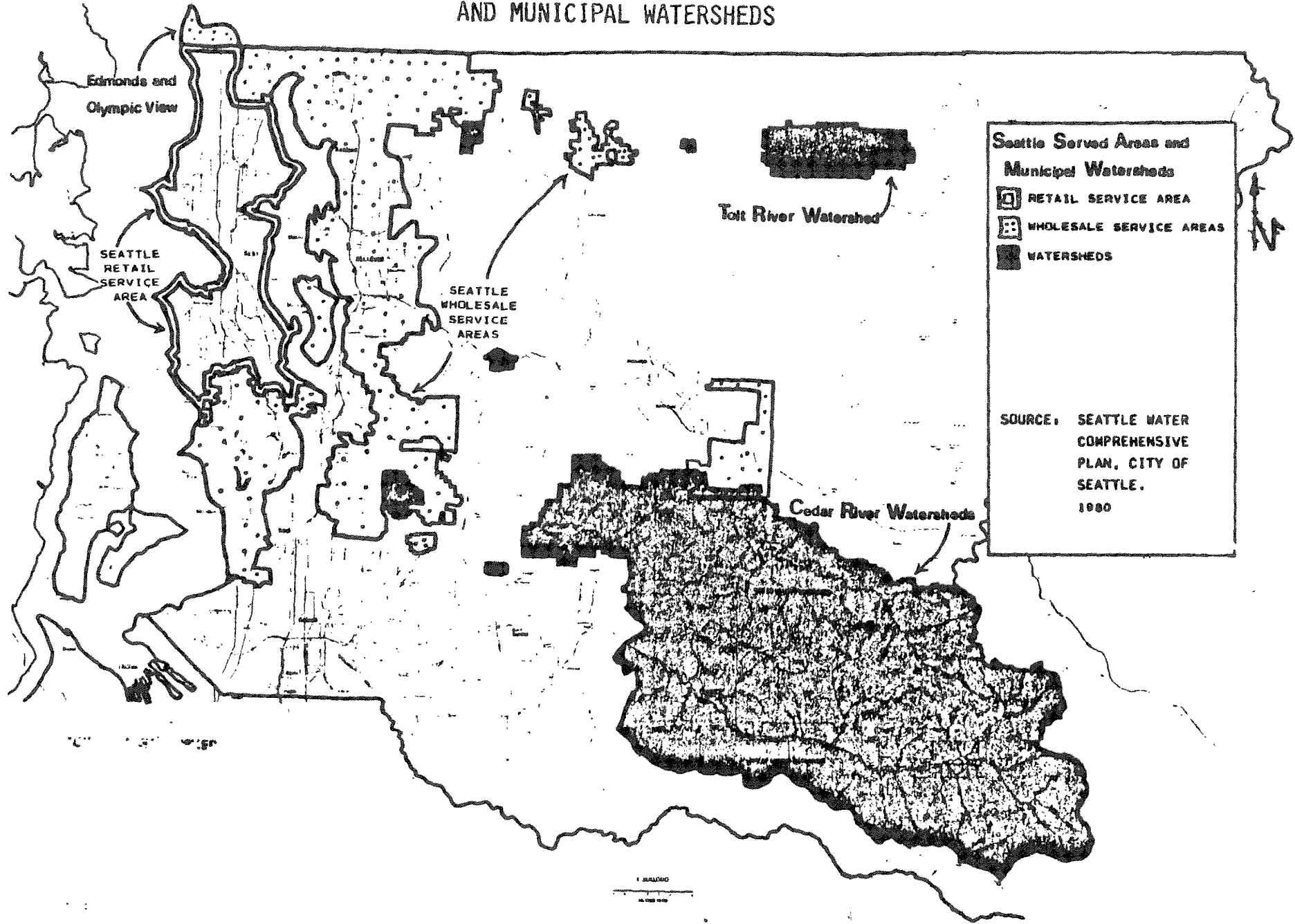
The above discussion illustrates strategically, the uncertainties surrounding South King County's water problems can be effectively and economically solved. King County should designate the South King County Area as a Critical Water Supply Area.

Seattle Service Area

The Seattle Water Department provides direct service within the City of Seattle and supplies wholesale water service to many purveyors throughout the County (see map 9). The water demand projections used in Seattle's planning process are based only on the project growth within the existing water service area. If the Seattle service area of the County remains the same or expands, Seattle will need to develop additional water sources to meet demand.

The North Fork of the Tolt River is another possible future supply for the mgd (see map 7, Water Resources chapter). A dam on the North Fork Tolt may provide about 66 mgd. The Department of Ecology (DOE) has set minimum stream flow requirements for the Tolt River and the low flow limitations for a number of its tributaries. The present instream flow regulations would limit the North Fork Tolt yield available to Seattle to 53 mgd. The Seattle Water Department is appealing this DOE regulation, asserting that it violates the 1971 Water Resources Act and the existing (1956) instream flow agreements with the Department of Fisheries (DOF) and the Department of Game (DOG).

CITY OF SEATTLE RETAIL AND WHOLESALE SERVICE AREAS
AND MUNICIPAL WATERSHEDS



If the Eastside Independent Water Supply Venture (EWSV) goes forward with establishing a water system utilizing a dam on the North Fork of the Snoqualmie River (see section below), Seattle will lose a large percentage of its wholesale service area. This decrease in water demand would leave Seattle with enough excess supply to last well past the year 2000. Seattle is closely following developments in the Eastside and trying to incorporate them into future planning as they occur.

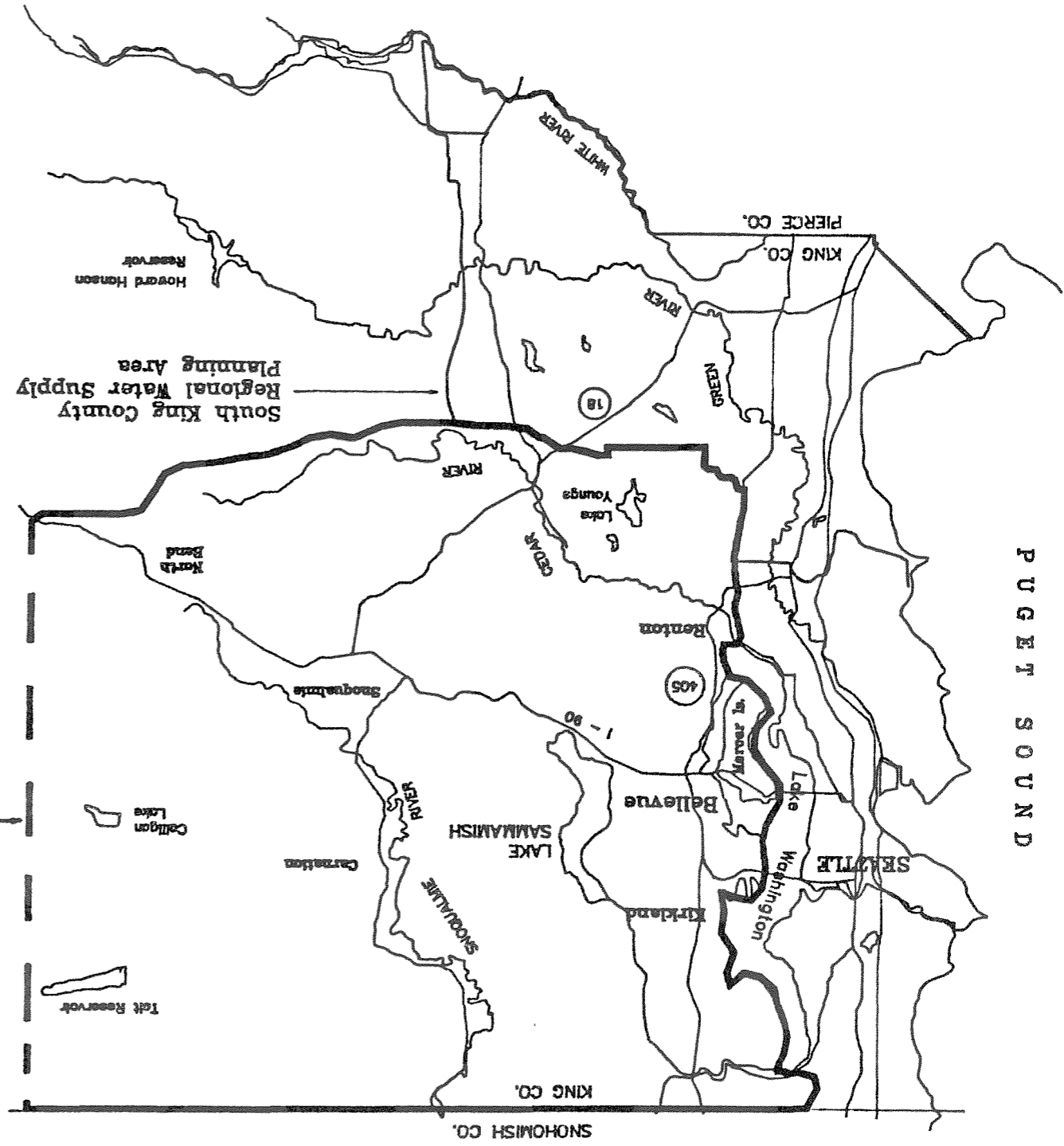
Proposed Eastside Independent Service Area

A consortium of water districts in East King County called the Eastside Water Supply Venture (EWSV), spearheaded by Bellevue, is considering a multipurpose dam on the North Fork of the Snoqualmie River, and construction of a pipeline to serve eastern King County (roughly Bothell to Renton).

The proposed Eastside Independent Service Area (EISA) is the region being considered for water service by the EWSV (see map 10). This region presently depends on a combination of Seattle wholesale water service and groundwater to meet current water demand. Independent forecasts by both Seattle and Bellevue predict large increases in water demand for the Eastside Supply Area because of rapid population growth.

If the EWSV is to take over water service for the region, it must be able to supply enough water to meet the difference between the growth of future demand and the region's present groundwater supplies. Based on future demand projections and the assumption that no water is acquired from the City of Seattle, the region will need an additional supply of about 27 mgd by the year 1990, 39 mgd by the year 2000, and approximately 50 mgd by the year 2010 (see Graph 3). The present groundwater supply of the area is approximately 14 mgd. If Redmond abandons its wells, groundwater supply will drop to about 11 mgd.

The proposed EWSV dam project on the North Fork Snoqualmie has an estimated total supply capability of 90 mgd. Phase 1 of the project would make about 60 mgd available to the Eastside Supply Area by the year 1995. Preliminary studies for the EWSV are still in progress, and it is unknown whether the project will be able to obtain the required County, State, and Federal permits for construction. The project must also prove economically feasible and be approved by a vote of the people within the participating districts' areas before actual construction can begin.



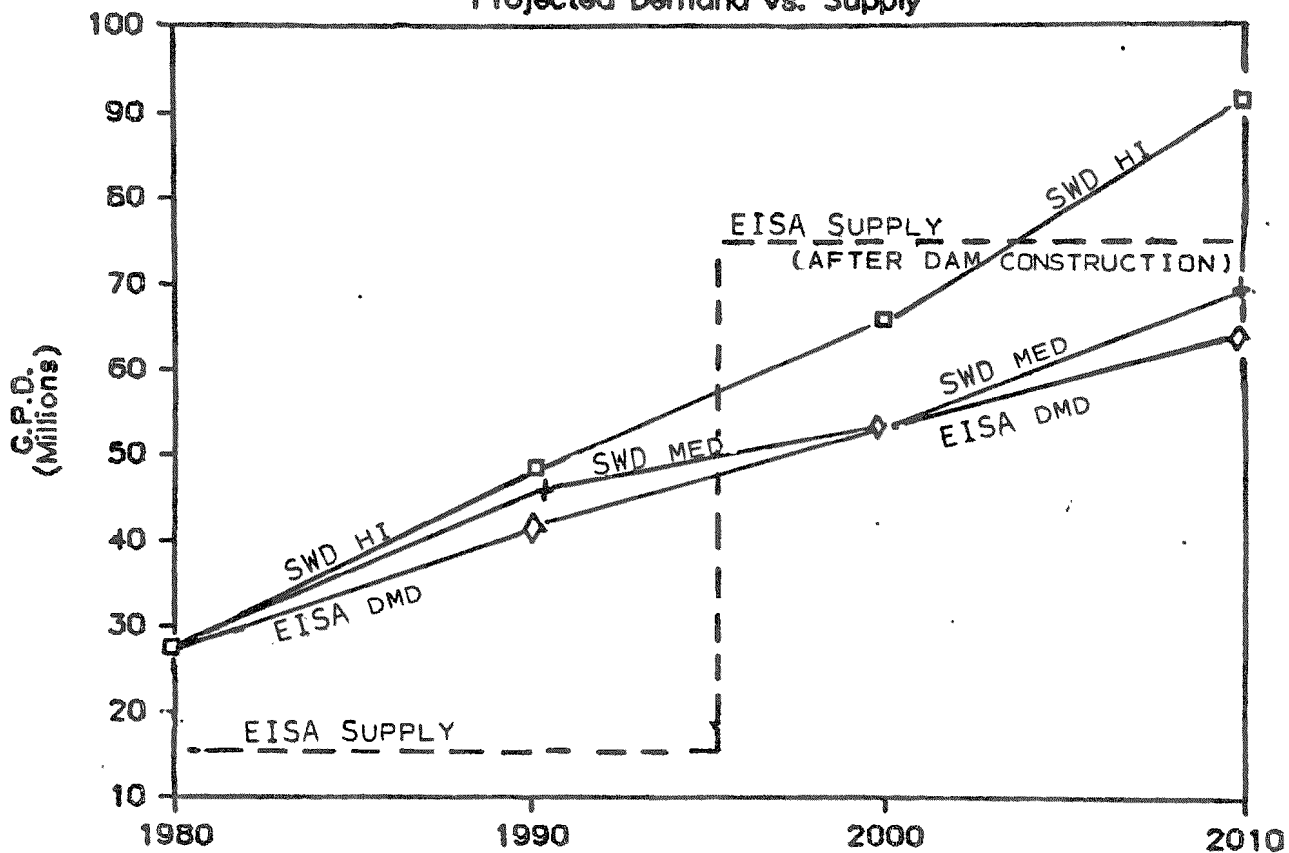
MAP No. 10
 Proposed Eastside Independent Service Area

East King County
 Regional Water Supply
 Planning Area

South King County
 Regional Water Supply
 Planning Area

EASTSIDE SUPPLY AREA

Projected Demand vs. Supply



- SWD HI: SEATTLE WATER DEPARTMENT HIGH DEMAND CURVE
- ◇ EISA DMD: EASTSIDE INDEPENDENT SERVICE AREA DEMAND PROJECTION
- + SWD MED: SEATTLE WATER DEPARTMENT MEDIUM DEMAND CURVE
- X EISA SUPPLY: EASTSIDE INDEPENDENT SERVICE AREA SUPPLY CAPACITY

SOURCE: DRAFT ENVIRONMENTAL IMPACT STATEMENT, DEVELOPMENT OF A WATER SUPPLY FROM THE NORTH FORK SNOQUALMIE RIVER, CITY OF BELLEVUE, 1985. SEATTLE 1985 DRAFT COMPLAN; SEATTLE COMPREHENSIVE REGIONAL WATER PLAN, SEATTLE WATER DEPARTMENT, 1985.

Graph 3 illustrates three different demand projections for the Eastside Independent Service Area. The SWD hi (high demand projection) and the SWD med (medium demand projection) were prepared by the Seattle Water Department. The EISA projection was prepared by the City of Bellevue. Despite the different methodologies used by Bellevue and Seattle, their projections are very similar. The three demand projections are plotted against a supply curve describing existing groundwater and Phase 1 of the North Fork Snoqualmie supply project. Phase 1 would be sufficient to meet demands until 2005 or beyond 2010.

Eastside Critical Water Supply Area

Problems initially identified include:

- 1) Supply conflicts (who shall be the major water wholesaler in the area and shall the North Fork Tolt or the North Fork Snoqualmie be the next major supply);
- 2) Continued development of poorly managed Class 3 and 4 Water Systems;
- 3) Existing Class 3 and 4 Water Systems which are failing;
- 4) Should one or more satellite management agencies be formed to address (2) and (3), above; and
- 5) The impact of urbanization on Groundwater.

These problems create a potential for inability to meet future water demands. The Coordinated Water Supply Plan will assist the utilities in developing an effective and efficient way to address these needs. This will occur through design of system interties, petitioning water supply reservation, joint source development, and by ensuring that each purveyor's water plan is consistent with King County plans and policies.

Eastside Critical Water Supply Area Designation

On the Eastside, the water supply demand management and service problems relate primarily to: the need to protect and manage groundwater resources, develop a coordinated approach to supply development, and allow for the satellite management of smaller, failing water systems.

King County should declare the Eastside a Critical Water Supply Area. In so doing, problems with new and failing Class 3 and 4 water systems can be addressed, and a cooperative effort between the Eastside Water Utility Coordinating Committee and the various fire districts can address fire protection issues raised in Chapter 7.

County Participation in Water Supply Decisions

King County should actively participate to the extent of its powers in regional decisions regarding water supply and quality. The County should participate in the Puget Sound Council of Government King County Subregional Council on Water Resources.

King County should also consider joining the Eastside Independent Water Supply Venture (EWSV). This organization was formed to evaluate alternative supply options for the Eastside. Several municipal agencies have joined the EWSV. However, large areas of the potential eastside service area are not within any city or water district. Significant growth is expected to occur within these areas. King County is the only governmental agency that could represent these areas on the EWSV.

Chapter VI

WATER QUALITY :

The availability of quality drinking water in King County is necessary for public health and future population growth. Although water quality in the region is historically good, a number of new pollutant sources threaten water quality.

Groundwater resources are susceptible to contamination and often the recharge area and the wells themselves are not as well monitored as the principal surface water sources in King County. Many of the small groundwater systems do not consistently monitor for water quality. Consequently, the extent of their contamination is unknown.

WATER QUALITY CONTAMINANTS

The main threat to water quality is human activity. The main sources of water contamination include sewage, garbage, and a wide range of industrial, commercial, agricultural, and household chemicals.

Toxic chemicals from urban non-point source runoff, land fills, and leaking underground storage tanks can contaminate groundwater through the recharge area and groundwater wells. With urban growth, the amount of land covered by impervious surfaces increases, reducing the land available for groundwater recharge. In addition impervious surfaces (e.g. parking lots, buildings, and workyards), increase the amount of storm runoff that can travel through polluted areas. The storm runoff concentrates nonpoint source pollutants which contaminate local groundwater. Permeable soils in recharge areas are also permeable to contaminants. Many contaminants are absorbed and filtered as water percolates through the soil, but almost no purification occurs after the water reaches the aquifer.

Groundwater moves extremely slowly, as little as a few feet per year. As a result, contaminants may not appear in water supplies until many years after they have entered an aquifer. Thus, groundwater quality problems developing now may not be discovered for a long time. Once a problem is found, it is extremely difficult and expensive to fully determine its scope.

Treatment of polluted groundwater is very expensive and generally limited to mitigation of the problem rather than full restoration of water quality. One alternative is to substitute a clean source for the contaminated source. Another is to blend the contaminated source with an uncontaminated source to provide water within standards. Cleanup methods vary from pumping and treating the water, to trying to chemically neutralize the contaminants, or capping the aquifer to prevent further influx of the contaminants. Groundwater protection strategies are clearly more desirable than the clean up of contaminated water.

Natural Contaminants

Some water sources may naturally contain substances that are health threats. Surface waters used for municipal water supply may contain quantities of natural dissolved organic material that react with disinfectant chlorine to form trihalomethanes, which are suspected carcinogens. Surface waters also may contain parasites, such as Giardia lamblia, that cause acute gastrointestinal illness. Although natural contaminants are not extensive, their ability to contaminate groundwater is exacerbated by human activity.

Human and Animal Wastes

The first significant threat to water quality recognized by water quality agencies was raw sewage. Improperly managed human and animal wastes carry the potential for disease. Vulnerable water sources, such as shallow aquifers, improperly cased and sealed wells, and unprotected springs, become polluted when exposed to failing sewage disposal systems or high concentrations of livestock manure. Once a water source is contaminated, the threat exists for the harmful bacteria or virus to be spread throughout the system.

Toxic Chemicals

There is a growing realization that toxic chemicals pose a serious threat to water quality and public health. Current standards do not address the wide range of pollutants that may now contaminate a water supply, because the standards were created before the effects of other pollutants were known. New standards need to be developed to cover synthetic organics and other toxic chemicals which threaten water quality.

Toxic chemicals are dangerous even in very small quantities and can be found almost anywhere humans exist. They are used in a wide variety of commercial, industrial, and agricultural applications, and have become a common part of human life. Toxic chemicals, are used in pesticides, fertilizers, solvents, and gasoline additives.

Toxic chemicals are present in underground storage tanks, urban storm runoff, abandoned landfills, and agricultural crop lands. In Seattle a domestic water line was penetrated by leakage from a gasoline storage tank. A study by the King County Health Department found that many abandoned landfills in the County are still producing toxic runoff. The State Department of Social and Health Services (DSHS) has recently found that ethylene dibromide (EDB) applied to strawberry fields has migrated down to contaminate wells hundreds of feet away from fields where the pesticide was sprayed.

The development of toxic chemical standards is complicated by insufficient knowledge of such chemicals health effects. These chemicals are extremely hazardous in high concentrations; the effects of low level exposure to humans are largely unknown. Insufficient information has slowed efforts to develop new water quality standards for toxic chemicals. DSHS is currently developing standards for synthetic organics as a result of SHB 1191, (1984 session, 48th legislature of the State of Washington), and should soon after develop standards for other toxic substances.

WATER QUALITY MONITORING

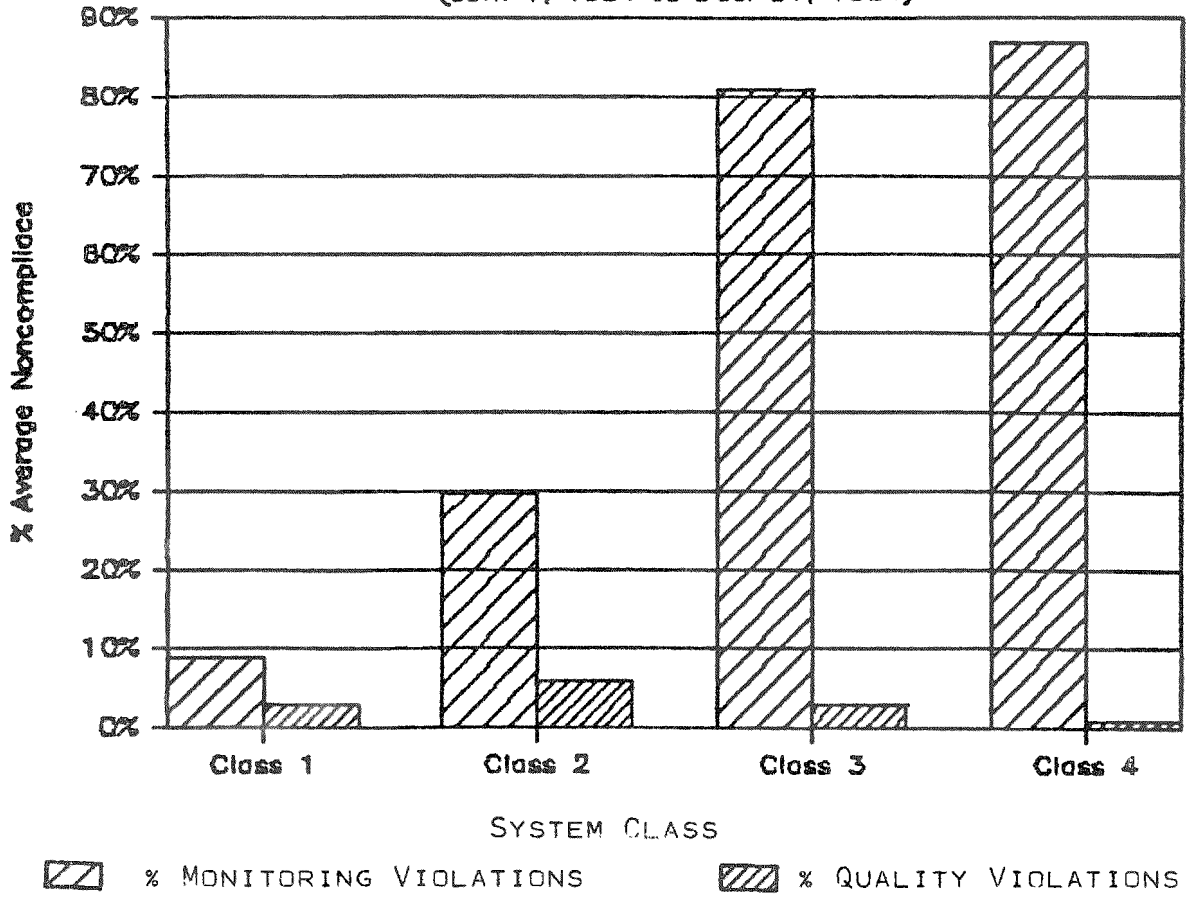
WAC 248-54, as administered by the Department of Social and Health Services, requires that all public water systems monitor the quality of drinking water. Problems with water quality monitoring include the failure to monitor maximum contaminant violations, failure to sample after violation, and difficulties in obtaining corrections to water quality violations.

Compliance by water purveyors of water quality monitoring requirements is inadequate: especially among the smaller water systems. For example, during 1984, an average of 9% of the Class 1 water purveyors did not submit bacterial samples for testing during the year. The percentage of non-compliance increased with a decrease in the size of the water system. An average of 30% of Class 2, 81% of Class 3 and 87% of Class 4 purveyors (see Graphs 4,5, and 6) did not submit bacterial samples for water quality testing.

The failure to monitor resulted in approximately 130,000 people in King County drinking unmonitored water. Although the information on non-compliance is for bacteriological testing only, it is very likely that water quality monitoring for pesticides and primary and physical contaminants is also very poor. Since the number of samples turned in for Class 2, 3 and 4 water systems is very small, it is difficult to determine the extent of water quality violations from the data. It is likely that a water system unreliable in water quality monitoring may also be unreliable in maintaining water quality standards.

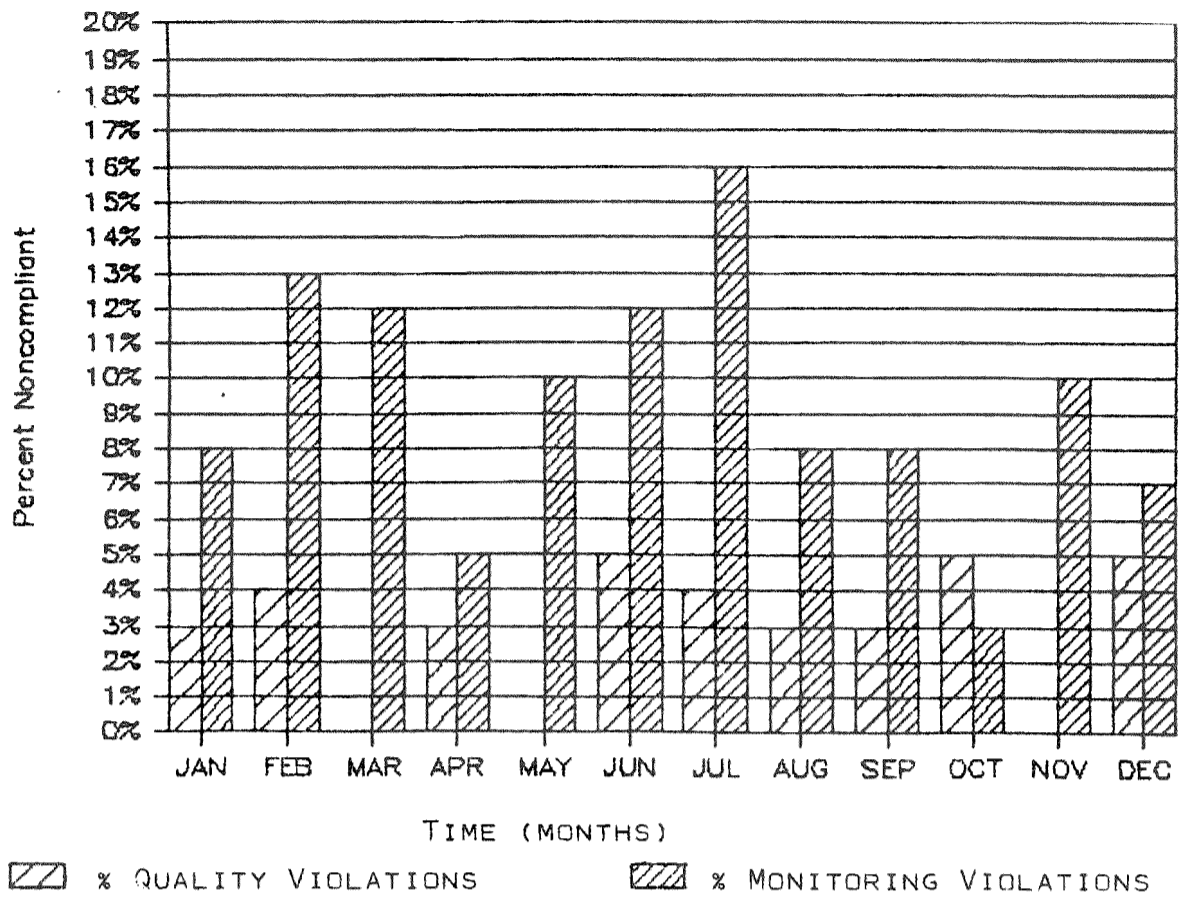
AVG. NONCOMPLIANCE BACTI-MONITORING

(Jan. 1, 1984 to Dec. 31, 1984)



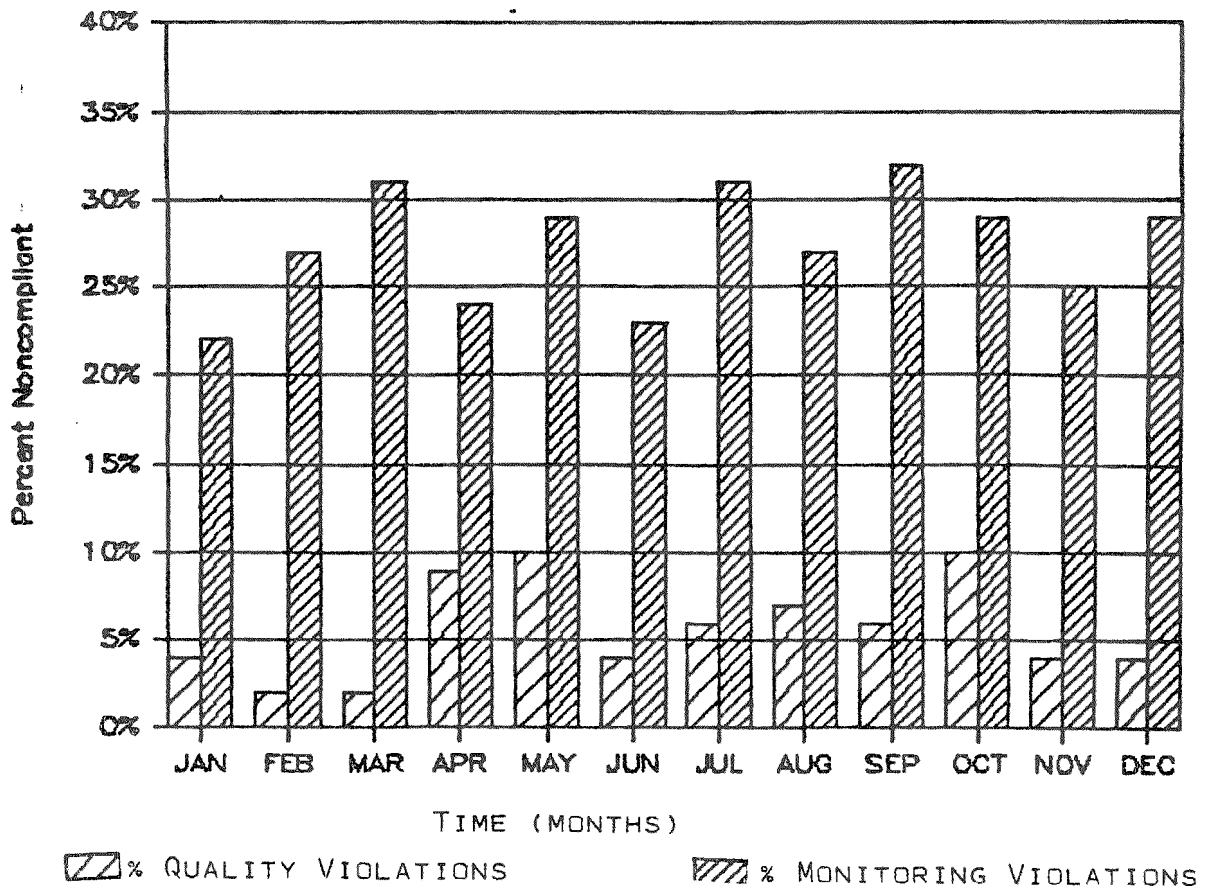
NONCOMPLIANT BACTI-MONITORING

CLASS 1 (JAN. 1, 1984 to DEC. 31, 1984)



NONCOMPLIANT BACTI-MONITORING

CLASS 2 (JAN. 1, 1984 to DEC. 31, 1984)



A 1984 study in King County's East Health District shows an average of 40% of all Class 4 water purveyors submitted samples. Of those submitting samples, 10% violated established standards. Not all samples violate drinking water supplies due to contamination of source. Violations can also be due to improper sampling techniques.

Table 6

PERCENT VIOLATIONS OF WATER QUALITY SAMPLES SUBMITTED

(January 1, 1984 to December 31, 1984)

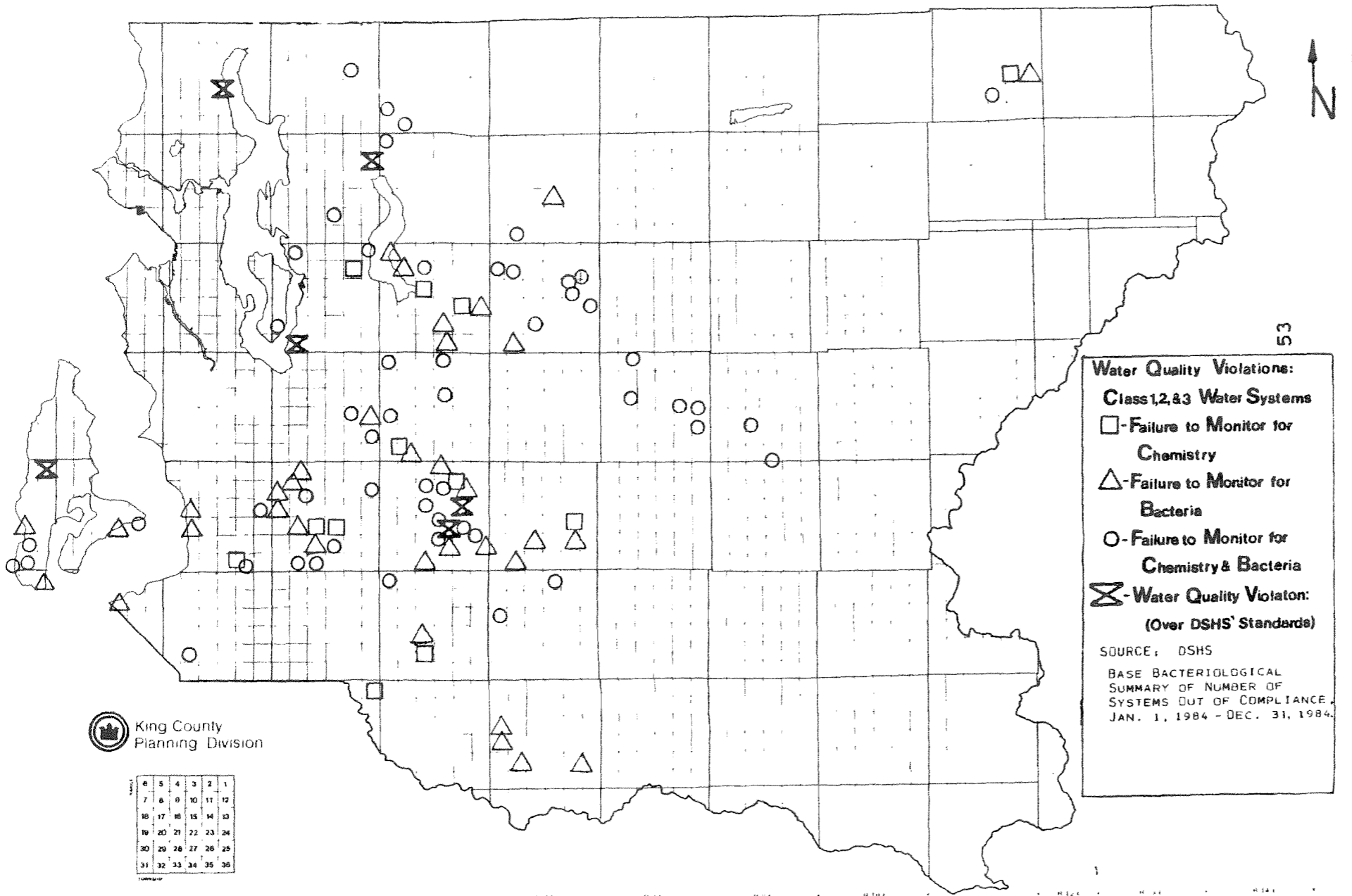
Total #	Avg.% of Syst.	Turb.* Submit.	Iron* >1.0 TU.	Mg.* >=.3mg/l	Bact >=.051mg/l	Inorg. *
Class 1	87	91 %	1.3 %	5.1 %	1.3 %	13.9 %
Class 2	129	70 %	3.3 %	1.1 %	5.5 %	7.8 %
Class 3	80	19 %	6.6 %	0 %	0 %	13.2 %
Class 4	1,299	13 %	4.1 %	4.1 %	7.1 %	3.6 %

* Percent of systems submitting samples in violation of DSHS standards, based on the number of systems actually submitting water quality samples.

Source: DSHS Data

The DSHS and the King County Health Department do not have sufficient staff to effectively regulate purveyor water quality monitoring or conduct sanitary surveys. Stricter regulation and enforcement are needed to ensure that water purveyors monitor their water as required by health regulations. Since there is no penalty for failure to monitor, there is no direct method for health agencies to force purveyors to monitor their water.


Water Quality Violations: Class 1, 2 and 3 Water Systems, 1984.



Water Quality Violations:
Class 1, 2, & 3 Water Systems

- - Failure to Monitor for Chemistry
- △ - Failure to Monitor for Bacteria
- - Failure to Monitor for Chemistry & Bacteria
- ⊗ - Water Quality Violation: (Over DSHS Standards)

SOURCE: DSHS
 BASE BACTERIOLOGICAL SUMMARY OF NUMBER OF SYSTEMS OUT OF COMPLIANCE, JAN. 1, 1984 - DEC. 31, 1984.

 King County Planning Division

6	5	4	3	2	1
7	8	9	10	11	12
13	14	15	16	17	18
19	20	21	22	23	24
25	26	27	28	29	30
31	32	33	34	35	36

Without proper monitoring of water systems, government health agencies, water districts, and the general public do not know the extent of water quality problems and the effect on public health. Proper monitoring would also allow aquifer contamination to be detected as quickly as possible. To protect public health, the DSHS and the King County Health Department should levy fines for non-compliance, hire additional staff and better enforce water quality monitoring regulations.

Most systems which submit samples do not violate state water quality standards. Of the systems that submitted samples in 1984, an average 2.7% of Class 1, 5.5% of Class 2, 3.1% of Class 3, and 1.4% of Class 4 samples were in violation of state bacterial standards (see Map 10 for the location of water quality violations for Class 1, 2, and 3 systems).

The water quality violations represented in Graphs 4, 5, and 6 are an example of the extent of water quality problems. As the information is for bacteriological monitoring for 1984 only, the true status of water quality violations for those monitored is difficult to determine. The limited data available indicates that from 5 to 10% of the purveyors have water quality violations within a given year. Although the percentage is not large, water quality violations in a Class 1 system can effect more than 100 connections. Since there is insufficient staff to investigate water quality violations, several water systems remain contaminated.

Under State and County regulations, water systems may be fined for chronic water quality violations. Most of the smaller systems, however, do not have the means to pay the fines or improve their water system to meet standards. Due to the mixed use and ownership of many small systems, it is difficult to identify a responsible party, even if a problem is discovered. In these cases the State and County health agencies are not always able to enforce water quality standards.

Besides monitoring water quality, the County Health Department can conduct periodic surveys of water systems to examine general maintenance and operation practices. However, water system reviews occur only when complaints are filed. If water quality problems are not monitored, they are discovered only after someone detects and reports the problem to the public health offices.

Public water systems operate over 1,000 wells in King County. A majority of the wells are run by Class 3 and 4 systems and poorly monitored. There are also hundreds of individual private wells. Each well represents a potential source of contamination to the tapped groundwater aquifer. Contamination may occur through the well drilling process or after development if the well is not cased or sealed properly, or abandoned properly after cessation of well use.

The Department of Ecology (DOE) administers a water well construction program that establishes minimum standards for well construction and qualifications for well driller licensing. The DOE has four people assigned to the responsibility for the well-drillers program for the entire state. Since only one person monitored well construction in the State until 1985, there was little inspection of new wells and relatively no inspection of abandoned wells (to ensure the protection of groundwater quality in King County).

GROUNDWATER MANAGEMENT PROGRAMS

As a result of recent State Legislation, the Department of Ecology has become involved in several programs to address groundwater quality issues. The Legislative mandates involve: a State Groundwater Quality Management Strategy, HB 232 designating a procedure for addressing groundwater quality issues, HB 1116 establishing a provision for funding and forming Aquifer Protection Districts, and HB1138 amending the Water Resources Act of 1971.

The State Groundwater Quality Management Strategy will consider several aspects of groundwater quality, including 1) classification of groundwater, 2) sensitivity of groundwater, 3) contamination standard levels, 4) monitoring requirements, 5) data management, 6) prohibitions and restrictions of activities, 7) role of local governments, and 8) implementation of the strategy. The form and direction of the State's Groundwater Quality Management Strategy will have major implications for King County in the areas of land use planning and health related water supply regulations.

HB 232 (1985 Session) will establish a procedure for local governments to develop groundwater management programs for problem areas. HB 1116 (1985) enables Aquifer Protection Districts to be formed by general election. After the Aquifer Protection District is designated, persons using groundwater or septic tanks will pay a new tax to fund groundwater protection measures. HB 1138 (1984) requires state planning efforts to prioritize groundwater protection efforts and local Comprehensive Plans to include groundwater protection as a goal in community plans.

Water Quality and Water Resources Data Management

Water quality information needs to be exchanged among King County, DSHS, and DOE to more comprehensively document where water quality problems exist; to provide the information available about each problem area; and to provide each agency with the information needed for determining how to treat existing water quality problems and prevent future problems. Currently, data valuable for water quality protection efforts is not organized or filed in a manner which is accessible. For example, the Health Department maintains its records manually without benefit of computers to manipulate or retrieve records. DOE's information on groundwater use (through water right allocation) is not readily accessible for comparison purposes with DSHS's information on water quality.

The HAZMAT (Hazardous Materials) Inspection Program could be an excellent source of information for groundwater protection programs. The program identifies hazardous material sites within the County, and includes the location, type, amount, and method of storage for various substances. The permits are used to identify sources of hazardous waste for the Small Quantity Waste Generator Program. The information could also be used to identify potential sources of groundwater contamination from spills, leaks, or other mishaps. The HAZMAT data could be combined with well records, land use information, and other water quality data to provide a basis for a groundwater protection program.

Groundwater Quality Protection Program

King County should develop a County-wide groundwater quality protection program. The program should include:

1. Groundwater supply and recharge area identification.
2. Study and evaluation of groundwater problems and current groundwater protection practices.
3. Designation of areas for special study under HB 232 and HB 1138.
4. Recommendations for a strategy to coordinate and implement groundwater protection programs which will rectify current groundwater quality problems, include groundwater protection as a goal in community plans, and improve groundwater quality monitoring.

Chapter VII

FIRE SERVICE

King County Motion 5701 specified that the Preliminary Assessment go beyond the scope of issues normally addressed and include an analysis of existing and potential fire service problems in King County. The Motion also called for the examination of alternative approaches to fire protection.

FIRE PROTECTION AGENCIES

There are 64 separate organizations providing fire protection in King County. These organizations include fire districts, cities, and specialized agencies. Fire Districts serve both incorporated and unincorporated areas of King County. Cities generally provide their own fire protection and also serve certain unincorporated areas of the County. Specialized agencies serve facilities such as the Port of Seattle and the King County International Airport. The State Department of Natural Resources provides fire service in remote rural forest land areas where there is no other fire service.

The following table summarizes fire protection organizations in King County:

Table 7

<u>FIRE PROTECTION ORGANIZATION POPULATION STATISTICS</u>			
<u>TYPE OF FIRE PROT. ORGANIZATION</u>	<u>NO. OF ENTITIES PER TYPE</u>	<u>TOTAL POPULATION PER TYPE</u>	<u>% POPULATION SERVED</u>
Fire District:	33	:	600,000
City :	27	:	700,000**
Specialized :	:	:	:
Agency :	4	:	n.a
:	:	:	:
TOTALS :	64	:	1,300,000**
			100%

* Fire District populations based on King County Planning Division Land Development Information System Housing Unit Estimates.

** City and total population derived from the King County Annual Growth Report, Department of Planning and Community Development 1985.

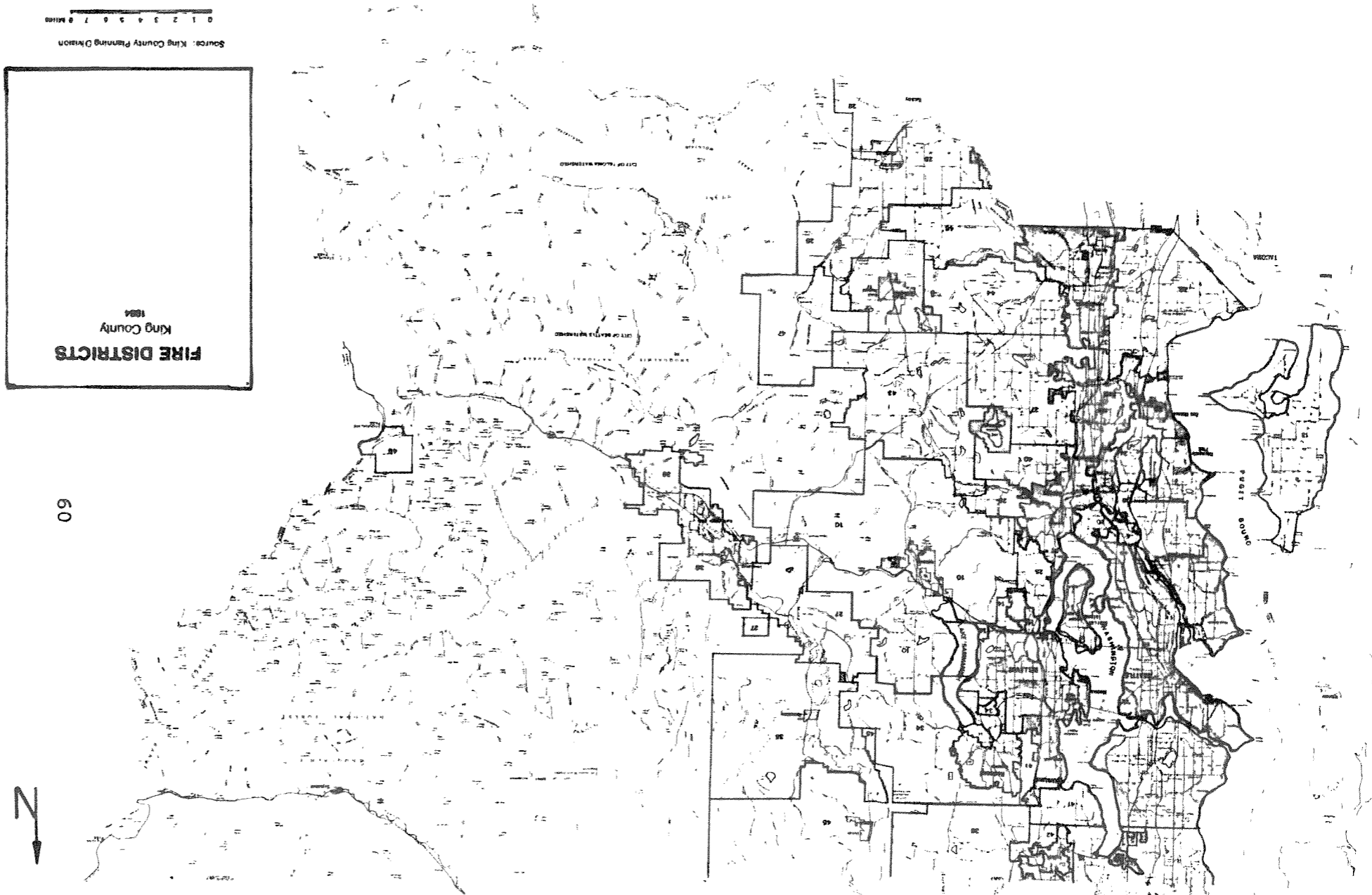
Source: King County Office of the Fire Marshal, January 1985.

Fire districts were established in response to growth in specific areas of the County. The formation of new fire districts was not coordinated with other fire districts, and boundaries were set up according to the immediate needs of a district. This process resulted in a large number of fire protection organizations with irregular service boundaries that do not support efficient fire protection (see map 11). Fire protection response and efficiency are not at an optimal level due to variations in service area size and boundary location.

King County fire districts are staffed by professional firefighters, volunteers, or a combination of both. Urbanized areas are usually served by full time professional firefighters (see map 12). Rural areas of the County rely on volunteers working out of unmanned fire stations. Table 8 shows fire district staffing status by district, for the Urban-Transitional and Rural-Resource land areas of the County. These land use designations are defined in the 1985 King County Comprehensive Plan. The Comprehensive Plan is designed to focus growth and public services in Urban Areas of the County. Transitional areas will be redesignated either Urban or Rural in upcoming community plans or plan revisions.

The fire service also performs a number of other functions besides fire fighting. Most fire protection agencies provide Emergency Medical Service (EMS) and respond to non-emergency requests for help with problems such as flooded basements and downed trees. Fire service organizations, with other local agencies, also help to coordinate emergency disaster planning.

FIRE DISTRICTS, KING COUNTY



FIRE DISTRICTS
King County
1984

Source: King County Planning Division
0 1 2 3 4 5 6 7 8 Miles
1:500,000

Fire District Personnel Staffing Status: Professional and Volunteer

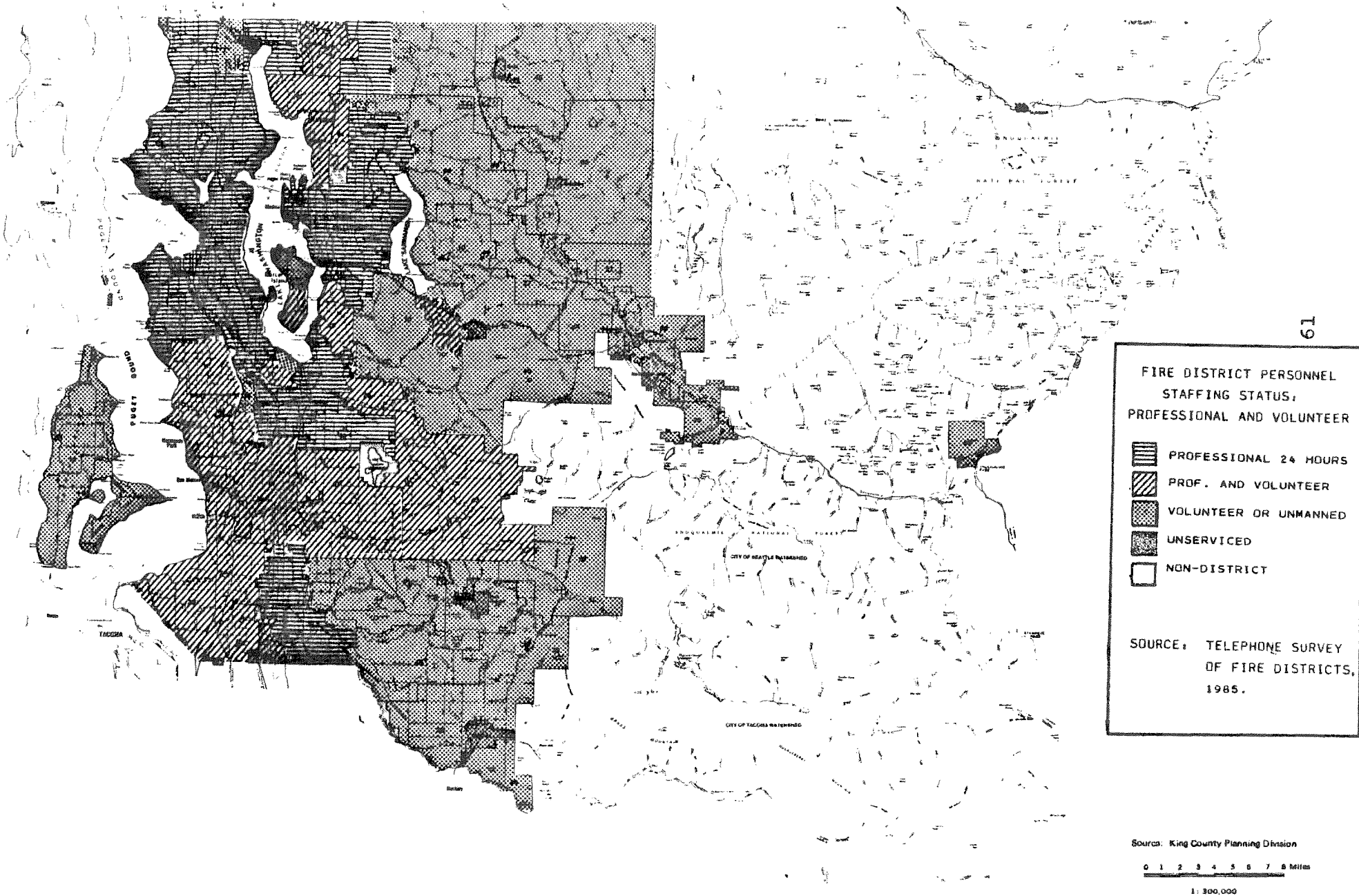


Table 8

FIRE DISTRICT STAFFING STATUS: PROFESSIONAL AND VOLUNTEER

URBAN AND TRANSITIONAL AREAS

NO.	DISTRICT/CITY	#STA*	PROF.24HRS.	PROF. VOL	VOL.	UNMANNED
4	SHORELINE	3	X		X	X
16	KENMORE	2	X			X
42	BOTHELL	3	X		X	
41	KIRKLAND	4	X		X	
36	WOODINVILLE	4	X	X		X
	SEATTLE	33	X			
34	REDMOND	4	X		X	X
14	BELLEVUE	6	X			
	MERCER ISLAND	2	X	X		
25	EAST RENTON	2		X		
	RENTON	3	X			
20	BRYNMAWR/SKYWAY	2		X		X
1	DUWAMISH	1	X			
1	WHITE CENTER	2		X		
2	BURIEN/HIGHLINE	3	X		X	
18	FOSTER	1			X	
	TUKWILA	2	X			
24	MCMICKENH/ANG.L	2		X		
40	SPRING GLEN	2	X			
26	DES MOINES	1		X		
37	KENT	3	X			
39	FEDERAL WAY	6	X		X	
31	AUBURN (JUNE '85)	2	X			
44	LEA HILL	4			X	
	CITY OF ISSAQ.	1		X		

TABLE 8
(CONTINUED)

RURAL AREAS AND RESOURCE LANDS

45	:	DUVALL	:	3	:	:	:	:	:	X	:	X
35	:	CARNATION	:	2	:	:	:	:	:	X	:	X
27	:	FALL CITY	:	1	:	:	:	:	:	X	:	
38	:	SNOQUA/N.BEND	:	2	:	:	:	:	:	X	:	X
10	:	**ISSAQUAH	:	7	:	:	X	:	:	X	:	
43	:	**MAPLE VALLEY	:	5	:	:	X	:	:	X	:	X
17	:	BLACK DIAMOND	:	1	:	:	:	:	:	X	:	X
47	:	PALMER/SELLECK	:	2	:	:	:	:	:	X	:	X
46	:	NEUWAUKUM	:	3	:	:	:	:	:	X	:	X
28	:	ENUMCLAW	:	3	:	:	:	:	:	X	:	X
49	:	SNOQUALMIE PASS	:	1	:	:	:	:	:	X	:	X
50	:	SKYKOMISH	:	1	:	:	:	:	:	X	:	X
13	:	VASHON/MAURY IS.	:	5	:	:	:	:	:	X	:	

* STA: Station

** District also falls in Urban-Transition lands.

Source: Survey of Fire Districts in King County. Public Utilities and Facilities Section, King County Department of Planning and Community Development.

Note: Some of this information may be incomplete.

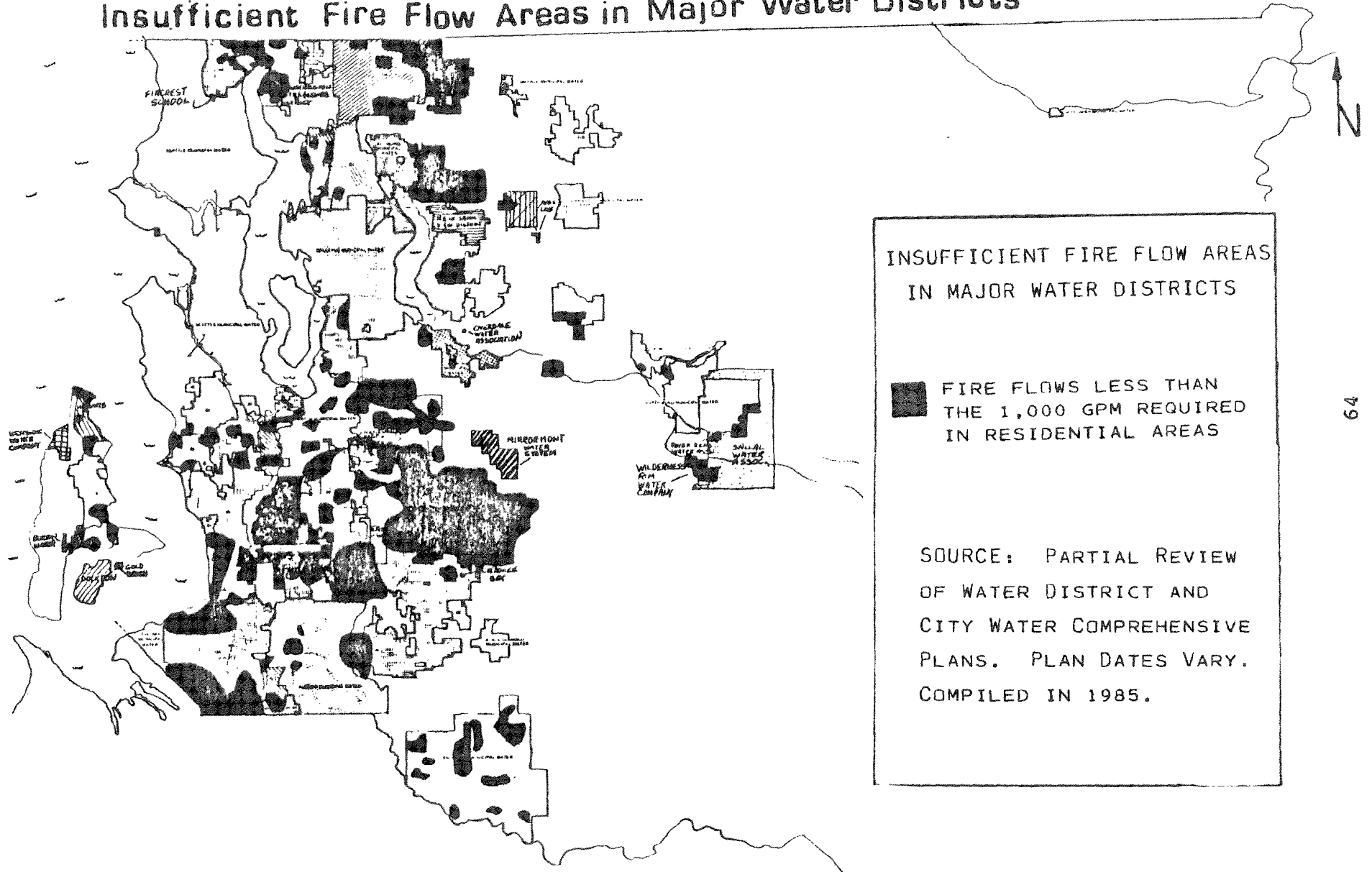
FIRE SERVICE STANDARDS

Fire service standards are divided into two groups: fire prevention and fire suppression standards. Fire prevention standards which are measures designed to prevent or detect the occurrence and spreading of fires. Fire suppression standards are requirements for facilities and personnel that facilitate fire suppression. Current standards emphasize fire suppression, and large fire flow requirements, rather than fire prevention.

Fire Suppression

Adequate fire flow (water supply), staffing, and equipment are critical to fire suppression. Fire flow standards are based on residential and commercial building and land use designations. These requirements vary throughout the County and include many exceptions. The situation is further complicated by different water purveyor fire hydrant and water main standards.

Insufficient Fire Flow Areas in Major Water Districts



INSUFFICIENT FIRE FLOW AREAS
IN MAJOR WATER DISTRICTS

■ FIRE FLOWS LESS THAN
THE 1,000 GPM REQUIRED
IN RESIDENTIAL AREAS

SOURCE: PARTIAL REVIEW
OF WATER DISTRICT AND
CITY WATER COMPREHENSIVE
PLANS. PLAN DATES VARY.
COMPILED IN 1985.

Source: King County Planning Division

Over 80% of the Class 1 water districts cannot provide adequate fire flow in a portion of their service area (see map 14). Fire flow standards relate directly to personnel, equipment, and water distribution facility requirements. High fire flow requirements are very capital intensive due to the following: costs for water storage, transmission, and distribution; equipment costs to deliver required fire flow; and personnel to operate water delivery equipment.

Since current fire standards emphasize fire suppression, a sufficient number of firefighting personnel are important for effective fire service. To deliver the minimum residential standard fire flow of 1,000 gallons per minute, ten fire fighters are required, according to the standard that 100 gallons can be delivered by each firefighter. Most fire districts throughout the County are served by professional, and/or volunteer firefighters, budget limitations and declining numbers of volunteers affect adequate staffing. Inadequate staffing may result in districts being unable to use the required fireflow which is available.

The time interval between the start of a fire and full development is critical for safe evacuation and effective fire fighting. The National Bureau of Standards determined that the average time to full fire development is between 15-17 minutes (see Graph 7). Fire district service areas and station locations need to be coordinated at a regional level to reduce firefighting response time to less than 15 minutes.

King County does not have a standard for firefighting response time. Response to fires depends on the timely transmission and distribution of adequate fire flow by trained staff and appropriate equipment. The height of a structure, type of occupancy, and construction materials also affect the number of personnel and equipment needed to put out a fire. A fire service standards ordinance proposed for County adoption by fire service providers establishes a maximum of 8 minutes total response time for fire service to most commercial buildings. Response standards should be developed to specify minimum equipment and personnel requirements for effective firefighting.

Fire Prevention

Fire prevention standards are designed to prevent or detect fire occurrence. These standards include: construction codes, building inspections, fire detection systems, and automatic sprinkler systems. Construction codes require that fire resistant building materials and draft stop partitions be used to minimize fire spreading. The Fire Marshal's Office inspects construction sites before construction begins and as work continues to verify structures and building practices meet fire codes. The Fire Marshal's Office can require that smoke, gas, or low heat detection systems be installed to meet the fire code requirement. Automatic fire alarm sprinkler systems may be required in larger and more vulnerable buildings where fire flow standards cannot be met. The County also regulates the handling and storage of flammable and hazardous materials through the new Hazardous Materials Inspection Program (HAZMAT).

Fire and Water Service Coordination

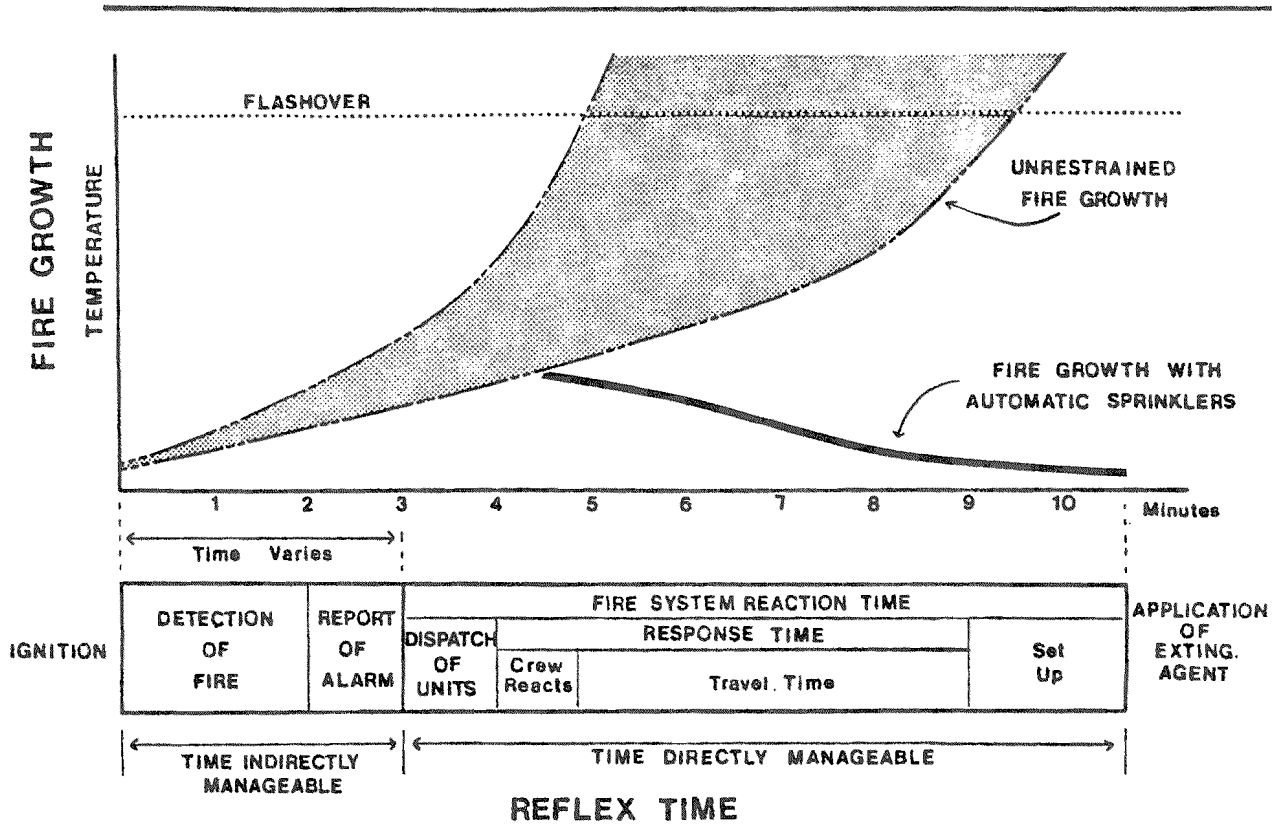
There are over 1,400 known public water systems dispersed throughout the 64 fire protection organizations in King County. This condition creates many difficulties for evaluating and providing adequate fire flows and evaluating fire service.

Adequate water, accessible through fire hydrants, is a critical part of firefighting. It is estimated that more than 90% of the 1,400 Class 4 water systems in King County do not provide fire hydrants. In most cases, the regulations do not currently require fire hydrants be installed in the rural areas where many Class 4 water systems exist. The sheer number of water systems within a fire protection agency's service area also presents many difficulties.

Table 9 shows the number of Class 1, 2, 3, and 4 water systems within each fire protection agency. The average fire protection agency has more than three different Class 1 water systems within its boundaries. More than one-third of the agencies have more than three Class 1 purveyors. In addition, most fire agencies have many other smaller (Class 2, 3, or 4) water systems within their boundaries. There is an average of approximately 17 small water systems per fire agency in King County. The largest numbers of smaller water systems occur in Fire District 10 (161) and Fire District 43 (175).

GRAPH #7

FIRE GROWTH vs REFLEX TIME



Class 1 water systems generally provide adequate fire flow and have fire hydrants. However, different water systems within the same fire district may have hydrants with different port sizes or different thread types on the ports. In other instances a water district may have two different hydrant standards if it is within two fire districts with different standards. Inconsistent hydrants can result in difficulty in obtaining adequate fire flows in a timely manner. Presently, some water systems use a 4" Seattle thread rather than the required National Standard thread. Another thread standard, the West Coast Standard, is used by other King County water districts. The County code requires that all new hydrants have two 2-1/2" and one minimum 4" port. The 2-1/2" ports must have National Standard thread. Although all new hydrants are meeting the 2-1/2" port, there continues to be variations in the 4" port thread sizes.

All fire hydrants should be brought up to current standards. Hydrant modification will be difficult because it is expensive and will require effort from many fire districts, water districts, and other government agencies. A forum to composed of these groups should be developed to coordinate the standardization of hydrants.

Another problem in fire and water service coordination is the adequacy of the basic water system installed and maintained by the water purveyor. Water mains must be of adequate size to provide the rate of water required for flows. Adequate storage must be available to provide fireflows for the time required for fighting fires. The mains and storage facilities must also be adequate to permit service to system users at the same time fires are being fought. A review of water plans revealed that some of the County's water purveyors do not have adequate mains or storage facilities.

Table 9

WATER AND FIRE DISTRICTS BOUNDARY OVERLAPS

FIRE PROTECTION AGENCIES	CLASS 1 PURVEYOR NAME	NUMBER OF CLASS 2	NUMBER OF CLASS 3	NUMBER OF CLASS 4
Algona	Algona	0	0	0
Auburn	Auburn, W.D. #124	3	0	11
Bellevue	W.D. #107, W.D. #117			
	W.D. #81, Bellevue			
	Kirkland	0	2	14
Black Diamond	Black Diamond	0	0	1
Bothell	W.D. #104, Bothell			
	NE Lake Washington	0	0	0
Carnation	Carnation	0	0	0
Duvall	Duvall	0	0	1
Enumclaw	Enumclaw	0	0	0
Issaquah	Issaquah	1	1	0
Kent	East Hill, Kent,			
	W.D. #87, #75, #58	0	1	3
F.D. #1	Seattle, W.D. #25, #20	0	0	0
F.D. #2	W.D. #85, #49, #75			
	Seattle	0	0	0
F.D. #4	W.D. #42, #83, Seattle,			
	Fircrest School	1	0	0
F.D. #5	W.D. #42, Seattle	0	0	0
F.D. #10	W.D. #82, #90, #707,			
	#117, #123, Renton,			
	NE Sammamish, Overdale,			
	Bellevue, Mirrormont	15	6	140

Table 9

WATER AND FIRE DISTRICTS BOUNDARY OVERLAPS
(CONTINUED)

FIRE PROTECTION AGENCIES	CLASS 1 PURVEYOR NAME	NUMBER OF CLASS 2	NUMBER OF CLASS 3	NUMBER OF CLASS 4
F.D. #11	: Seattle, W.D. #45 : #20, #125	0	0	0
F.D. #13	: W.D. #19, Burton Water : Dockton, Heights, Gold : Beach, Westside	13	0	59
F.D. #14	: Bellevue, W.D. #117, : W.D. #107	0	0	3
F.D. #16	: W.D. #42, #83, Seattle, : NE Lake Washington	0	0	1
F.D. #17	: W.D. #86, Cedar River : Sewer and Water Dist., : Black Diamond	2	2	5
F.D. #18	: W.D. #125, #75, : Tukwila	0	0	0
F.D. #20	: W.D. #63, #57, #14, : #128, Renton, Seattle	0	0	0
F.D. #24	: Kent, Tukwila, W.D. #75:	0	0	0
F.D. #25	: W.D. #108, #107, #90, : Renton, Maplewood : Addition Co.	3	2	11
F.D. #26	: W.D. #75, #56, #54,	1	1	1
F.D. #27	: W.D. #127, #82, : Ames Lake	4	5	33
F.D. #28	: Enumclaw	1	0	34
F.D. #31	: Auburn, W.D. #124	0	0	0

Table 9

WATER AND FIRE DISTRICTS BOUNDARY OVERLAPS
(CONTINUED)

FIRE PROTECTION AGENCIES	CLASS 1 PURVEYOR NAME	NUMBER OF CLASS 2	NUMBER OF CLASS 3	NUMBER OF CLASS 4
F.D. #34	: W.D. #81, #122, #104 : Bellevue, Union Hill : NE Lake Washington : Redmond, Ames Lake	: : : : 3	: : : : 2	: : : : 65
F.D. #35	: Ames Lake, Carnation : W.D. #119	: : 2	: : 2	: : 14
F.D. #36	: W.D. #104, #81	: 2	: 1	: 25
F.D. #37	: East Hill, Auburn : Kent, W.D. #111, Cedar : River Sewer and Water : District #87, #58	: : : : 9	: : : : 3	: : : : 105
F.D. #38	: Wilderness Rim, North : Bend, Snoqualmie, River : Bend, Sallal	: : : 5	: : : 5	: : : 17
F.D. #39	: W.D. #56, #124 : Tacoma, Kent, Auburn	: : 1	: : 3	: : 6
F.D. #40	: Renton, W.D. #58, #108	: 1	: 1	: 1
F.D. #41	: W.D. #81, NE Lake : Washington	: : 1	: : 0	: : 1
F.D. #42	: Bothell, NE Lake : Washington, W.D. #104	: : 0	: : 1	: : 0
F.D. #43	: Cherokee Bay, W.D. #90 : #108, Cedar River Sewer : and Water District, #94	: : 13	: : 12	: : 150
F.D. #44	: Auburn, W.D. Cedar : River Sewer and Water : District, #46	: : : 4	: : : 0	: : : 50

Table 9

WATER AND FIRE DISTRICTS BOUNDARY OVERLAPS
(CONTINUED)

FIRE PROTECTION AGENCIES	CLASS 1 PURVEYOR NAME	NUMBER OF CLASS 2	NUMBER OF CLASS 3	NUMBER OF CLASS 4
F.D. #45	Duvall, W.D. #119 #104	2	0	21
F.D. #46	Enumclaw, W.D. #44 Auburn	4	1	28
F.D. #47	None	4	0	10
F.D. #49	Summit	0	0	0
Kirkland	Kirkland, NE Lake Wash. #104, #81	0	0	0
Lake Forest Park	W.D. #83, #42	0	0	1
Mercer Island	Mercer Island	0	0	1
Milton	W.D. #124	0	0	0
Pacific	Pacific	0	0	0
North Bend	North Bend	1	0	0
Redmond	W.D. #81, Redmond, Bellevue	1	1	8
Renton	Renton, W.D. #90, #58	0	0	1
SeaTac-Airport	W.D. #75, #125, #49	0	0	0
Seattle	W.D. #63, Seattle	0	0	0
Snoqualmie	Snoqualmie	0	0	0
Tukwila	Tukwila, W.D. #75, #125	0	0	1

FIRE SERVICE STANDARDS AND LAND USE CONFLICTS

Consideration of fire protection standards as part of the land use planning and development process in King County is incomplete and sometimes contradictory. County consideration of fire protection issues generally occurs on a project-by project basis. This consideration is generally limited to the adequacy of fire flow and compliance with standards of the building and fire codes. The planning and development review process does not adequately consider the cumulative affects of growth on fire service.

Two aspects of growth impact fire service: rate and type. New development places immediate demands on the fire service. These demands begin early in the construction phase in the form of emergency medical and fire calls at job sites. However, tax revenue from a new project does not flow to a fire agency for up to two years after construction commences. Consequently, rapid growth can be very difficult for a fire district to cope with when little revenue to support the required increases in staffing and equipment are available.

The type of new construction can also work to compound the adverse impacts of rapid growth on a fire district. Certain types of buildings or occupancies may need equipment and personnel not available in a given district. For example, high-rise offices or hotels require large numbers of fire fighters to respond to an alarm. Districts staffed full-time with only two or three full-time fire fighters will not be able to respond adequately to high-rise or hotel alarms.

Some occupancies may use hazardous materials that a fire district is not equipped to deal with. These problems occur because there are no adopted standards for fire agency staffing, equipment, or response time. A program to develop standards for fire service needs to be developed. The standards that do exist contain exemptions or are applied ineffectively. Normally, hydrants are required for new development. However, the fire hydrant code contains exemptions that allow new development to occur without installing hydrants. The biggest exemption is for lots 35,000 square feet or larger. The philosophy behind this approach is to provide for less stringent standards in low density areas where fire flows are less likely to be available. In practice, however, this exemption has created hundreds of lots within the Urban Area that are not served with fire hydrants.

About one-third of the lots created in King County are created through the short subdivision process. Most of these lots are larger than 35,000 square feet and within the Urban Area of the County (see 1985 Annual Growth Report). However, since the code does not require hydrants, many of these short-platted lots are not served by adequate water mains and fire hydrants. A code is needed that requires hydrants within the Urban Area, while providing flexibility in the Rural Area where fire flows may not be available.

Exemptions and inadequate standards cause similar problems for emergency vehicle access. In addition to exemption from fire hydrant requirements, some short-platted lots are allowed exceptions from full road improvement requirements. This creates problems for fire and emergency medical access. Access can also be inhibited by the road distance from a fire station to a site. Many new developments have occurred where access was restricted by a road pattern that was incomplete or blocked off. Missing or obstructed road segments can add minutes to response time. The planning and development approval process has not always given adequate consideration to the issue of response time. King County needs to develop standards for water supply, fire hydrants, access and response time.

Developing such standards will require participation of all affected parties including King County, fire agencies, water purveyors, and others.

NEW FIRE PERFORMANCE STANDARDS

The 1985 King County Comprehensive Plan establishes the need to promote population growth in County areas that have adequate existing or planned public services. According to the Plan, King County will focus public investment in new facilities and services in Urban Areas. In this way, public dollars can be used more effectively and efficiently. This policy could be applied to fire service standards to replace the inconsistencies and exemptions of the current system. Uniform standards based on building type, location, and land use would provide more effective guidelines for fire service regulation than the current system of varying standards. Higher performance standards could be applied in urban areas where fire dangers are more critical.

The objective of the new performance standards should be to improve fire prevention. Existing fire standards have traditionally emphasized fire suppression and the requirement for large fire flow capabilities. In urban areas this has promoted the development of facilities, equipment, and staff to deliver massive fire flows. This buildup of personnel and facilities requires a large budget to finance operations and maintenance.

Fire service standards based on a fire prevention approach would be more cost effective in the long term and place more of the financial burden on developers instead of taxpayers. Although the installation of automatic alarm and sprinkler systems has a large initial cost, there is limited need for maintenance once the system has been installed.

A policy requiring mandatory sprinklers and provisions for fire flow as a secondary measure has the following advantages.

- 1) Sprinkler systems can apply water efficiently and promptly during the fire development stage.
- 2) Sprinkler operation is not affected by smoke or heat whereas firefighters may be.
- 3) The system can provide immediate fire occurrence notification to the Fire Department.
- 4) The growth of a fire is restrained dramatically, extending the period during which the fire can be most effectively extinguished.
- 5) Fewer fire fighters are required to extinguish the fire.

Fire Service Master Plan

A review of the issues related to fire standards and fire service problems indicates a Fire Service Master Plan (FSMP) needs to be developed. A Committee should be organized to bring together all affected parties to prepare and recommend standards for fire prevention and emergency response. Such a plan would include input from fire agencies, water purveyors, builders, developers, insurance representatives, and County officials. Two ordinances drafted by County Fire Chiefs might be a good starting point for developing County-wide standards for access, fire flows, sprinkler requirements, and response.

A Fire Service Master Plan should incorporate an effort to inventory the County's fire service resources. These resources could then be compared to current service areas and population distributions to assess the adequacy of fire service by population and geographical area. Fire service area boundaries could be reconsidered and, when necessary, modified to permit more effective fire protection service to the public.

CHAPTER VIII

APPENDIX

Appendix Methodology

The Preliminary Assessment was compiled from written sources, data reports, conversations with individuals in the fields of water and fire service, and surveys of King County Fire and Water Districts. Staff carried out the literature research, and survey work from 1983 to 1985 with the assistance of in-house staff and the Preliminary Assessment Advisory Committee.

The written and other data sources used in the Preliminary Assessment included government reports, scientific studies, comprehensive water and fire plans, and local government reports.

The conversations with individuals experienced in the water and fire service fields occurred during scheduled meetings (e.g., of the King County Utility Technical Review Committee or the Puget Sound Council of Governments Water Resources Committee) or in planned interviews. The surveys of fire and water districts were performed over the phone or by information from water and fire district data sources. The surveys were informal in nature and not statistically designed.