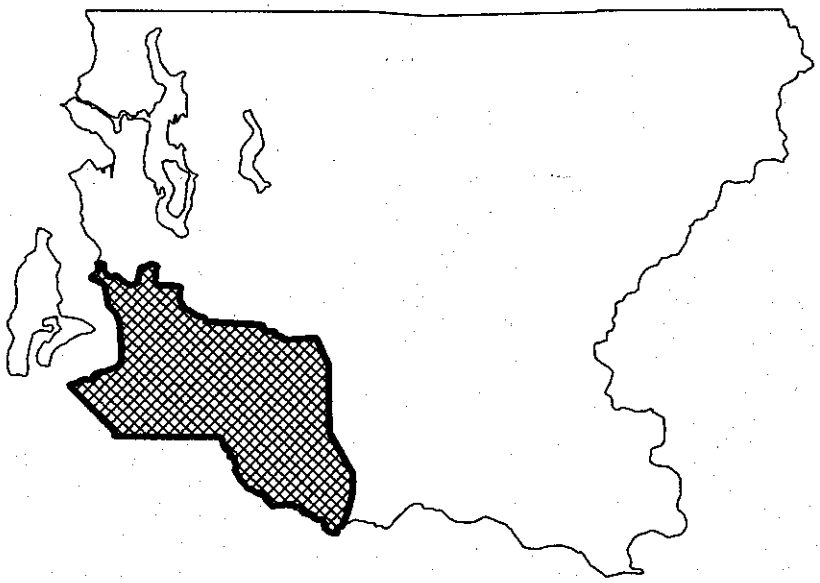
SOUTH KING COUNTY

COORDINATED WATER SYSTEM PLAN



OCTOBER 1989

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October 3, 1989

File No. 4281.1

Mr. Dennis Johnson, Chairman
South King County
Water Utility Coordinating Committee
Covington Water District
30033 188th Ave. SE
Kent, WA 98042

Subject: South King County Coordinated Water System Plan
Regional Supplement

Gentlemen:

Economic and Engineering Services, Inc. (EES), in conjunction with its subconsultants URS Consultants and CH2M-Hill, Inc., is pleased to submit the final South King County Coordinated Water System Plan (CWSP). This document provides direction and guidance for the future planning, management, and operation of water systems within South King County. The CWSP has also been designed to initiate procedures and standards needed to ensure the orderly and efficient development of water resources for public water use throughout the area.

This document incorporates the major policies, procedures, and recommendations jointly developed by and for the area's water utilities through the Water Utility Coordinated Committee (WUCC). The area utilities have played a major role in guiding the development and review of the CWSP. Included within the document are the recommended review procedures, minimum design requirements, designated service areas, and other provisions required by law for a CWSP. The Water System Plans of individual utilities are an essential element of the CWSP and are integrated and appended to this document by reference.

Meeting the future water supply needs of South King County is the collective challenge facing local utilities, and the responsible agencies of King County and the State. Implementation of the recommendations within this CWSP will aid in meeting this challenge.

EES appreciated the opportunity to assist the South King County Regional Water Association, the County, and the WUCC in preparing this document.

Sincerely,

John M Maxwell

John M. Maxwell, P.E.
Vice President

JMM:mda:I

Enclosure

SOUTH KING COUNTY
COORDINATED WATER SYSTEM PLAN

REGIONAL SUPPLEMENT

October, 1989

Prepared By:

Economic and Engineering Services, Inc.

Under the Direction Of:

South King County
Water Utility Coordinating Committee

In Association With:

CH2M-Hill
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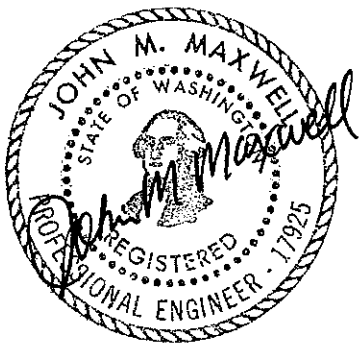
CERTIFICATE OF ENGINEER

SOUTH KING COUNTY

COORDINATED WATER SYSTEM PLAN

1989

The technical material and data contained in this report were prepared under the supervision and direction of the undersigned, whose seals as professional engineers licensed to practice as such, are affixed below.



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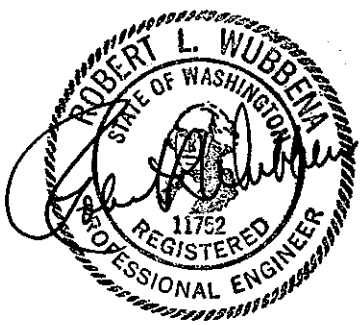

Robert L. Wubbena

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SOUTH KING COUNTY
COORDINATED WATER SYSTEM PLAN

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GLOSSARY OF ACRONYMS AND TERMS

The following definitions are applicable to interpretation of the CWSP. Additional definitions may be found in Chapter 248-54 WAC, "Rules and Regulations of the State Board of Health Regarding Public Water Systems," revised February, 1988, Department of Social and Health Services, Water Supply and Waste Section, LD-11, Olympia, WA 98504.

ACRONYMS:

APWA	The American Public Works Association.
AWWA	The American Water Works Association.
BALD	King County Department of Parks, Planning, and Resources/Building and Land Development Division.
ccf	One hundred cubic feet.
cfs	Cubic feet per second.
CIP	Capital Improvement Program.
CWSP	Coordinated Water System Plan (Chapter 70.116 RCW).
CWSSA	Critical Water Supply Service Area System Plan (Chapter 70.116 RCW and Chapter 248-56 WAC).
DOT/APWA	Combined standards for public works construction practices of the Washington Department of Transportation and the American Public Works Association, 1984 Edition.
DSHS	Department of Social and Health Services, State of Washington. (Note: Effective July 1, 1989, responsibility for the CWSP transferred from the Department of Social and Health Services to the Department of Health. Approval and implementation of the CWSP contained in this document will be by the Department of Health.)
Ecology	Department of Ecology, State of Washington.
EPA	United States Environmental Protection Agency.
gpcd	Gallons per capita per day.

gpd	Gallons per day.
gpm	Gallons per minute.
GWMP	Ground Water Management Plan.
KCC	King County Code.
MGD	Million gallons per day.
PSCOG	Puget Sound Council of Government.
PP&R	King County Department of Parks, Planning, and Resources.
RCW	Revised Code of Washington.
SKRWA	South King County Regional Water Association.
SKCHD	Seattle-King County Health Department.
SSMA	Satellite System Management Agency. An organization, individual, or other entity which is prequalified, as provided in the CWSP, to render services such as operation, maintenance, development, or management of water systems in King County.
SSMP	Satellite System Management Program. A program established to provide for technical assistance, contract services, and other resources to meet management needs of satellite systems. (See Satellite System).
SWD	Seattle Water Department.
ULID	Utility Local Improvement District.
USGS	United States Geological Survey.
USRP	Utility Service Review Procedure. An administrative procedure set up under local agency jurisdiction to identify the water purveyor best able to serve an area where new public water service is requested. (See Designated Purveyor).
UTRC	King County Utility Technical Review Committee.
WAC	Washington Administrative Code.
WRIA	Water Resource Inventory Area.

WUCC	South King County Water Utilities Coordinating Committee.

TERMS:

Classes of Public Water Systems	Class 1 - A public water system having 100 or more permanent services Class 2 - A public water system having 10 through 99 permanent services. Class 3 - A public water system serving a transitory population of 25 or more on any one day. Class 4 - A public water system which is not a Class 1, 2, or 3 system. (Note: New State regulations were adopted on September 13, 1989, which redefine the classes of water systems. However, in the context of this CWSP, the above definitions apply.)
Designated Purveyor or Designated Utility	A water purveyor (utility) identified to provide water service to a given area. When willing to provide the service in a timely and reasonable manner, the designated purveyor is assigned an exclusive right to provide public water service to the area and is required to include the area within its approved Water System Plan or King County Water Comprehensive Plan.
Expanding Water System	Those public water systems installing additions, extensions, changes, or alterations to their existing source, transmission, storage, or distribution facilities which will enable the system to increase in size its existing service area. New individual retail or direct service connections onto an existing distribution system shall not be considered an expansion of the public system.
Fire Flow	The rate of water delivery needed for the sole purpose of fighting fires. The fire flow volume shall be in addition to the requirements of the water system for domestic demand.
Franchise Area	Non-exclusive area in which a utility is permitted by the County to extend facilities in public rights-of-way. A franchise area is not equivalent to a service area.
Interlocal Agreement	See Service Area Agreement.

Intertie	A physical connection between individual water systems which allows water supply to be transferred in one or both directions. An intertie can be established as a primary source, secondary or peaking supply, or emergency supply. Ordinarily, the use of an intertie is governed by a written agreement or contract between the utilities. A modification to water rights issued by Ecology may also be required.
King County Water Comprehensive Plan	King County Code 13.24 requires, as a prerequisite for granting right-of-way franchises and construction permits, that a comprehensive plan be prepared by utilities providing water service in unincorporated areas of the County. The plans are reviewed by a County Utilities Technical Review Committee (UTRC) prior to submittal to King County Council for approval.
Land Use Designation	The land use(s) allowed in a geographical area by right or permit, as provided in the King County Comprehensive Plan and Zoning Ordinance.
Level of Service	Operational features, such as pressure, flow, reliability, etc., provided to the customer by the water system.
New Construction	Any addition of supply, transmission, distribution or storage facilities, either in a new water system or an expanding water system, which provides a capability to serve additional dwelling units or other buildings.
Public Water System	Any water supply system intended or used for human consumption or other domestic uses, including source, treatment, storage, transmission, and distribution facilities where water is furnished to any community or group of individuals, or is made available to the public for human consumption or domestic use, but excluding all water supply systems serving one single family residence. It also does not include water systems meeting all of the following requirements: 1. Purchase their entire supply of water from another public water system subject to these regulations; 2. Do not treat the water (other than softening or corrosion control); and, 3. Do not sell water. Businesses or systems merely storing and distributing water provided by others are exempt unless that system sells water as a separate item or bills separately for the water provided.

Remote System	A water system located within the service area of a designated utility that is detached and is not served by a direct connection from the designated utility.
Satellite System	A water system not served by direct connection to an existing water utility. A satellite system may be located within or outside the service area of a designated purveyor. A satellite system may be owned and/or managed by an approved Satellite System Management Agency.
Service Area	A geographical area assigned to a water purveyor for the purpose of providing both current and future public water service. Boundaries are defined by agreements among adjacent utilities and are recorded on a set of maps on file with BALD and SKCHD. Water service provided within designated service areas must be consistent with local land use plans.
Service Area Agreement	An agreement signed by water utilities which identifies the service area for which the utility has retail water service responsibility.
Service Connection	A physical connection through which water may be delivered to a customer for discretionary use. Unless otherwise indicated, all such connections, whether currently in use or not, shall be considered as a service connection. The service connection defines the limit of the water utility's responsibility for system design and operation unless otherwise provided for in the water utility's condition of service policies. Utility customers such as mobile home parks, planned unit developments, condominiums, apartment buildings, industrial/commercial sites, or other similar complexes are generally considered exterior to the water system. In such cases, the purveyor shall be required to meet design standards for water systems up to the point of service to the customer; and beyond that point, the applicable plumbing and building codes, fire codes, County health regulations, and local ordinances are deemed to be sufficient to protect the public health and to ensure adequate water service. These customers are not themselves considered herein as water purveyors unless specifically designated as such by DSHS.

Water System Plan	A written plan prepared for a particular water system and service area which identifies a schedule of needed improvements, a financial program, and an operations program. A water system which is expanding within a designated service area may be required to include other elements in its plan. Details of Water System Plan requirements can be found in WAC 248-54-065.

ACKNOWLEDGEMENTS

The following individuals served as Chair of the Water Utility Coordinating Committee (WUCC) throughout the initiation and preparation of the Coordinated Water System Plan, or as representatives of the government agencies that participated in the study process.

Gary Cline, King County Water District No. 111, Chairman, WUCC

Frank Currie, City of Auburn, Chairman, WUCC

Dennis Johnson, Covington Water District, Chairman, WUCC

Don Wickstrom, City of Kent, Chairman, WUCC

Bob Bruce, King County Council

David Feltman and Richard Rodriguez, King County Building and Land Development Division

Carolyn Boatsman and Trudy Rolla, Seattle-King County Department of Public Health

David Parkinson, Seattle Water Department

Richard Siffert, Carol Richmond, and Moe Batra, Department of Health

Special recognition is offered to the past and present administrators of the South King County Regional Water Association (SKRWA). The vision and perseverance of John Sawyer in his role as a Commissioner of Federal Way Water and Sewer District were instrumental in forming the SKRWA and initiating the Coordinated Water System Plan (CWSP) process to focus on regional water resource and supply issues facing South King County. Under his late leadership as Administrator, the activities of SKRWA were promoted further in a coordinated effort with other utilities throughout King County and the State. Subsequently, Gary Cline has served effectively as the SKRWA Administrator. He has guided the completion of the CWSP and brought together the diverse interests of various State and local agencies an interest groups benefitting from the CWSP. The success of this CWSP is in a large measure attributable to these gentlemen, the individuals listed above, and the efforts of the WUCC.

SECTION I

SUMMARY

SECTION I

SUMMARY

1. INTRODUCTION AND BACKGROUND

This document is the Regional Supplement of the South King County Coordinated Water System Plan (CWSP). The CWSP consists of two parts: the Regional Supplement, which presents an assessment of water supply needs in South King County and a program to meet those needs; and, individual water system plans prepared by the utilities for their designated service area. The individual plans are prepared within established guidelines and must be consistent with the policies and procedures of this Regional Supplement. Those individual water system plans, which have been approved by the County and the Department of Social and Health Services (DSHS), are incorporated by reference herein in the Appendix, and are on file with the County.

The CWSP was developed by Economic and Engineering Services, Inc. (EES) under the direction of the Water Utility Coordinating Committee (WUCC). The WUCC was appointed in 1986 by the King County Council and included representatives of water purveyors, local governments, and agencies responsible for water supply and public health in King County.

The CWSP meets the requirements of several State laws relating to water resource management and utility planning. The Water Resources Act of 1971, Chapter 90.54 RCW, sets forth the State's fundamentals for water resource management to ensure that the waters of the State will be protected and fully utilized for the greatest benefit to the people of the State. Continuing with the intent of this Act, the Legislature enacted the Public Water System Coordination Act of 1977, Chapter 70.116 RCW. This statute, referred to herein as the "Coordination Act," established procedures (WAC 248-56) for water utilities in the State to coordinate their planning and construction programs with other water utilities and local government in the same geographic area.

Subsequent to passage of the Water Resources Act of 1971, the Department of Ecology (Ecology) issued "Procedures Relating to the Reservation of Water for Future Public Water Supply" (WAC 173-590). These regulations provide for specific resources to be set aside for use by public water systems in a geographical area to meet projected needs for a period of 50 years.

The Public Water Systems Coordination Act or the water rights reservation process may be used separately or in combination by public water systems in the same geographic area. Both of these laws, however, require that a CWSP be prepared for the study area.

Once reviewed by the County for consistency with land use plans, shoreline master programs, and/or local development policies, and after adoption by DSHS, the CWSP becomes the management and planning framework for water supply development within the Critical Water Supply Service Area (CWSSA) for which the CWSP was developed. The CWSP is reviewed every 5 years and amended, as necessary, to meet changing needs.

2. PRELIMINARY ASSESSMENT AND CRITICAL WATER SUPPLY SERVICE AREA DECLARATION

As a preface to implementing the Coordination Act, a "Preliminary Assessment" of water supply and fire protection issues was completed for King County in 1985. The Preliminary Assessment identified several issues of concern in King County that may preclude the delivery of a safe, efficient, and reliable water service to the citizens of the County. Those issues include:

- Proliferation of small water systems.
- Possible limitation of water quantity available to King County.
- Lack of coordination between adjacent water utilities, resulting in an unorganized regional approach and duplication of facilities.
- Overlaps and conflicts in service areas.
- Lack of County policies linking water system planning to land use plans.
- County land use policies and development approval processes which promote/encourage the establishment of small water systems.

Due to the variety and depth of these problems and concerns, the Preliminary Assessment recommended implementation of the Coordination Act in King County.

Following this recommendation, the King County Council, on December 15, 1985, adopted a declaration that a CWSSA be declared for South King County, Skyway, Vashon, and by later amendments, East King County. This action initiated the procedures of the Coordination Act in each area. A WUCC, a representative committee of Class 1 and 2 water purveyors, was then appointed to oversee CWSP preparation in each area. The WUCC recommended the King County Council identify CWSSA external boundaries for each area, and that a CWSP with uniform and consistent policies be developed to meet the objectives of the Coordination Act.

3. PROJECT AUTHORIZATION

Responsibility for development of the South King County CWSP has been shared by King County and the South King County Regional Water Association (SKRWA). The SKRWA is a group of water purveyors throughout this area which functions under the legal authority of an Interlocal Cooperation Act Agreement. The SKRWA assumed responsibility of obtaining grant funding from DSHS for preparation of the CWSP. SKRWA and King County, through Parks, Planning, and Resources Department (PP&R), Building and Lands Development Division (BALD), have administered this project and jointly approved the project's Scope of Work prior to grant application.

Preparation of the CWSP for South King County has been undertaken in accordance with a contract between SKRWA and EES, dated June 16, 1986. The policies, procedures, and recommendations presented herein were developed with the cooperation of the King County PP&R, BALD, the Seattle-King County Health Department (SKCHD), water purveyors and other parties represented on the WUCC, the County Council, Ecology, and DSHS.

4. RELATIONSHIP TO OTHER STUDIES

A comprehensive evaluation of water supply and water resource issues in South King County was a goal shared by the SKRWA and King County. The majority of all supplies in South King County emanate from groundwater or spring sources. Therefore, both agencies supported the simultaneous and comprehensive evaluation of groundwater supplies. As a result, an extensive investigation of groundwater resources was initiated by the U.S. Geological Survey (USGS) at the request and partial funding of SKRWA and King County. Ecology also participated in funding of the USGS study. The USGS study is focused on regional groundwater characterization and availability over an area that encompasses most of the CWSP planning area.

In addition, a Ground Water Management Plan (GWMP) process was initiated. The GWMP process is administered by Ecology with the intent of developing methods to protect the quality and quantity of groundwater, meet future resource needs while recognizing existing water rights, and provide effective and coordinated management of groundwater resources. Again, the SKRWA and King County are co-lead agencies for this project. The focus of the GWMP is to more closely evaluate four specific subareas within the same area used for the USGS study.

In combination, the USGS study will characterize the groundwater supplies, the GWMP will establish methods to properly monitor, protect, and manage the resource, and the CWSP provides administrative procedures for coordinated resource utilization and a regional strategy to ensure that public water supplies can meet the future demands created by adopted King County land use policies.

It was originally intended for all three studies to initiate and conclude simultaneously. However, each has followed a different completion schedule. The CWSP is the first study to be completed, with the USGS and GWMP reports not expected until later in 1989. As a result, information to complete the Water Right Reservation application is unavailable and this CWSP has limited itself to a thorough analysis of existing rights and projected demands, but has not specified groundwater areas for future reservation action.

CWSPs were also initiated simultaneously in other areas of King County. Completion of these documents was coordinated to ensure that uniform design standards, review procedures, satellite system management, and other criteria were developed for implementation within all CWSP areas. Therefore, the completion of the South King County CWSP was delayed to ensure the coordination of these administrative issues. In addition, the supply strategies of the East and South King County CWSP documents are closely related through interties and wheeling of water. These supply aspects were also coordinated and jointly pursued by the WUCCs from both areas to ensure their compatibility.

5. FINDINGS AND CONCLUSIONS

Implementation of the Public Water System Coordination Act has provided an opportunity to address a variety of technical, financial, and administrative problems associated with water utility service in South King County. The following is a summary of the major findings and conclusions which were identified and developed during the development of the CWSP. These findings and conclusions led to the development of the policies, procedures, and recommendations which are presented in summary form later in this Section.

A. Administration

(1) The objective of SKRWA and King County in preparing the CWSP is to assist the area's water utilities in establishing an effective process for planning and development of public water systems. This objective has been met by establishing service areas, design standards, service review procedures, a long-term water supply strategy for the area, and a process to pursue resolution of water resource issues, all in a manner that is consistent with King County land use policies.

(2) Within the CWSSA there are 16 Class 1, 31 Class 2, and over 600 Class 3 and 4 public water utilities. Some of these, along with other unknown or undocumented systems, were installed without review or approval prior to initiation of this Plan.

(3) The County right-of-way franchises issued to water systems are non-exclusive and do not establish a definite boundary for capital improvement planning or for the assignment of service responsibilities to utilities. Service area boundaries identified by each utility through the CWSP process will provide this needed assurance and responsibility that must be honored by local and State agencies, as well as the utility.

(4) Two errors were identified in the external boundary which need to be administratively corrected during approval of the CWSP. The external boundary erroneously omitted a portion of the Normandy Park Water Company, which has recently merged with King County Water District No. 75, and an area around Lake Retreat, both of which participated in the CWSP process.

(5) All Class 1, 2, and expanding Class 3 and 4 utilities were requested to identify their existing and future service area boundaries. These have been recorded on a computerized master map and provided to BALD and SKCHD. Service Area Agreements confirming these boundaries are required to be submitted by all of these systems to confirm their responsibility and role in the provision of water service.

(6) Utilities having signed Service Area Agreements as a part of the CWSP will have exclusive right to the service area described in the Agreement. Utilities not signing the Agreement will have exclusive rights only to their existing service area.

(7) Design standards and specifications for the construction of water facilities were developed as criteria for developers and utilities alike. They are consistent with King County land use policies. More stringent standards may be applied if mandated by a specific utility. However, prescribed criteria must be met in rural areas which are consistent with the adopted King County Comprehensive Plan.

(8) A Utility Service Review Procedure (USRP) was developed which establishes a uniform procedure for referral of applicants for development approvals to existing water utilities and Satellite System Management Agencies (SSMA) as a first right of refusal of water service. The intent of the process is to identify existing purveyors who are willing and able to provide water service. This procedure will be administered by BALD and help ensure accountability for decisions and clarify the authority of the various agencies.

How do the utilities designate areas for service??

(9) A Satellite System Management Program was developed to ensure that long-term operations and management is available for existing small systems and for new systems in areas either not designated for service by existing utilities or in areas where existing utilities are unable to provide an immediate connection.

(10) An appeals process was developed to resolve disputes regarding the provision of timely and reasonable service. Appeals may be filed by either a water service applicant, developer, or utility in the event of a dispute arising through the administrative procedure of the CWSP. All appeals are to be submitted in writing to BALD. BALD simultaneously provides the appeal to the SKRWA and the King County Utility and Technical Review Committee (UTRC). If a solution cannot be reached by the SKRWA, a decision is made by the UTRC. The decision of the UTRC shall be binding on all parties, subject to further appeal rights granted by statute.

(11) The BALD was designated as the King County lead agency in implementation of the CWSP. As such, BALD serves as the initial and primary contact for most institutional and administrative activities. The SKCHD and DSHS also have regulatory roles in relationship to public water systems, as such they will carry out key provisions of the CWSP in South King County.

(12) A framework for a Utility Data Management Center (Center) to be operated jointly by the East King County Regional Water Association (EKRWA) and the SKRWA was established. The objective is to assemble, maintain, and provide water quality, water use, mapping, and technical support to the member utilities. The framework recognizes the necessity and contractual requirements for a parallel water quality data file to be developed and maintained by the SKCHD to fulfill their regulatory and groundwater management responsibilities. The water quality data files for the Center and SKCHD should be interchangeable and a joint effort to maintain them in a current date condition.

B. Water Utility Planning and Operations

(1) The CWSP Regional Supplement provides the framework for water supply and system planning. All water purveyors should consider the findings and conclusions of the CWSP and ensure that their individual water system plans are consistent with the CWSP.

(2) Water conservation was addressed in the study process as a supply option. Drawing upon existing literature and the experience of member utilities, 24 conservation measures were identified as having some potential for successful implementation by South King County utilities. These measures were then grouped for evaluation into the categories of public education, technical assistance, and policy. A three-tiered program was then developed which varies in scope based upon the size of the utility. Each program utilizes the resources of utilities and the SKRWA. The programs (base, moderate, and comprehensive) target water savings of 4 to 8 percent by the year 2000 as expressed in a reduction of the average day per capita consumption requirement.

(3) Future population and water demand projections for 10-, 25-, and 50-year planning periods have been developed for South King County under various options which acknowledge the impacts of conservation efforts and increased multi-family densities. The growth and demand scenario which includes conservation impacts has been employed by the CWSP as the target projections for source of supply evaluations.

The population trends are based on the 1988 moderate growth forecasts prepared by Puget Sound Council of Governments (PSCOG). Per capita consumption data from area utilities were developed for urban, transitional, and rural Forecast Analysis Zones (FAZs). In addition, an estimate of saturation population and demands were developed with County staff based upon the approved King County Comprehensive Plan. The 1985 population and peak daily demands, respectively, were 247,615 and 87 MGD. The year 2000 population is 347,139, with peak demands ranging from 110 MGD to 122 MGD based, respectively, on conservation impacts versus continued existing conditions. The year 2040 population is 617,270, with peak demands of 194 MGD or 216 MGD based on the same conditions as above.

The importance of population and demand forecasting cannot be overstated, nor can the need for periodic updates of these trends and the data used to generate them. Although econometric model forecasting provides a desirable level of sophistication, it requires sufficient input data for many historical and future variables to render reliable results. Therefore, all utilities within the CWSP area, especially Class 1 systems, need to routinely collect information needed to conduct a forecast model during the next update of the CWSP.

(4) Shorter term population and demand forecasts were used for purveyors to prepare their individual water system plans and identify capital improvements in their system during the next 5-10 years. Longer-range projections have been used for regional resource supply and management strategies.

(5) Each utility is responsible for the preparation of its own individual water system plan. King County and DSHS have agreed that individual water system plans must be submitted for review within 1 year from the date of CWSP completion, i.e. the date of CWSP submittal to the King County Legislative Authority for review. Individual plans submitted earlier may be approved by the County and DSHS. However, all plans will be considered to have the same submittal and approval date as the CWSP.

(6) In many instances, water rights for the utilities appear to be outdated and in need of review and correction by the utility and Ecology. Many systems have certified rights on sources no longer in use which tends to overstate the amount of firm yield.

(7) There are a large number of small water utilities in South King County which are operating with limited financial, staff, and water resources. These systems have difficulty in meeting current needs, and are unable to meet additional requirements imposed by growth or the State and Federal Safe Drinking Water Act. The small size and inadequate revenue base of many of these utilities will make it difficult to finance needed improvements. Staffing of such water systems is usually on a volunteer basis and needed maintenance and monitoring is likely to be overlooked. County and State support is needed to ensure compliance with public health and minimum service requirements and to encourage the merger of these systems with adjacent larger utilities. This is necessary to provide proper water service. Satellite management services may also provide this assistance.

C. Water Resource Strategy

(1) Potential exists for immediate implementation of an effective water conservation program. This should be a joint effort of the utilities and SKRWA. Water conservation should be the foundation of the water resources strategy.

(2) Local groundwater is the primary source of supply for most South King County water purveyors, except King County Water District No. 75 which purchases water from the City of Seattle.

(3) Only a few water systems have adequate groundwater monitoring programs. The current database is inadequate to manage the groundwater resources without the cooperation of all water purveyors and local government.

(4) Groundwater plays an important role in managing the use of surface water supplies. Conjunctive use relieves surface water demands during summer low flow periods, and allows groundwater to recharge by maximizing surface water use in high flow periods.

(5) Continued development of local wells will remain an important near-term solution. However, preliminary results of the GWMP suggest the intermediate aquifers in the Federal Way area and aquifers in the King County Water District No. 75 and Des Moines areas are nearing their withdrawal capacity. In addition, these preliminary results also raise doubt regarding the ability of local groundwater throughout the CWSP study area to satisfy projected long-term demands and/or saturation densities.

(6) Supply options from surface water sources within the Puget Sound region, from the Nisqually River to the Skagit River, are limited due to competing uses, source development problems, water right considerations, and treatment costs. In most instances, the limiting factor is the established instream flow.

(7) Reliance upon imported surface water from the City of Tacoma's Pipeline No. 5 and an intertie with supplies from the City of Seattle's Cedar River supply system are integral to long-term supplies for South King County.

(8) An evaluation of source requirements for the larger Class 1 regional utilities in the SKRWA utilities was conducted to schedule additional source improvements. This indicates the combined resources of Federal Way, Kent, Auburn, KCWD 75, Covington Water District, and KCWD 111 to have a surplus of 12.7 MGD in the year 2020 and a deficit of 14.5 MGD by 2040 in meeting demand forecasts under the conservation scenario. Because not all surplus waters can be hydraulically "wheeled" to offset deficiencies in other regional utilities, the deficit in 2020 and 2040 increases to 2.2 MGD and 23.9 MGD if only 50 percent of surplus capacity is assumed available to meet regional demands.

(9) Tacoma's Pipeline No. 5 project will initially provide 15 MGD supply to South King County. Covington Water District, Federal Way Water and Sewer District, the City of Kent, and KCWD 111 have purchased 3.46 MGD, 4.62 MGD, 4.62 MGD, and 2.31

MGD, respectively. The contract calls for the availability of those supplies by January 1, 1993. Enhancement of the Howard Hanson Dam will increase available supplies to Tacoma and its users by approximately 32 MGD.

(10) Tacoma's Pipeline No. 5 also provides an option for artificial recharge of aquifers in the South King County area. Two possible areas suitable for recharge are Auburn and Federal Way which are both bisected by Pipeline No. 5.

(11) Covington Water District, KCWD 111, and Cedar River Water and Sewer District have entered negotiations with the City of Seattle to obtain water from the Cedar River Supply System and wheel water through their piping to all contiguous systems. In addition, the City of Black Diamond, subject to a final determination regarding its authorized water rights, has approximately 7.5 cfs of unused water from its springs that it has indicated may be available from sale to adjacent utilities or to the Pipeline No. 5 grid.

The continued development of interties between adjacent utilities will enhance reliability and build a hydraulic grid suitable for meeting emergency needs and "wheeling" water for regional supplies.

6. RECOMMENDATIONS

The following recommendations provide guidance to the County and water purveyors in implementing the water system development programs which will meet the needs of South King County.

A. Administration

(1) The PP&R/BALD should continue to serve as the lead agency in guiding the implementation of the CWSP.

(2) Following adoption of the CWSP, the Boundary Review Board should be formally notified of those utilities who have signed Service Area Agreements, of the service area boundary of each such utility and be requested to recognize these boundaries in the conduct of the Boundary Review Board responsibilities.

(3) The service area boundaries established by the CWSP process should be recognized in the County franchise program for the provision of utility service.

Council authority preempted?

planning area?

(4) Procedures for the review and approval of water service to new developments located in the County should follow the USRP, identified in Section V of this CWSP.

(5) DSHS and King County should establish, by appropriate rule and ordinance, a Satellite System Management Program, as outlined in Section VI of this CWSP. The goal of this program is to guarantee that long-term operations and management responsibility will be assumed by qualified agencies for new and existing satellite water systems.

(6) King County should review and amend, if necessary, existing Code 13.24, to ensure the UTRC has the authority to review and resolve appeals or disputes, as provided in the CWSP. These appeals or disputes may be filed either by a water service applicant, a developer, a utility, or another affected entity over matters pertaining to the timely and reasonable provision of service.

(7) King County should adopt, by ordinance, the Minimum Standards and Specifications for water utilities, developed by the South King County WUCC, outlined in Section IV. A water utility may adopt more stringent standards in its own service area, as long as standards in rural areas are consistent with the adopted King County Comprehensive Plan.

(8) SKRWA should enter into appropriate agreements for development of a Center by EKRWA providing data management and technical service assistance.

B. Water Utility Planning and Operations

(1) It is recommended that, unless a documented health problem exists, approval of proposed system expansion be derived for systems that have not submitted their water system plan or service area agreement within 1 year from the date of submittal of the CWSP by the WUCC to the County Council.

(2) Each water utility should verify that Ecology has properly recorded water rights for the sources and service area of its water system. A water right application should be filed immediately if documents are not recorded. Utilities wishing to retain rights on sources no longer in use should work with Ecology and a groundwater geologist to evaluate the likelihood of developing another source from the same aquifer, thereby enabling application for a change in the point of withdrawal. Any unused or non-transferrable water rights should eventually be relinquished.

(3) Water utilities already having or which are interested in participating in interties, regional supplies, or other shared facilities, should identify the appropriate boundary encompassing the place of use for all new water right applications. Further, Ecology should be requested to revise existing water rights for these facilities to reflect a point of use that encompasses the expanded boundary.

(4) The SKRWA should utilize the results of the ongoing GWMP to prepare and submit an application for water rights reservation. Efforts should also be initiated to pursue the requirements associated with water rights issued on waters to be used for artificial groundwater recharge.

(5) Water utilities throughout South King County should adopt the water conservation program presented in Section VII and actively pursue measures of implementing the program as a means to reduce future water demands and to postpone future source development. In addition, the utilities should work closely with Ecology, DSHS, and local agencies to facilitate State and local legislation that supports prudent conservation measures by all users of ground and surface waters of the State. It is further recommended that the SKRWA and South King County WUCC support utility efforts by implementing their responsibilities assigned by the conservation program.

(6) All water utilities should review and implement the water quality and quantity monitoring programs developed by the GWMP. Particular improvements are needed in the area of metering production from all sources of supply and customer consumption, periodic measurements of static and dynamic water levels in all sources, and scheduled water quality testing. This data should be routinely entered into the data base program developed by the GWMP.

(7) Utilities should include in capital facilities planning the capability to provide fire flow, as required by the Minimum Standards and Specifications.

(8) Utilities participating in regional supply network development should develop joint financing and source development programs based on mutual benefits.

(9) All interties with adjacent utilities should be sized to accomplish the appropriate regional objective of reliability, regional transmission, and/or emergency interties.

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(10) The WUCC should work closely with Ecology and DSHS to reach agreement on the appropriate variables for econometric modelling of water demand forecasts. Once agreement is reached, the WUCC should notify utilities of the type of data and frequency of collection required to refine the modelling forecast during the update of the CWSP. The WUCC should monitor the progress of key utilities in collection of this data and to submit the data for inclusion in the EKRWA/SKRWA Center.

C. Water Resource Strategy

(1) Water utilities should follow the recommendations of the GWMP and consult with hydrogeologists to develop available groundwater supplies within their area.

(2) Work closely with Tacoma during construction of Tacoma's Pipeline No. 5 supply to make this supply available by 1993, and support efforts for the Howard Hanson Dam enhancement project.

(3) Initiate efforts to identify the location, capacity, operational conditions, and water resource regulatory constraints of artificial recharge projects in the South King County area.

(4) Pursue with Tacoma and Seattle the location, funding, and schedule of an intertie between Pipeline No. 5 and the Cedar River supply system.

(5) Investigate other options for the importation of supplies of regional significance.

D. Implementation

(1) Several programs and studies which are vital to the provision of efficient and reliable utility service in South King County have been identified in the CWSP. The programs and studies are generally presented in Exhibit I-1 along with recommended time frames for their implementation. Each water purveyor should assist in the implementation of the programs and studies.

(2) Once approved by the WUCC, this CWSP should be reviewed by King County for conformance with County policies and submitted to DSHS for approval pursuant to Chapter 70.116 RCW.

(3) The King County Council should administratively amend the CWSSA external boundary to incorporate two adjustments in the boundary alignment which omitted portions of Normandy Park Water Company and Lake Retreat.

(4) The WUCC and County agencies should assist DSHS, as requested, in the resolution of unresolved service area conflicts to ensure that final service areas are consistent with County utility service objectives.

(5) Twice annual meetings of the WUCC should be scheduled to review CWSP implementation.

(6) The minimum water systems standards presented in Section IV should be reviewed annually by a review committee of the WUCC. Recommended revisions should be submitted to the County Council for adoption.

(7) The objectives and procedures outlined in the CWSP are considered to be reasonable and achievable by all properly operated water systems. Repeated failure to provide safe, reliable, and minimum levels of water service, as measured by the CWSP criteria, should serve as a basis to evaluate adequacy of service. If a water purveyor repeatedly violates health and operational standards, the WUCC, King County, and DSHS should evaluate procedures to ensure the system is upgraded or placed into receivership. Such a program must follow due process. However, the customers have a right to expect good quality water service based on cost of service.

(8) This CWSP should be revised and updated, as necessary, every 5 years, as prescribed by Chapter 70.116 RCW.

EXHIBIT I-1

CWSP IMPLEMENTATION SCHEDULE
(September, 1989)

Program Elements	Responsible Entity	1 Q 1990	2 Q 1990	3 Q 1990	4 Q 1990	1 Q 1991	2 Q 1991	3 Q 1991	4 Q 1991	1992	Comments
1. Plan Adoption											
A. CWSP	BALD/DSHS	(1)	(2)								
B. Individual Water System Plans	Utility					(1,2)					
2. DSHS Program on											
A. Satellite System Management	DSHS										
B. Sm. System Financial Criteria	DSHS		(2)								
3. King County Ordinances											
A. Minimum Design Standards	BALD		(1)								
B. Satellite System Management	BALD/SKCHD			(1)							
C. UTRC Review Authority	BALD		(1)								
D. Service Area Boundaries Recognized in Boundary Review Board & Franchise Activities	BALD		(1)								
E. Service Area Agreement A Prerequisite to Expansion of Service	BALD/SKCHD		(1)								
F. Amend Standards for Approval of Water Comprehensive Plan	_____				(1)						
4. Water Utility Coordinating Comm.											
A. Scheduled Meetings	WUCC				(3)		(3)		(3)	(3)	Twice Annually
B. Establish Appeal Resolution Subcommittee	WUCC			(3)							
C. Review Design Standards	Subcomm.				(3)				(3)	(3)	Annually
D. Monitor GWMP Activities	WUCC										Ongoing
E. Reach Agreement w/DSHS & Ecology on Econometric Modelling of Demand Forecasting	WUCC	(3)									

EXHIBIT I-1 continued

Program Elements	Responsible Entity	1 Q 1990	2 Q 1990	3 Q 1990	4 Q 1990	1 Q 1991	2 Q 1991	3 Q 1991	4 Q 1991	1992	Comments
6. Regional Resource/Supply											
A. Implement Water Conservation Program	SKRWA/ Utilities			(3)							Phased
B. Pipeline No. 5 Construction	SKRWA	(1,2)	(3)								Complete 1992
C. Artificial Recharge Invest.	SKRWA/ Utilities		(3)				(3)				
D. Seattle Intertie Investigation	SKRWA/ Utilities	(3)				(3)					
E. Groundwater Monitoring Prog.	SKRWA	(3)									Ongoing
F. Collect Use/Supply Data	Utilities	(3)									Ongoing
G. Implement Database Management System	SK/EK RWA SKCHD	(3)									Ongoing
7. Update CWSP	BALD/WUCC										Every 5 Years

Footnotes:

(1) Acceptance or approval by County.
(2) Adoption or approval by State regulatory agency.
(3) Action by other agency/entity.

SECTION II

THE COORDINATED WATER SYSTEM PLAN PROCESS

SECTION II

THE COORDINATED WATER SYSTEM PLAN PROCESS

1. INTRODUCTION

The Public Water System Coordination Act, enacted in 1977 and codified as Chapter 70.116 RCW, establishes a procedure for the State's water utilities to coordinate their planning and construction programs with adjacent water utilities and other local governmental activities. This Act specifies that the Department of Social and Health Services (DSHS) or the County Legislative Authority may declare an area within a County as a Critical Water Supply Service Area (CWSSA). This declaration is based upon the findings of a Preliminary Assessment identifying problems related to inadequate water quality, unreliable service, or lack of coordinated planning.

In 1971, the State Legislature enacted the Water Resource Act, Chapter 90.54 RCW, which set forth fundamentals of water resource policy to ensure the waters of the State will be protected and fully utilized for the greatest benefit of the people of the State. Subsequently, "Procedures Relating to the Reservation of Water for Future Public Water Supply," Chapter 173-590 WAC, were established. These procedures are available to public water systems within a geographical area for use in reserving water rights required to meet their projected domestic needs over the next 50 years. This program is administered by the Department of Ecology (Ecology) in an effort to resolve competing water use activities within a geographical area and establish a management system that will ensure that an efficient overall water resource program is developed.

The Public Water System Coordination Act and the Water Rights Reservation processes may be used individually or in combination by the local public water utilities. Implementation of either of these laws requires that a Coordinated Water System Plan (CWSP) be prepared for the study area. The South King County CWSP has been prepared in accordance with requirements of both. It consists of a compilation of water system plans prepared by each expanding water utility, and this document, which is known as the Regional Supplement. A listing of applicable supporting regulations is provided in Appendix A.

2. PRELIMINARY ASSESSMENT

In an effort to address various issues and concerns related to water supply in King County, a Preliminary Assessment of problems related to water supply and fire protection issues, water quality, and reliability of service was prepared by King County. This report, entitled "Preliminary Assessment of Water Supply

and Fire Protection Issues in King County" was completed by the King County Department of Planning and Community Development and accepted by the King County Council by Motion No. 6407, on December 16, 1985.

Several problems were identified in the Preliminary Assessment, many of which could be solved on an individual utility basis. There were, however, a number of problems the Preliminary Assessment identified as being most appropriately solved through implementation of the Coordination Act. These items are summarized in the recommendations of the Preliminary Assessment as shown in Exhibit II-1.

Based on the conclusions of the Preliminary Assessment, the King County Council declared the South King County a CWSSA through Ordinance No. 7578, also on April 21, 1986, as shown in Exhibit II-2.

By this action, the Public Water System Coordination Act was invoked. A Water Utility Coordinating Committee (WUCC) was formed by King County Ordinance No. 7589, dated April 21, 1986. The WUCC was made up of representatives of all purveyors with 50 or more service connections, as well as representatives from King County and DSHS.

As its first action, the WUCC recommended the External Boundaries of the CWSSA. The County Council formally adopted External Boundaries on September 22, 1986, by Ordinance No. 7785. The area served by the Normandy Park Water Company and the area around Lake Retreat were originally recommended by the WUCC to be included within the external boundary. They were inadvertently omitted from the study area map incorporated with Ordinance No. 7785. These corrections are shown in Exhibit II-3, and utilities within these areas were incorporated into the CWSP planning process. Therefore, the WUCC recommends adoption of these changes in the final Plan approval.

3. CWSP PREPARATION

Preparation of the CWSP involved the joint efforts of participating local WUCC members and County agency staff through approximately 2 years of monthly meetings. In addition, a design standards subcommittee met frequently to address facility design standards and specifications. Several special meetings were also held with County departments to establish or clarify policies. Finally, a combined committee of representatives from the various CWSSA areas met frequently with County staff to clarify issues and strive for uniform procedures, policies, and standards throughout King County. The South King County CWSP generally preceded all other areas in development. The draft CWSP for South King County was issued in August, 1988. Completion of the final CWSP was delayed until September, 1989, to facilitate development of uniform procedures, policies, and strategies among South King, East King, and other area WUCCs. Uniformity was reached among the South and East King County WUCCs on

major administrative procedures. Some subtle differences exist between the CWSSA areas on limited issues. The option for continued discussion between the WUCCs and County was preserved for these issues.

In addition, a thorough review was made of all available studies and reports regarding water resources, water quality, land use, population projections, and other general planning topics. Existing and proposed regulations and ordinances promulgated either by federal, State, County, or local governing bodies were also examined.

The CWSP results were further coordinated with ongoing studies by the U.S. Geological Survey (USGS) to characterize groundwater supplies within a similar study boundary, and efforts by South King County Regional Water Association and King County to develop a Ground Water Management Plan (GWMP) for the area.

The following areas received particular emphasis during preparation of the CWSP:

A. Future Service Area

Each utility was requested through correspondence, and during the WUCC meetings, to plot its existing and future service area boundaries on a map. Each Class 1 and 2 system was sent a certified letter, along with a 7-1/2' USGS map, requesting identification of its proposed future service area. Class 3 and 4 systems were also contacted by Seattle-King County Health Department (SKCHD) to determine those anticipating future service expansion. The future service area boundaries were plotted on base maps to identify conflicting or unclaimed areas. Those utilities that did not identify their future service area were assumed not to be interested in expanding. For those utilities, the future service area was assumed to correspond to the existing service area. A standard agreement was formulated to allow utilities to recognize adjacent service areas by reference to the standard base maps. No known service area conflicts are unresolved.

A more thorough description of the procedures utilized in establishing utility service areas is described in Section III.

B. Minimum Design Standards

This subject included a diverse list of considerations by the utilities, including: material specifications, construction practices, distribution facilities, metered services, fire flow requirements, etc. The contents and

application of these standards were developed jointly through input of WUCC representatives and the County. Consistency with standards developed for the East King County CWSP was achieved.

Final standards are included in Section IV. When accepted and adopted by ordinance by the County and approved by DSHS, these will become the minimum standards for all new water system improvements. A water utility may adopt these standards by reference, or may adopt more stringent standards.

C. Utility Service Review Procedure (USRP)

The USRP was developed to identify the appropriate purveyor, both willing and capable, to provide water service to new developments and expansions. This procedure utilizes the recognized future service areas as a basis for assigning new applicants for development permits to water utilities. In undesignated areas, the procedure emphasizes adjacent utilities with an approved water system plan as the preferred service providers. If qualified existing utilities are not adjacent, the King County Building and Land Development Division (BALD) may refer the developer to a Satellite System Management Agency (SSMA). A structured uniform approach in utilizing this review procedure was developed jointly with other WUCCs. The recommended program for utility service review is outlined in Section V.

D. Satellite System Management Program

A program for providing satellite management services to existing and new water systems was developed. These services would be provided by SSMAs meeting qualifications established by DSHS. This program is described in Section VI.

E. Regional Water Supply

The regional supply needs of South King County were evaluated for the future 10-, 25-, and 50-year planning periods. Forecasts of future population and water demand within the area were made based upon the 1988 Puget Sound Council of Governments report entitled, "Population and Employment Forecasts" and water use data from local utilities. Various assumptions regarding conservation and multi-family usage impacting future demand were considered. Preliminary groundwater data from the ongoing GWMP were evaluated and compared to future demands. Long-term water supply alternatives were considered. The conclusion was reached that a conjunctive use program of ground and surface water supplies will provide the most flexibility and reliability in providing new

source. Reliance upon surface supplies from Tacoma's Green River Pipeline No. 5 and interties with Seattle's Cedar River supply system were evaluated using a hydraulic analysis program. Section VII presents these conclusions.

F. Water Rights

A thorough review of the status of existing water rights was conducted for utilities within the CWSSA. Two sources of information were compared. One source was the water right printout records and the water right claims registry of Ecology. The other was in-service/installed capacity information obtained from utility questionnaire responses, utility comprehensive water plans, and the Water Facility Inventory of DSHS. The result was a determination of: (1) where a utility's present use appears to not be adequately covered by water rights; and, (2) those instances where a utility holds water rights for future expansion of use.

Subsequent to completion of the CWSP, the original intent by South King County Regional Water Association and the WUCC was to submit a water rights reservation application. In March, 1988, the Legislature enacted Substitute Senate Bill No. 6724 which prohibited action on water right reservation applications until July 1, 1989. This deadline has now passed. However, results and correlation between the USGS and GWMP studies regarding groundwater characteristics and yield capacities are not yet available. Therefore, the CWSP focused on assessing current capacities, water rights, and data limitations required for filing a petition for water right reservation.

G. Individual Water System Plans

The Public Water System Coordination Act states that each purveyor within the External Boundary shall be responsible for preparing a Water System Plan for the purveyor's future service area. An exception to this criteria exists for non-municipally owned public water systems that existed prior to September 21, 1977, and which have met minimum State Board of Health requirements but do not plan to extend water service beyond their existing area.

The planning requirements are determined by DSHS and vary for utilities based upon their size. These requirements are summarized below and described more completely in Appendix B.

(1) Systems over 1,000 service connections - complete water system plan.

(2) From 100 to 999 service connections - abbreviated water system plan.

(3) Remaining systems - planning questionnaire.

Appendix A also presents a questionnaire used by SKCHD which, in conjunction with the DSHS Water Facility Inventory form, fulfills the planning requirement for all systems with less than 100 service connections. All completed water system plans of the individual utilities are incorporated herein to the CWSP by reference, as Appendix C and are kept on file at BALD.

It should also be noted that Chapter 13.24 King County Code requires that a King County Water Comprehensive Plan be approved by the King County Council as a prerequisite for the granting of new right-of-way franchises, right-of-way construction permits, and right-of-way franchise renewals.

Exhibit II-4 illustrates the procedure established for the review and approval of individual water system plans by the County and DSHS. This procedure should be utilized for plans reviewed as a component of the CWSP effort. It is recommended as the review method of plans not yet submitted and for updates of all individual plans.

4. REGIONAL SUPPLEMENT

This plan has been prepared under the provisions of WAC 248-56-700 which allows for a CWSP which consists of: (1) a compilation of water system plans approved by DSHS, and (2) a supplement which addresses water purveyor concerns relating to the entire CWSSA. The review and approval procedure for this document, the Regional Supplement, is outlined in Section IX.

Table II-1 lists the Class 1, 2, and expanding Class 3 and 4 water utilities and indicates whether their signed boundary agreement has been filed, the level of their water plan requirements, and if a plan has been submitted and approved. This Table serves a number of purposes including the following:

A. Identifies for each utility its degree of compliance with the planning requirements of the CWSP.

B. Assists King County and DSHS in their review of the CWSP for consistency with County policies and state statutes and regulations.

C. Directs King County and DSHS attention to those utilities which must satisfy basic CWSP planning requirements before system improvement and/or expansion of service takes place.

As indicated on Table II-1, some utilities have not submitted their service area agreement or water system plans. The WUCC recommends that all water utilities complete these documents and submit them to DSHS and BALD no later than 1 year from the date the CWSP is submitted to King County for review. Unless a documented health-related improvement is involved, approval of proposed system expansions should be denied for utilities not meeting these requirements after that date. If a service area conflict arises, development activity should be denied within the contested service area. Due to the importance of tracking the status of these utilities, the BALD should be responsible for completing and updating Table II-1 and updating the service area maps. The AutoCAD disks used to develop the base map and all service areas have been provided to BALD for this purpose.

The Regional Supplement has been completed and is represented by the document contained herein. The compilation of individual water plans indicate that many utilities must prepare or update their plans. WAC 248-56-800 enables DSHS to approve portions of the CWSP found to be consistent with adopted plans and policies. As additional water system plans receive County and DSHS approval, they may be administratively included within the adopted CWSP.

TABLE II-1

SOUTH KING COUNTY WATER UTILITY PLANNING STATUS SUMMARY

System	Service Area Agreement Submitted	Plan Requirement	Plan Submitted (S)/ Approved (A)	Number Approved Svcs. (1)	No. of Service Connections (1)
Class 1					
King Co. WD 54	X	AWSP		N/A	593
King Co. WD 75	X	WSP	S	N/A	14,571 (2)
King Co. WD 94	X	AWSP			121
King Co. WD 111	X	WSP	S		3,076
Algona Water	X	AWSP			540
Auburn, City of	X	WSP			8,100
Black Diamond, City of	X	AWSP			389
Cherokee Bay Comm. Club	X	AWSP			400
Covington Water District	X	WSP	S		6,618
Enumclaw, City of		WSP			3,500
Federal Way Water & Sewer		WSP	S		17,680
Kent, City of	X	WSP	S		7,762
Milton, City of		WSP	(3)		-
Pacific, City of		AWSP			738
Tacoma, City of		WSP	(3)		-
Class 2 (4)					
201 - Auburn E. Mobile	X	Q			75
202 - Auburn Mobile Park	X	Q			63
204 - A.C. Butcher		Q			12
205 - Chambers Water Co.		Q			11
206 - Crestview Tracts #3		Q			22
207 - Crestview Water #4		Q			19
208 - Crestview W. Water		Q			50
211 - Derbyshire Acres		Q			59
212 - Diamond Spring Water	X	Q			37
214 - Erickson Suburban		Q			34
215 - Evergreen Sky Ranch		Q			13

TABLE II-1 continued

System	Service Area Agreement Submitted	Plan Requirement	Plan Submitted (S)/ Approved (A)	Number Approved Svcs. (1)	No. of Service Connections (1)
219 - Hazelwood Heights		Q			30
223 - Logandale Water Co.		Q			27
225 - Masonic Home of WA		Q			(5)
226 - Meridian Meadows		Q			39
227 - Morton Manor #2		Q			12
228 - Muckleshoot Comm.		Q			33
229 - Newaukum Country		Q			22
231 - Ravensdale Trailer		Q			25
232 - Ravensdale Water Co.		Q			32
233 - Remolif Addition		Q			23
234 - Sawyerwood Estates	X	Q			17
235 - Sawyerwood Water		Q			10
236 - Sched Water/P.T. Park		Q			75
237 - S. Auburn Water	X	Q			16
239 - Walczak		Q			40
240 - Welchs Water Assn.		Q			23
241 - Wells Water Assn.		Q			13
242 - Wolschlagel #1/ Wesley Gardens		Q			16
243 - Y Bar S		Q			76
238 - Sunset Park Water		Q			24

TABLE II-1 continued

System	Service Area Agreement Submitted	Plan Requirement	Plan Submitted (S)/ Approved (A)	Number Approved Svcs. (1)	No. of Service Connections (1)
Class 3 & 4 (Expanding)					
Darroll Anderson		Q			
B.P. Public Water		Q			
Barr Communal Water		Q			
Johnson-Staton		Q			
L. Boysen		Q			
Burton		Q			
Green River Gorge Resort		Q			
Christensen-Gambell		Q			
Jim Graswell		Q			
Mike Dacey		Q			
Daniels		Q			
Roy Daniels #3		Q			
Diamond		Q			
R. Benson		Q			
Habenicht		Q			
Hilde		Q			
Houser		Q			
Iddings Farm Service		Q			
Kennedy-Plummer		Q			
Klein		Q			
Lake Retreat Bible Camp		Q			
Dorothy Landis		Q			
Richard Lovell		Q			
Olson Public Water		Q			
Gorge Heights		Q			
Massena		Q			
Maxey North		Q			
Maxey South		Q			
McGatlin		Q			
SE 176 Water		Q			
Newman		Q			
Maple Ridge		Q			
Purdue		Q			

TABLE II-1 continued

System	Service Area Agreement Submitted	Plan Requirement	Plan Submitted (S)/ Approved (A)	Number Approved Svcs. (1)	No. of Service Connections (1)
Person		Q			
Friends of the Plateau		Q			
James Robertson		Q			
Tatman		Q			
E. Thomas		Q			
Todnem		Q			
Vahberg		Q			
West		Q			

Footnotes:

(1) Taken from DSHS Water Facility Inventory (WFI) forms or obtained from: SKCHD records; contact with water system; or copies of water system plans.

(2) Includes Normandy Park.

(3) Water System Plans prepared for Pierce County CWSP. Reviewed and found to be compatible with South King County CWSP.

(4) Identification number assigned only for mapping purposes.

(5) Transitory population.

Abbreviations:

AWSP - Abbreviated Water System Plan
Q - Questionnaire
WSP - Water System Plan

EXHIBIT II-1

RECOMMENDATIONS OF THE PRELIMINARY ASSESSMENT OF WATER SUPPLY AND FIRE PROTECTION ISSUES IN KING COUNTY

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.

Ground Water Management

4. 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.

5. 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

6. 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.

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

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

9. 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

10. 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

11. 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.

12. 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.

13. 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.

14. 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

15. 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.

16. Water quality information needs to be exchanged among various agencies (King County, DSHS and the 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.

17. 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

18. 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.

19. 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.

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

21. 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.

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

CREATION OF SOUTH KING COUNTY CRITICAL WATER SUPPLY SERVICE AREA

December 12, 1985
7560A/BB:tmb

Introduced by: BRUCE LAING

Proposed No.: 85-675

ORDINANCE NO. 7578

AN ORDINANCE related to water supply and fire protection issues in King County, and declaring Critical Water Supply Areas in King County pursuant to R.C.W. 70.116.040.

PREAMBLE:

In accordance with the provisions of R.C.W. 70.116.040 and W.A.C. 248-56-300 through 400, the County Executive has prepared a preliminary assessment on water supply and fire protection issues in King County which, among other things, proposed the designation of certain areas as critical water supply areas in King County.

As required, the preliminary assessment was submitted to the King County Council for acceptance. The council formally accepted the report and the recommendations pertaining to critical water supply areas by Motion 6407 on December 16, 1985.

Whereas state law requires that the county legislative authority declare critical water supply areas by legislative enactment, this ordinance supplements the motion accepting the report by formally declaring the critical water supply areas.

BE IT ORDAINED BY THE COUNCIL OF KING COUNTY:

SECTION 1. Pursuant to Chapter 70.116 R.C.W., the King County Council hereby declares the areas of South King County, Skyway, and Vashon as critical water supply areas (as preliminarily mapped in the Preliminary Assessment accepted by Motion 6407.) The county executive shall notify the Department of Social and Health Services, State of Washington, and form Water Utility Coordinating Committees pursuant to

R.C.W. 70.116.040 for the purpose of preparing coordinated water supply plans for the declared areas.

INTRODUCED AND READ for the first time this 16th day of December, 1985.

PASSED this 21st day of April, 1986.

KING COUNTY COUNCIL
KING COUNTY, WASHINGTON

Audrey Gruger
Chair

ATTEST:

Dorothy M. Owens
Clerk of the Council

APPROVED this 30th day of April, 1986.

D. Ron Sims
King County Executive

EXHIBIT II-3

SOUTH KING COUNTY
CWSP EXTERNAL BOUNDARY

LEGEND

ORIGINAL EXTERNAL BOUNDARY .....

RECOMMENDED EXTERNAL BOUNDARY ▬▬▬

ECONOMIC AND ENGINEERING SERVICES, INC.

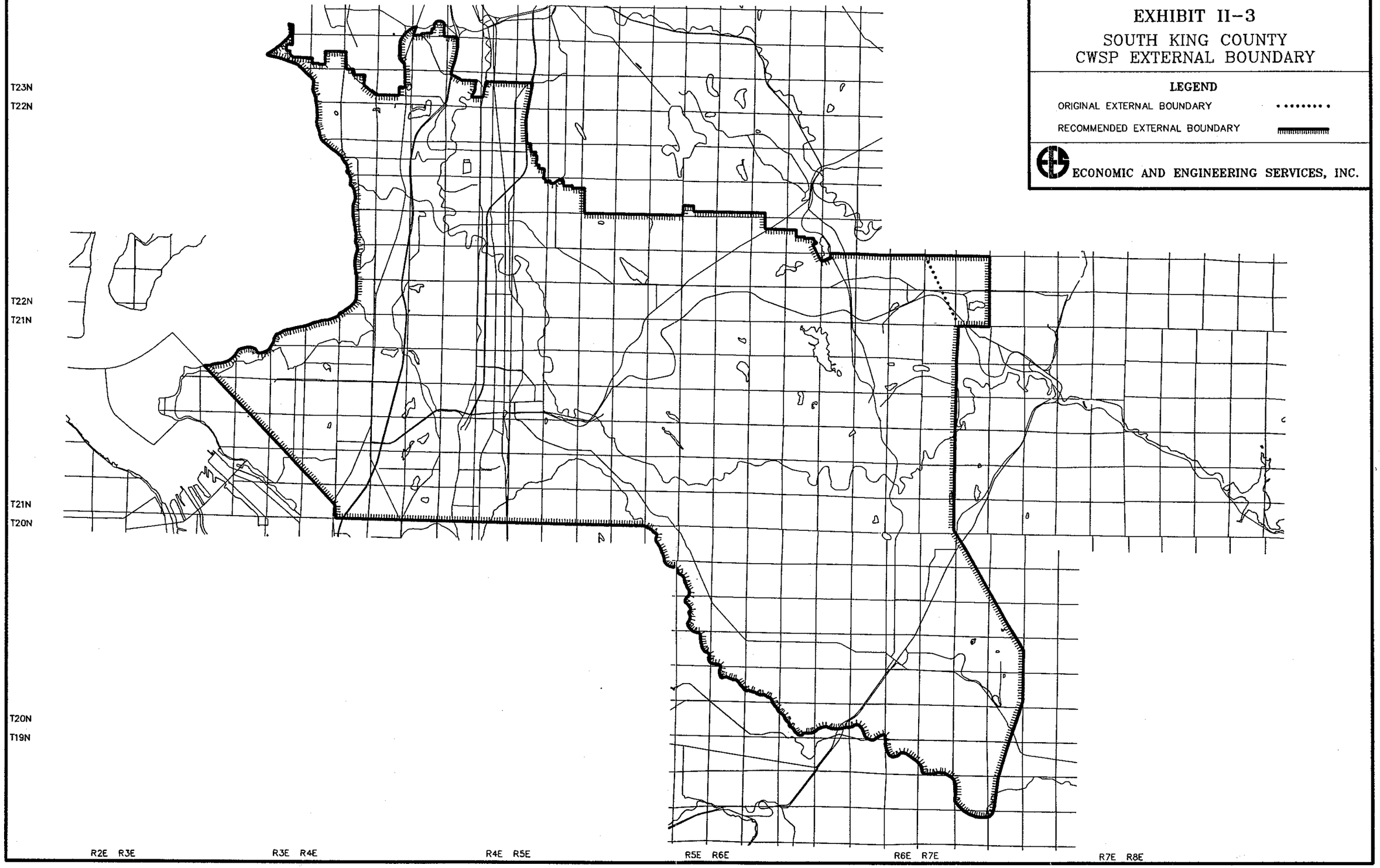
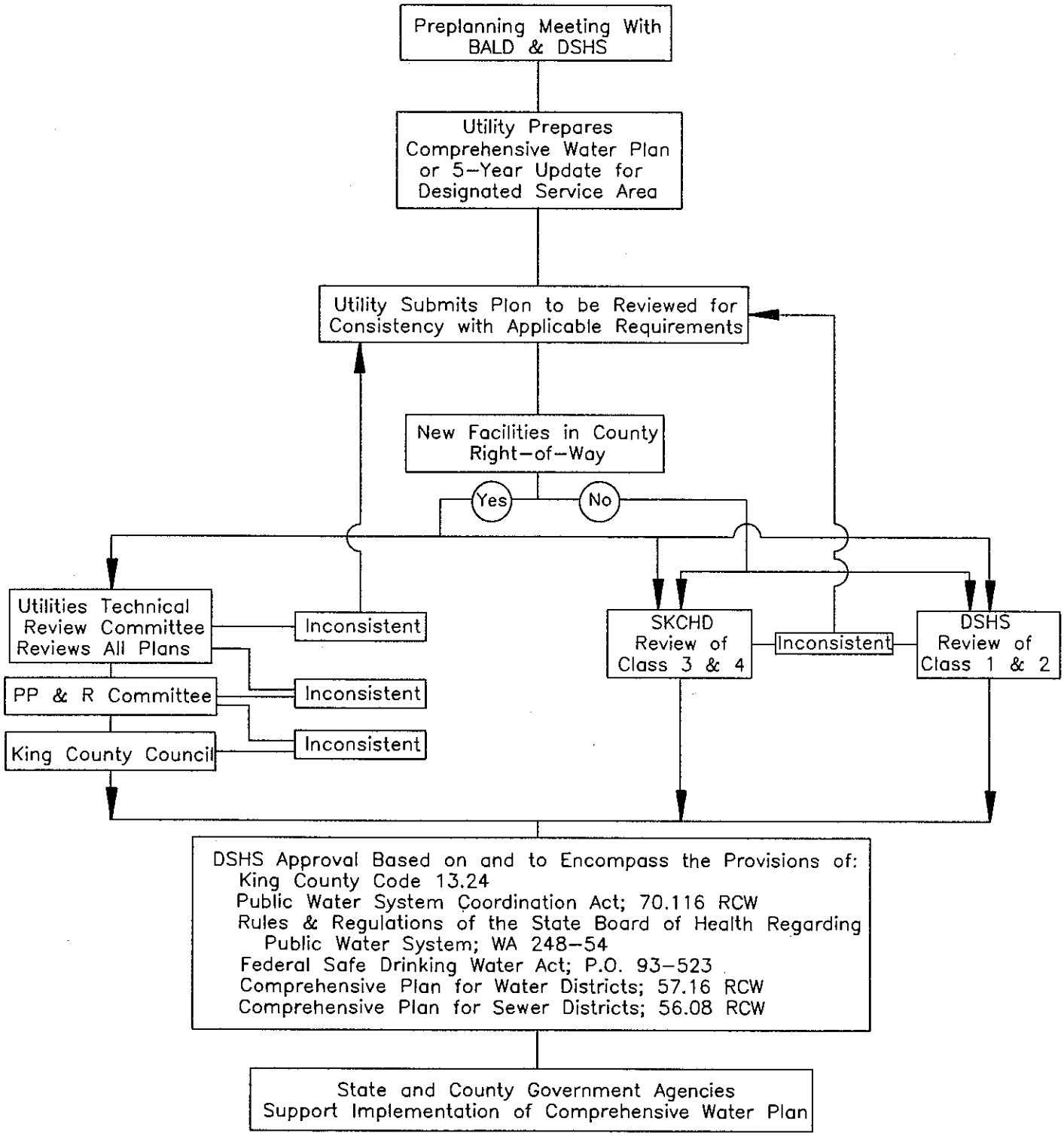


EXHIBIT II–4

SOUTH KING COUNTY CWSP
COMPREHENSIVE WATER PLAN REVIEW PROCEDURE



SECTION III

WATER UTILITY SERVICE AREAS

SECTION III

WATER UTILITY SERVICE AREAS

1. INTRODUCTION

The Public Water System Coordination Act requires that a procedure be established to identify the existing and future service areas of public water utilities within the Critical Water Supply Service Area (CWSSA).

The establishment of service area boundaries carries with it two obligations. The first obligation is that the County and State governments recognize an identified utility as the responsible agency for providing all public water service within a designated area. The second obligation is that the utility shall assume responsibility, within its service area, for planning and implementing water system development and proper utility management. For those areas within the CWSSA which are not within any utility's designated service area, the Utility Service Review Procedure (USRP), gives priority to service by an adjacent utility with an approved water system plan or a Satellite System Management Agency (SSMA). If neither of these service options is available a new utility may be formed.

The Coordination Act provides the legal mechanism, for municipalities and private water utilities alike, to establish an exclusive service area within the unincorporated County areas. This procedure provides the utilities with the assurance that their planning, capital improvement programs, and financial commitments are consistent with State and County requirements.

From the County's perspective, designated service areas will mean a specific utility has accepted responsibility for development of cost-effective and efficient service to accommodate the future growth that these areas will experience. Growth management objectives established for these areas by the County's Comprehensive and Community Plans must be accounted for in each utility's approved plan and actual improvements.

The Coordination Act requires that service area boundaries be established by agreement among the purveyors based on a variety of factors. These factors include: topography, readiness and ability to serve, local franchise areas, legal water system or municipal boundaries, future population projections, and sewer service areas. It also specifies that these service areas be developed in conformance with the land use policies of the County.

2. SERVICE AREA COMMITMENTS AND PROCEDURES

The designated service area defines the area within which all future customers will be provided retail water service by the designated utility. An important distinction is that a utility's water facilities, such as sources of supply and reservoirs, can be located outside the utility's future service area. These facilities can be located within another utility's retail service area; provided the facilities are not used for direct retail service without the written concurrence of the designated utility.

Once adopted as part of this Coordinated Water System Plan (CWSP), the designated service area will be the exclusive service area of the identified utility. As a condition of being granted a designated service area, the utility shall meet certain obligations and commitments, as described in the following:

A. Water System Plan and Service Area Agreement

Each utility, including an SSMA, is required to prepare and submit to the County and/or the Department of Social and Health Services (DSHS) a Water System Plan (WSP) within 1 year of the date the CWSP is presented to the County for review. The WSP must identify the service area boundaries. During the pendency of the 1 year planning period, those utilities having signed service area agreements as a part of the CWSP will have exclusive rights to the service area described in the agreement. Utilities not signing an agreement will have exclusive rights only to their existing service areas. In this case, service outside of the utility's existing service area may be assigned, according to the USRP, as though located in an undesignated area.

Once a WSP is approved and service area agreements are in effect, the service area will be assigned to that utility. If, at any time, DSHS determines the utility has failed to comply with the standards or provisions of its WSP, the designated service area may be revised or revoked based on the test of timeliness and reasonableness.

B. Conditions of Service by Designated Utility

Water service can be provided by the designated utility, either through direct connection to the utility's existing water system, or as a detached remote system managed by the utility or others through agreement. In either case, the utility will identify for the applicant all of the conditions of service which must be agreed to prior to the provision of water service. The Coordination Act requires that the utility be willing to extend service in a timely and reasonable manner. Once the applicant agrees to these conditions, a building permit or preliminary plat approval can be issued.

C. Interim Service Agreements

A utility may receive a request for service within its designated service area and may not be able to provide immediate service. If this occurs, interim services by an adjacent utility, an SSMA, or the developer/homeowners association may be allowed by the designated utility. Service may be provided either through physical connection to an adjacent utility's system or installation of a detached remote system. The appropriate level of services should be stipulated in a written agreement. The general content of such an agreement is described and discussed in Section VI, Satellite System Management Program. Service area adjustments are not required for provision of interim services.

D. Service Area Adjustment

In the future, if a utility determines that its service area is either too large or too small, the service area boundaries may be revised at any time. However, this will require the signing of revised service area agreements by all affected adjacent purveyors. Such revisions and agreements shall be approved, following the same procedures as adoption of the CWSP, and filed with the Building and Land Development Division (BALD) for incorporation in the official CWSP file.

This CWSP must be reviewed by the Water Utility Coordinating Committee (WUCC) at a minimum of every 5 years and updated as necessary. Service areas adopted in this Plan may also be revised at that time, if such revisions are considered appropriate by the utilities concerned.

3. SERVICE AREA SELECTION PROCESS

The Public Water System Coordination Act specifies that no new public water systems be created after the boundaries of the CWSSA are established unless an existing system is unable or unwilling to provide service. Therefore, existing systems had to be defined, identified, and contacted to establish their existing and anticipated future service areas. All undesignated land is served as prescribed by the USRP which is described in Section V.

All Class 1 and 2 utilities were contacted by certified letter and/or through the South King County Regional Water Association (SKRWA) newsletter. They were asked to verify their existing service area, as well as boundaries depicting their anticipated service area within the next 10 years. Over 600 Class 3 and 4 systems were also contacted by letter from the Seattle-King County Health Department (SKCHD) to identify expanding systems and the location of their future service area. Expanding Class 3 and 4 systems were not considered to be those adding additional customers up to a pre-approved limit. However, adding

customers beyond an approved limit or enlarging the geographic area of service was considered expansion. Thirty-eight Class 3 and 4 purveyors indicated their intent to expand. Utilities not responding were assumed to have no desire for expansion.

For purposes of clarifying who should be contacted, the WUCC agreed that an existing system should include any Class 1, 2, 3, or 4 water systems, as defined by WAC 248-54-015, which met one of the following definitions:

- An existing approved water supply system: a water supply system which has had plans and specifications approved by either DSHS or SKCHD, has been physically installed, and has received a certificate of completion from the system engineer or designer.

- An existing unapproved water supply system: a water supply system which has been physically installed without approval of plans and specifications by either DSHS or SKCHD. Any request for service connection to an unapproved water system will be subject to the water system complying with appropriate DSHS (WAC 248-54) and/or SKCHD (Rules and Regulations No. 9) regulations.

- An approved water system in the planning or construction stages: a water supply system with approved plans, from DSHS or SKCHD, which have not expired but the system installation has not been started or completed at this time.

- An approved proposed water system: a proposed water supply system having a completed and approved source site inspection on record which has not expired, including site inspections performed as part of a short or formal subdivision.

Service areas for all Class 1 and 2 systems, as well as expanding Class 3 and 4 systems, were computerized using AutoCAD Version 9.0 onto a master set of maps. In addition, a computerized map was developed from data provided by SKCHD showing the location of all Class 3 and 4 systems to the nearest quarter-quarter section. Exhibit III-1 shows the service areas for all Class 1 utilities. The service area maps and all AutoCAD data disks are incorporated into the CWSP by reference in Appendix D, and are on file with BALD and SKCHD.

There are no unresolved service area disputes at the time of finalizing the CWSP Regional Supplement. There are some areas of service overlap between adjacent utilities which are acceptable and have been addressed either in separate agreements between the utilities or through their Service Area Agreement for water service areas.

It should also be noted that during the CWSP process, two mergers took place. King County Water District No. 56 customers voted for dissolution and merger with Federal Way Water and Sewer District and the City of Des Moines. The City of Des Moines is served by King County Water District No. 75. The change occurred during the selection of service areas when the CWSP promoted more reliable and cost-effective service being provided by merging. In addition, Normandy Park Water Company merged with King County Water District No. 75 during the spring of 1989.

4. SERVICE AREA AGREEMENTS

A Service Area Agreement (Agreement), also referred to as an Interlocal Agreement, was drafted and approved by the WUCC and forwarded to the utilities for signature along with final copies of their future service area maps. A copy of the Agreement is included herewith as Exhibit III-2.

Establishment of individual Agreements among all water systems in the study area is extremely cumbersome. Therefore, the Agreement was used to allow the utility to agree with the boundary of its service area as it is shown on the official County map. In so doing, the utility acknowledges adjacent utility boundaries also shown on this map, and thus avoids entering into separate agreements with each adjacent utility.

Where understandings concerning joint service, transfer of service, or common boundaries require more specific terms than are provided in the Agreement, the affected utilities address the specific conditions in a Supplemental Agreement. In order for these Supplemental Agreements to be recognized in implementing the CWSP, the utilities must place them on file with BALD as an addenda to the Agreement.

To confirm designated service areas and establish their legal service boundary, all expanding water utilities must complete the Agreement and submit it to BALD. Each Agreement will be reviewed in conjunction with individual WSPs.

Unless a documented health-related problem is involved, failure to submit an Agreement should result in denial of proposed system expansions within the service area. For utilities with unresolved service area conflicts, this denial should be limited to proposed activities within the contested service area.

Recognition of utility service areas and Agreements by the County shall be incorporated into the County franchise review process. If the standards of KCC 6.27 are met, the existing franchise boundaries can be revised to coincide with the designated water service area boundaries of the CWSP. Also, the Boundary Review Board should be notified of those utilities who have signed Service Area

Agreements, of the service area boundary of each such utility, and be requested to recognize these boundaries in the conduct of Boundary Review Board responsibilities.

5. UNRESOLVED SERVICE AREAS

There were no known service area disputes at the time of preparation of the CWSP Regional Supplement.

6. SERVICE AREA BOUNDARY CHANGE PROCEDURE

Changes in utility service area boundaries will occur when two utilities wish to expand or reduce their service areas. These will be approved only if a new conflict in service areas is not created by the modification.

A revised Service Area Agreement will be required of utilities requesting boundary changes. The BALD and the WUCC will review and approve all requested adjustments in service area boundaries to ensure that utility service is consistent with the CWSP objectives. The BALD will maintain and incorporate all approved boundary changes on the County's official service area maps, and forward these changes to DSHS and other appropriate County agencies. These boundary changes will be integrated into the USRP described in Section V.

The realignment of service area boundaries will require an amendment to the utility's water system plan when the plan is updated every 5 years.

EXHIBIT III-1

CLASS 1 WATER UTILITY SERVICE AREAS

LEGEND

UNDESIGNATED AREA

CLASS 1 WATER SERVICE AREAS

CWSP PLANNING BOUNDARY

ECONOMIC AND ENGINEERING SERVICES, INC.

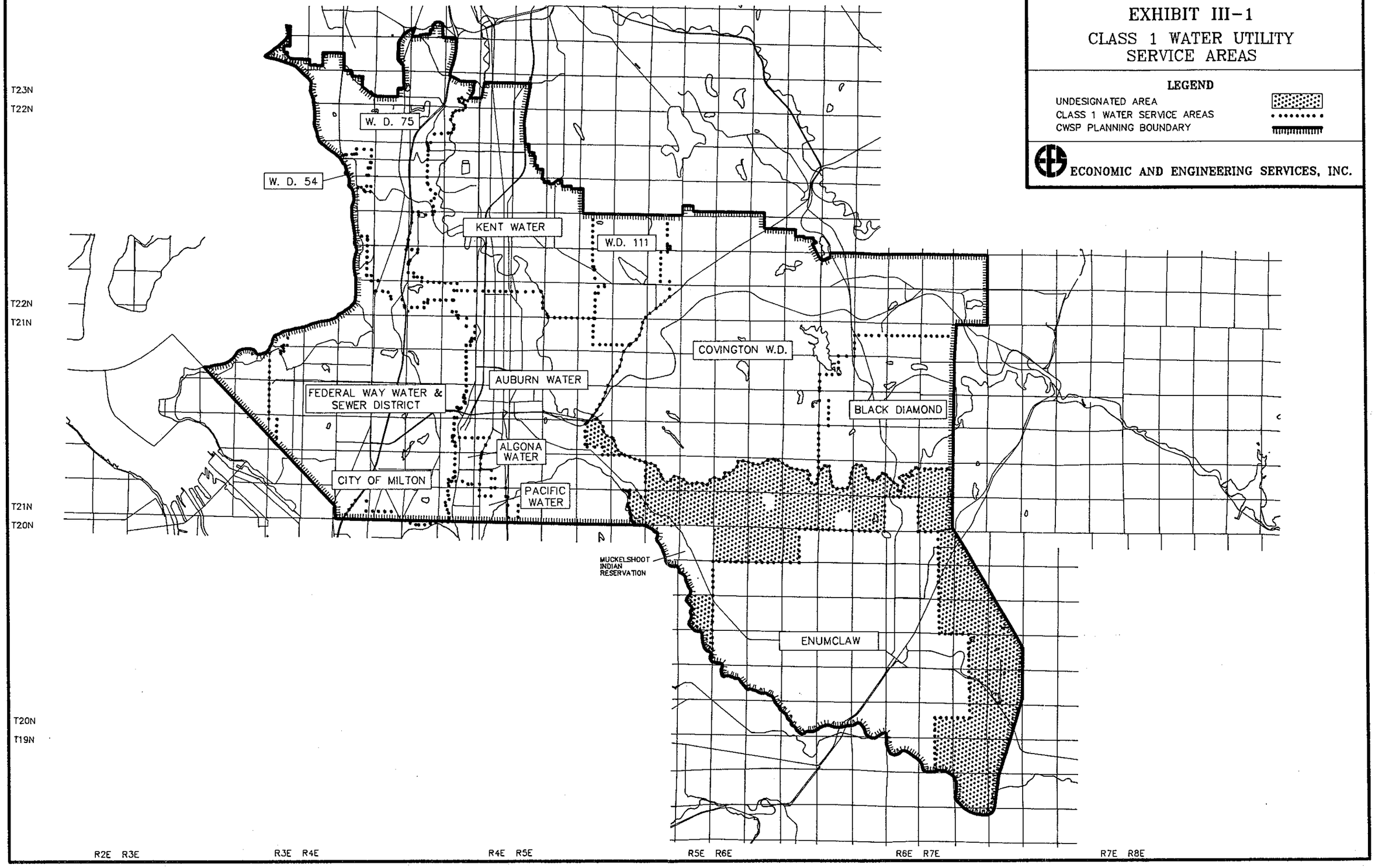


EXHIBIT III-2

INTERLOCAL AGREEMENT FOR ESTABLISHING WATER UTILITY SERVICE AREA BOUNDARIES AS IDENTIFIED BY THE SOUTH KING COUNTY COORDINATED WATER SYSTEM PLAN

PREAMBLE

The Interlocal Agreement for the water utility service area boundary identifies the external boundary of the service area for which the designated water purveyor has assumed retail water service responsibility. The responsibilities accepted by the water purveyor are outlined in the South King County Coordinated Water System Plan (CWSP), and as defined by the adopted rules and regulations of the Department of Social and Health Services (DSHS). This agreement does not give new authorities or responsibilities to the water purveyor or to the County or State regulatory agencies, but rather acknowledges the geographical area for these designated service responsibilities.

The terms used within this Agreement shall be as defined in the implementing regulations of Chapter 70.116 RCW, except as identified below.

1. South King County Water Service Area Map shall mean the map referenced in the Interlocal Agreement as Attachment A for the retail service area, except as amended in accordance with the CWSP procedures and with the concurrence of the affected water purveyors.

2. Retail Service Area shall mean the designated geographical area in which a purveyor, a group of purveyors, or another organization provides water to other water purveyors on a wholesale basis. A wholesale water supplier shall not provide water to individual customers in another purveyor's retail service area except with the concurrence of the purveyor responsible for the geographical area in questions.

3. Lead Agency for administering the South King County Water Utility service area agreements and service area maps shall be the King County Parks, Planning, and Resources Department, Building and Lands Division, unless otherwise established by amendment to the CWSP.

AGREEMENT RESOLUTION

The authority for this Agreement is granted by the Public Water System Coordination Act of 1977, Chapter 70.116 RCW.

WHEREAS, Such an Agreement is required in WAC 248-56-730, Service Area Agreements-Requirement, of the Public Water System Coordination Act; and

WHEREAS, Designation of retail water service areas, together with the cooperation of utilities, will help assure that time, effort, and money are best used by avoiding unnecessary duplication of service; and

WHEREAS, Definite future service areas will facilitate efficient planning for, and provision of, water system improvements within South King County as growth occurs; and

WHEREAS, Definite retail and wholesale utility planning areas will help assure that water reserved for public water supply purposes within South King County will be utilized in the future in an efficiently planned manner,

NOW, THEREFORE, the undersigned party, having entered into this Agreement by their signature, concurs with and will abide by the following provisions:

Section 1. Service Area Boundaries. The undersigned utility acknowledges that the South King County Water Utility Future Service Area Maps, included as Attachment A to this Agreement, identify the utility's future water service area. The undersigned further acknowledges that there are no service area conflicts with adjacent water utilities, or, where such conflict exists, agrees that no new water service will be extended within disputed areas until such conflicts are resolved.

Section 2. Common Service Area Transfer. It is understood that utilities may initially continue existing water service within the boundaries of neighboring utilities, as defined in Section 1 hereof. Such common service areas, if they exist, are described in Attachment B to this agreement. Also included in Attachment B are copies of, or a list of, all resolutions, ordinances, or agreements enabling these uncontested overlays. The undersigned utility agrees that any water line for retail service extending outside of the retail service area boundary, as set forth in Section 1, shall be phased out and service transferred to the designated adjacent utility on an economic basis or by mutual agreement.

Economic basis consideration may include, but are not limited to:

(a) A determination by the present owner of service lines that maintenance, repair, and/or replacement costs exceed attributable income.

(b) Planned or imminent major street improvements or major improvements to either or both water systems which include an opportunity to transfer service.

The terms of the transfer of service area described in this Section shall be established in a separate agreement among the adjacent utilities whose boundaries are affected.

Section 3. Boundary Streets. Unless separate agreements exist with adjacent utilities, this party agrees that the utility which is located to the north and/or east of boundary streets between this party and adjacent utilities will be entitled to provide future water service on both sides of those streets. Depth of service on boundary streets shall be limited to one platted lot or as otherwise agreed by the utilities. Existing services on boundary streets shall remain as connected unless transfer of service is agreed to by both parties, as per Section 2. These provisions do not disallow the placement of mains in the same street by adjacent utilities where geographic or economic constraints require such placement for the hydraulic benefit of both utilities.

Section 4. Boundary Adjustments. If, at some time in the future it is in the best interest of the undersigned party to make service area boundary adjustments, such modifications must be by written concurrence of all involved utilities and the proper legislative authority(ies). These written modifications must be noted and filed with the designated King County lead agency and DSHS. It is understood by the undersigned utility that it may decline to provide service within its designated service area boundary, but in that case, an applicant may be referred to other adjacent utilities, to a pre-qualified Satellite System Management Agency (SSMA), or a new utility may be created and the original service area boundary will be adjusted accordingly.

Section 5. Service Extension Policies. The undersigned utility agrees that in order to expand its water service area, other than by addition of retail customers to existing water mains, or to serve in the capacity of a pre-qualified SSMA, it shall have adopted design standards and Utility Service extension policies. The design standards shall meet or exceed the South King County Water System Minimum Standards and Specifications.

This agreement by reference includes the following attachments:

Attachment A - South King County Water Utility Future Service Area Map (see Section 1)

Attachment B - Common Service Area Agreement - Optional - Utility may attach copies or list such agreements if relevant. (see Section 2)

IN WITNESS WHEREOF, the undersigned party has executed this Agreement as of _____.

_____
Water Utility

_____
Representative

_____
Title

Receipt Acknowledged:

_____
King County Parks, Planning, and
Resource Department

_____
Date

ATTACHMENT B

COMMON SERVICE AREA AGREEMENTS

Location of Common Service Area	Adjacent Utility	Signed Agreement Yes/No	Document Date	Copy Attached Yes/No

SECTION IV

WATER UTILITY DESIGN STANDARDS

SECTION IV

WATER UTILITY DESIGN STANDARDS

1. INTRODUCTION

A primary objective of the Coordinated Water System Plan (CWSP) is to develop minimum design and performance criteria for the water utilities in South King County. A Design Standards Subcommittee of the South King County Water Utilities Coordinating Committee (WUCC) prepared a draft of Minimum Design Standards. These draft standards were reviewed by the WUCC and provided to other CWSP areas in King County to promote consistency. Several meetings were jointly held with representatives of other Regional Water Association (RWA)/WUCC committees, as well as County staff, to facilitate the development of a uniform set of standards which accommodated differing concerns in local areas. This Section presents the engineering and construction design criteria which were uniformly adopted by the South King and East King WUCCs to achieve the overall objectives of the CWSP.

2. MINIMUM DESIGN STANDARDS

Standardized design and performance criteria are essential for establishing a common set of standards which apply to and set a base level of utility planning, design, and construction for all public water utilities. Uniformity and consistency in standards will, in the long-term, reduce costs to customers as system interties and/or consolidation of utilities takes place. In addition, these standards, in conjunction with the Utility Service Review Procedure (USRP), will clarify the facility requirements and financial impacts of projects proposed by developers and water service applicants.

The Public Water System Coordination Act requires development of minimum standards applicable to water system improvements within a Critical Water Supply Service Area (CWSSA). The South King County Coordinated Water System Minimum Design Standards were developed to fulfill this requirement. These are minimum performance, design, and construction standards used to maintain uniformity of design between adjacent water utilities. Each purveyor, as a part of their water system plan, is required by WAC 248-54-105, to identify their design standards and specifications. By reference to these Minimum Design Standards, the intent of this requirement will be met.

A copy of these standards is shown in Appendix E and is on file at the Building and Land Development Division (BALD) and South King County Health Department (SKCHD) offices. These standards apply to all new and existing systems which install new capital facilities. Retroactive application of the stan-

dards is limited to their incorporation into system plans to replace existing facilities. Retroactive application is at the discretion of the water utility, unless necessary to meet minimum state health standards. Existing water systems are not required to utilize these minimum standards for repair of existing facilities.

The content of the standards is consistent with the Minimum Design Standards of the Department of Social and Health Services (DSHS) and Department of Ecology (Ecology). In addition, they adopt by reference the standards of the American Water Works Association (AWWA), the Washington State Department of Transportation/American Public Works Association (DOT/APWA), and other County rules, regulations, and ordinances. Other special source, design, material, and construction criteria are also listed.

Minimum standards for fire flow, flow duration, hydrant specifications, hydrant locations, and other fire protection measures were evaluated at great length by the WUCC and were jointly addressed with County staff. It was agreed that when fire protection is provided by a public water system, the conditions of service should be prescribed by these minimum standards in conjunction with City codes within their service areas and King County Code 17.08, as amended, for all other unincorporated areas. During this study, various changes to Code 17.08 were proposed by the King County Fire Chiefs Association, and were reviewed by the WUCC and King County.

In general, the requirements of King County Code 17.08 are more stringent than WAC 248-57 regarding fire flow requirements. There did appear to be some lack of interpretation of existing fire protection requirements and the required timing to install facilities, particularly in transitional areas. Therefore, the Minimum Design Standards have been prepared to correlate minimum fire flow requirements based upon land use planning documents, as prescribed by Chapter 248-57 WAC. In addition, an inquiry procedure is proposed wherein the County verifies the most current land use classifications, particularly in transitional areas, and provides this information to utilities before they prepare individual water system plans. In unincorporated County areas, the standards specify that where fire flow is from public water utilities, the distribution mains will be sized to provide a minimum of 1,000 gpm flows, or greater, if required. The installation of hydrants and reservoirs in rural and transitional areas can be scheduled to conform with individual comprehensive water system plans unless required sooner by King County.

The standards provide for a Standards Committee to review these standards on an annual basis, to monitor their application, and to evaluate their appropriateness to the conditions and needs that exist within South King County. The committee should also monitor the application of the standards by the regulatory agencies and the utilities to ensure the objective of uniform minimum standards is achieved.

3. WAIVER PROCESS

A waiver process exists for circumstances where the minimum design standards create undue hardship. Outside designated service areas, a waiver may be obtained through the Appeals Process described in Section IX. In this instance, a waiver can only be granted to Class 4 systems located in rural land use areas where fire flows are not required.

Within designated service areas, the designated purveyor has the sole authority to allow the installation of facilities for remote systems which conform with DSHS standards but are less stringent than the South King County Minimum Design Standards. In this instance, lesser standards can only be granted to new systems with four or fewer service connections and where fire flow is not required. The acceptance of lesser standards should be noted on the Certificate of Water Availability by the designated utility and in its service area contract with the applicant. It is anticipated that this waiver will be utilized primarily when the proximity of a smaller system will benefit from larger, nearby facilities planned for future installation by the designated utility.

4. UTILITY STANDARDS

The standards established for South King County are considered to be minimum standards allowed for new and expanding water systems. It is not intended for these standards to also be interpreted as the largest or most stringent criteria. Some water utilities may consider these standards to be inadequate to meet the requirements of their service area. Therefore, a utility may adopt the minimum standards described herein or may adopt more stringent standards, provided such standards are not inconsistent with applicable land use plans or the conditions to exceed minimum design standards, as cited in Appendix F. They may not, however, reduce the County standards for new services except as provided in the waiver process. If any water utility chooses to expand upon the minimum standards, they are encouraged to coordinate the development of their utility standards with adjacent systems to promote consistency throughout the County.

The DSHS approval procedure for water system plans encourages the development of standard construction specifications by the water utility. By referring to these adopted Minimum Design Standards, which include both APWA and AWWA standard construction specifications, the State requirements are fulfilled. This, however, also places the water utility under the obligation to use these as minimum construction standards, unless amended.

SECTION V

UTILITY SERVICE REVIEW PROCEDURE

SECTION V

UTILITY SERVICE REVIEW PROCEDURE

1. INTRODUCTION

This Coordinated Water System Plan (CWSP) establishes a set of administrative procedures, water resource policies, and growth objectives for South King County water utilities. The procedures are to guide local officials, citizens, developers, and state and federal regulatory agencies in identifying the necessary facilities for providing an adequate water service.

Provisions of the Public Water System Coordination Act require that no new public water system be established within South King County unless it is determined that existing purveyors are unable to provide the service, in a timely and reasonable manner. This section presents the administrative procedures for reviewing development proposals and associated requests for water service in South King County, in order to identify existing purveyors who are willing and able to extend this new water service.

A general philosophy of the CWSP is that water utility service should not dictate growth patterns. On the contrary, land use policies should establish growth trends within the water utility service areas to permit the water utility management program to be responsive to, and provide service commensurate with, applicable adopted land use policies.

Water system plans must address the water system facilities required to accommodate growth. This growth is projected to occur within each utility's service area, based upon the County's Comprehensive Plan, municipal land use plans where an interlocal agreement exists, and adopted Community Plans. Capital improvements are planned and constructed to conform with the anticipated service requirements associated with those Plans.

In addition, if an applicant for water service is proposing a land use change, such a change could incur a significant financial burden on the provider of water service. Because water utilities must, of necessity, develop their systems to conform with applicable land use plans, any major change in land use may require substantial system improvements to serve the proposed development. Therefore, special review procedures will apply to applications which propose a land use change.

2. UTILITY SERVICE REVIEW PROCEDURE

The Utility Service Review Procedure (USRP) identifies the utility in whose designated service area a proposed development lies. It then describes the available prioritized water service options. It also describes options for water service to proposed developments lying outside of designated service areas.

Within the USRP process, reference to "service area(s)" means the specific geographical area described in the written agreement required by RCW 90.116.070(1) and WAC 248-56-730(1). The service area boundary will be identified by a map attached to the agreement. The boundary will include the area within which direct service or retail service connection to customers is currently available (existing service area), and the area for which water service is planned (future service area) by the designated utility.

The USRP applies to all development proposals and associated requests for water service requiring approval by the County. These include: new plat or subdivision development; short plats; land use permits, changes, and approvals; rezones; issuance of residential and commercial building permits; creation of new water systems; resolution of health emergencies arising out of existing public water systems; source site inspections; and other activities. At the time an application is submitted for permits or approvals, or upon request, the King County Building and Land Development Division (BALD) will initiate and finalize the review procedure. They will coordinate the review with the Seattle-King County Health Department (SKCHD) prior to issuance of any approvals. A flow chart of steps to be followed in the USRP is provided as Exhibit V-1.

The USRP procedures are intended to identify an existing water purveyor willing and able to provide water supply facilities and to include the new development within its service area. In effect, the result of the USRP is to assign the proposed new development or land use to the service area of a designated water utility. In the event a designated utility is unable or unwilling to provide service, the prioritized referral process referenced in subsequent paragraphs should be followed.

Pursuant to State law, water service requests occurring within a contested service area or the service area of a utility that has not completed either its individual Water System Plan (WSP) or its Service Area Agreement will be denied until these issues are resolved.

A. Development Proposals or Water Service Requests in Conformance with Applicable Land Use Plans

When development and associated water service applications conform with land use plans and zoning ordinances, the USRP will generally follow the sequential steps outlined in Exhibit VII-1. This procedure is described by the following:

(1) The King County Parks, Planning, and Resources Department, BALD, will coordinate review of all development proposals within the unincorporated area of King County. BALD will be responsible for ensuring conformance with the applicable comprehensive land use plans, Community Plans, Zoning Code, service area agreements for future municipal annexation areas, and utilities' water system plans. Upon determination of appropriate land use designation, BALD will review building requests for conformance with the appropriate building and fire codes throughout the County.

(2) The review of development applications which propose to use a private well or spring source to serve a single service will be coordinated with the SKCHD in the following manner.

First, if the proposed development is outside the designated service areas of existing purveyors, the application will be referred to the SKCHD for direct action. The SKCHD will develop guidelines for source development which will be available to applicants. In cases where the SKCHD determines that use of a private system would entail a health hazard, construction can be denied. This would require the applicant to contact an appropriate existing adjacent system.

Second, where the proposed development is within the designated service area of an existing utility, BALD will refer the applicant to that utility. The intent of this referral is to bring the applicant and utility together for an examination of the alternatives of connecting to the existing public system. Should the utility not be willing or able to provide timely service, or the applicant considers the conditions of service to be unreasonable, the applicant will be referred to the SKCHD for action as described in the first instance above.

(3) Where two or more service connections are proposed, the applicant must coordinate his supply needs with an existing utility, as assigned. The BALD will review the proposed water service request and refer the applicant to a designated utility, adjacent utilities, SSMAs, or allow the creation of a new utility, as outlined in the steps below.

(a) Proposed Development Within Designated Service Areas

The applicant will be referred to the designated utility. In response to a request for water service, the utility will give notice of its intent to exercise one of the following options, in order of priority:

- The designated utility provides direct service by extending existing mains and supply; or
- The designated utility approves design of a detached remote system and then owns or operates the system. A contract establishes responsibilities for operation, management, and financial obligations until the two systems are connected; or
- The designated utility approves design of a detached remote system and enters an agreement specifying the operational and financial requirements of the owners of the remote system. The remote system may be operated by an adjacent utility, an Satellite System Management Agency (SSMA), or the developer/homeowners association. The designated utility retains contractual responsibility for monitoring operation and for water quality. The remote system owners are responsible for financing and proper operation. Where the remote system consists of four or fewer connections that require no fire flow, the designated utility may allow facilities which meet DSHS standards but are less stringent than the CWSP minimum design standards. It is anticipated these more lenient standards will be utilized primarily when the proximity of a small system will benefit from larger nearby facilities planned for future installation by the designated utility.
- The designated utility denies the provision of service, relinquishes that portion of its service area, and a new system may be created.

(b) Proposed Development in Relinquished Service Areas or Non-Designated Areas

If a designated utility is unwilling or unable to provide service or the development is in an undesignated area, the following will occur:

- o BALD identifies adjacent purveyors with an approved water system plan that provides for expansion and gives them the first option to serve the new development. If responsibility is accepted, service area boundaries are changed; or
- o If an existing purveyor is unwilling to assume ownership or operational responsibility, BALD will refer the developer to an approved SSMA list; or
- o If no SSMA is willing to assume responsibility for service under reasonable terms, the developer may create a new system. The new purveyor will be required to submit a service area agreement and prepare a water system plan with all applicable financial and operating planning information.

(4) The proposed project must be reviewed with the assigned utility to identify the engineering, design standards, financial, managerial, and other requirements of service. Fire flow requirements for the proposed project will be determined by the appropriate Fire Marshal and reviewed by the utility prior to its signature of a Certificate of Water Availability. Review by the assigned utilities will ensure the applicant and purveyor have discussed the requirements of both parties.

The utility will provide to the applicant a signed Certificate of Water Availability listing conditions of service prior to King County's issuance of the required approval/permit. A joint committee composed of representatives of the various King County WUCCs and King County staff have developed a Certificate to be uniformly used in all CWSP areas.

(5) After the preliminary plat or other land use permits are approved, a written contract should be developed and executed between the utility and applicant to formalize the conditions of service responsibilities. Although each utility may have special considerations to be included within their contract, Appendix F provides an example of suggested model contract components specifying the relation-

ships and responsibilities of the utility and applicant. This same contract format is applicable to Satellite System Management, as described in the next Section.

Prior to approval of final plat or building permits, the water facilities are to be installed to meet the utility's minimum standards, or bonded for completion.

B. Development Proposals or Water Service Requests Not in Conformance with Applicable Land Use Plans

If a development proposal requires a zoning change or alteration of applicable land use plans, then each affected utility shall be contacted by the BALD and allowed to comment on the proposal prior to approval of that change. By identifying new or additional utility costs associated with changes in land use or zoning, these costs of development can be integrated into the decision making process. This will allow the assignment of these costs to customers benefiting from the land use change.

C. Appeals Process

Rules adopted by DSHS provide that no new public water system is to be approved within the external boundaries of a CWSSA unless specifically authorized by DSHS. Such authorization may be granted under certain conditions. A key determinant is whether existing purveyors can provide service in a timely and reasonable manner (WAC 248-56-620). For purposes of reviewing and resolving such issues, BALD will coordinate a two-step appeals process as described in Section IX.

3. SPECIAL REVIEW CONSIDERATIONS

In the review of development proposals and associated requests for water service, the BALD shall be guided by the special considerations provided below:

A. Applications for Service to Non-Residential Properties

Commercial and industrial properties represent a fire flow responsibility that may greatly exceed flows required for residential housing. These flow requirements are critical to the sizing of the storage, pumping, and piping facilities. For these reasons, BALD shall also use the referral process described herein for all proposed commercial and industrial developments.

B. Expansion of Existing Class 3 and 4 Water Systems

The SKCHD identified 38 out of over 600 Class 3 and 4 water systems in the South King County area which anticipates future expansion. Expansion of these systems is being tracked by SKCHD with respect to the number of active services versus initially approved services. Expansion beyond the initial approval will not be allowed without further review of system capabilities by SKCHD or DSHS.

Special consideration is required for the expansion of small systems both inside and outside designated service areas. These issues are addressed below:

(1) Expansion Outside Designated Service Areas

Expanding Class 3 and 4 systems located outside of designated service areas of existing utilities will be referred by BALD to adjacent utilities with approved water system plans or SSMAs. This will allow the expanding Class 3 or 4 system to discuss and evaluate utility service proposals by an adjacent utility or SSMA versus expansion. If the decision is made to pursue expansion, the system owner must submit to BALD a completed Service Area Agreement and a Water System Plan commensurate with the planned system expansion.

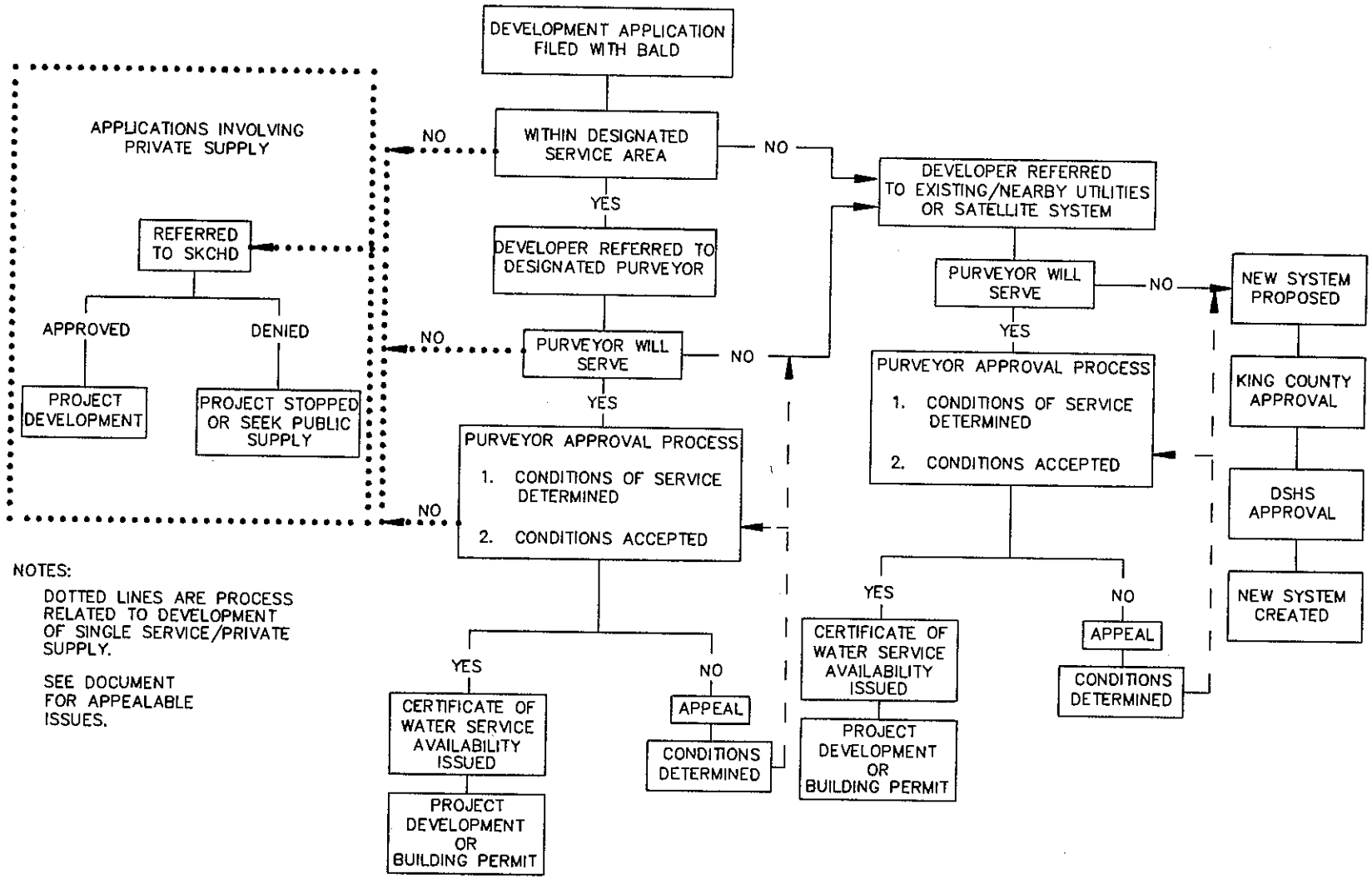
(2) Expansion Within Designated Service Areas

Expansion beyond initially approved service connections for an existing smaller utility located within a designated utility service area will not be allowed without approval by the larger utility. The CWSP places responsibility on the review agencies to recognize a specific utility's service area. In turn, the utility is responsible for effective management within that service area.

4. ACTIVITIES WITHIN MUNICIPAL BOUNDARIES

Water service requests within established city limits are not subject to the USRP. Applicants for such water service must contact the municipality directly.

EXHIBIT V-1
UTILITY SERVICE REVIEW PROCEDURE
FLOW CHART



SECTION VI

SATELLITE SYSTEM MANAGEMENT PROGRAM

SECTION VI

SATELLITE SYSTEM MANAGEMENT PROGRAM

1. INTRODUCTION

As described in Section V, the Utility Service Review Procedure (USRP) is a process to be implemented by King County, whereby proposed developments requiring a public water supply will be referred to existing utilities as a first step in obtaining water service. This process applies to developments proposed both within and outside of the designated service areas of existing utilities. The goal of this process is to minimize the creation of new public water systems.

During the plan development process, the Water Utility Coordinating Committee (WUCC) recognized that many utilities would not be able to immediately serve new developments within their service areas by direct connection. Also, a portion of the study area remains undesignated in that no existing utility plans to serve that area at the present time. The WUCC also recognized that many existing, small utilities need technical and financial assistance to properly operate and maintain their systems under increasing requirements at the local, state, and federal level.

Given the circumstances, the WUCC developed a program designed to provide operational and/or support services to new and existing public water systems. This program is the Satellite System Management Program (SSMP) which is described in this Section.

2. GOALS OF PROGRAM

A. For the Customer

(1) Assure the homeowner/final user is entitled to:

(a) A safe drinking water supply.
(b) An economic supply, both in the short- and long-term.
(c) A voice in the operation and financing of the system.

(2) Assure that responsibility for operation, maintenance, and repair of the system is defined with respect to:

(a) Financial ability to repair the system when it is needed (short- and long-term).
(b) Timely response (24-hour availability).

(c) Water quality.
(d) Competent and qualified staff or contract personnel.

B. For the Regulator

(1) Provide a program structure which:

(a) Minimizes new systems.
(b) Identifies a 24-hour contact/focal point.
(c) Results in systems managed by knowledgeable owners and operators.
(d) Assures financial responsibility.
(e) Assures compliance with water quality requirements.
(f) Assures system reliability and compliance with design standards.

C. For the Owner

(1) Results in a water system that:

(a) Has financial stability.
(b) Is long-term.
(c) Has responsibilities and contact persons well identified.

3. SATELLITE SYSTEM MANAGEMENT AGENCY (SSMA)

To achieve these goals, an SSMA concept was adopted by the WUCC. Under this concept, qualified public or private entities may provide water system operation and management services to a number of utilities. Through the resulting economies of scale, skilled personnel may be employed and water rates maintained at the lowest possible level.

For purposes of the Coordinated Water System Plan (CWSP), an SSMA is defined as any entity, public or private, that is certified to be qualified to properly operate and maintain a public water supply system, either through direct ownership or on a contract basis. The WUCC concluded that a uniform, state-wide, approach is needed to define the responsibilities of SSMAs, and specifically, what level of reporting requirements and financial qualifications are needed by an SSMA. Therefore, the WUCC recommended that the Department of Social and Health Services (DSHS) establish, through regulations, the certification procedures.

It is intended that all classes of public water systems may seek certification under this program. Once certified, an SSMA may:

- o Provide services to new systems within the undesignated area of the Critical Water Supply Service Area (CWSSA), where neighboring, existing systems cannot provide service in a timely and reasonable manner. Services may be provided by direct ownership of the system or through contract with the developers.

- o Provide services to new developments within the service area of an existing utility, at the request of and through contractual arrangements with the designated utility. This is intended as a temporary arrangement which terminates when the designated utility assumes direct responsibility for water service to the development.

- o Provide services to existing utilities if either within or outside of designated service areas, through ownership or contractual relationship.

4. IMPLEMENTATION

The program adopted by the WUCC is to be implemented in the following manner:

A. New Systems Within Designated Areas

The designated purveyor determines the method of providing "public water service" in the following order or relinquishes portions of the designated service area:

(1) Purveyor extends service; or,

(2) Purveyor approves design of remote system and then owns and operates system; or

(3) Purveyor approves design of remote system and enters into an agreement for operation of system by property owners or a contact operator (see 4.C. below regarding the recommended form and content of the agreement). The purveyor retains contractual responsibility for water quality, is responsible for monitoring operation, and property owners are responsible for financing and operation; or,

(4) Purveyor relinquishes service area and new system created.

B. New System/Non-Designated Area

(1) The county identifies adjacent purveyors with an approved water system plan that provides for expansion and gives them first option to service the new development as a remote system. If responsibility is accepted, boundaries are changed; or,

(2) If a new system is created due to the absence of a willing existing purveyor to assume ownership or operational responsibility, the County will refer the developer to an approved SSMA list. The SSMA assumes ownership and/or operational responsibility through agreement with the developer or property owners; or,

(3) If no SSMA is willing to assume responsibility for service under reasonable terms, the developer may create a new system, and the new purveyor will be required to demonstrate the ability to ensure compliance with the items included in the agreement referred to in 4.C. below, and have an approved financial plan. The financial plan and its use must be filed with the County annually.

C. The responsibilities of the developer and operator should be clearly delineated in an agreement. An example of an agreement format and categories of issues which, at a minimum, are recommended to be addressed by the agreement, is provided in Appendix F.

5. SUPPORT SERVICES BY UTILITIES AND AGENCIES

In order to assist in identifying which systems are in need of an SSMA or other forms of utility support, the WUCC recommends that DSHS and Seattle-King County Health Department (SKCHD) provide the following assistance for all systems:

- Regularly survey to verify compliance with routine bacteriological and chemical analysis, as well as system design and operation necessary to protect public health, as provided in Chapter 248-54 WAC, and KC Title 12, or as amended;
- Monitor water quality and provide laboratory services;
- Coordinate inventory and records; and,
- Coordinate list of qualified SSMAs.

The South King County Regional Water Association (SKRWA) should also provide technical support and data management services for Class 1 systems.

Following completion of the surveys and the filing of findings, DSHS and SKCHD will implement an aggressive monitoring and enforcement program. On a voluntary basis, the SKRWA will initiate a Technical Services Program designed to provide assistance, upon request, to water purveyors, SKCHD, and DSHS, and to make recommendations on how the Class 1, 2, 3, and 4 systems will be able to meet their responsibilities as public water suppliers. SKRWA will assist by categorizing the inventoried systems into the following recommended management categories:

- o Transfer operation and/or ownership to a designated Class 1 utility.
- o Transfer operation and/or ownership to a qualified SSMA.
- o Contract with qualified operating agencies and/or existing Class 1 purveyor, with the property owners retaining ownership responsibility.
- o The existing owner has the ability to retain ownership and operating responsibility, with the County monitoring compliance with regulatory requirements.

SKRWA members will work with those Class 3 and 4 systems recommended for transfer of ownership and/or operation in an effort to expedite the scheduled corrections to potential public health problems.

6. PREQUALIFICATION OF SATELLITE SYSTEM MANAGEMENT AGENCIES

In order to assure that non-municipal SSMAs providing the above services have adequate resources to meet both the current and future needs of King County, a prequalification process is recommended. This process does not apply to city or special purpose district municipal water utilities.

The WUCC determined that an SSMA program is valuable to the area and to the State. However, it was also concluded that a uniform State-wide approach is needed to deal with the responsibilities of SSMAs and, specifically, what level of reporting and financial qualifications are needed by an SSMA. Therefore, the WUCC recommended that DSHS should establish qualification procedures for an SSMA. It was also recommended that SKCHD and King County Department of Parks, Planning, and Resources/Building and Land Development (BALD) maintain a list of approved SSMAs for use in the utility service review procedures.

The WUCC also recommended that structured financial criteria be developed for SSMAs. The WUCC suggested that all new water systems, unless municipally owned or regulated by the State Utility and Transportation Commission, should be required to establish a dedicated Renewal/Replacement Account and

a financial plan/program, with dollar amounts to be based on the new system's needs for reserves and for major repairs. The Account should be pledged to the water system's customers/properties to be used exclusively for renewing, replacing, or upgrading capital water facilities, including direct service connection to another system.

It was further recommended that SSMAs and new water systems submit an annual financial report to SKCHD and/or DSHS, as appropriate, for review. All parcels included within the designated service area of a water purveyor may be subject to a minimum monthly assessment necessary to pay their proportionate share of the operating and maintenance costs and funding for a reserve account of the financial plan.

SECTION VII

REGIONAL WATER SUPPLY STRATEGY

SECTION VII

REGIONAL WATER SUPPLY STRATEGY

1. INTRODUCTION

The future water supply requirements of South King County appear to be significant in order to keep pace with the growth anticipated and defined by the King County Comprehensive Plan and projected by the Puget Sound Council of Governments (PSCOG). In the past, water demand in South King County has been met primarily by groundwater and spring supplies. King County Water District No. 75 is the only utility in the study area to purchase significant quantities of surface water from the City of Seattle.

The continued reliance upon groundwater to meet future demands has received closer scrutiny in recent years. This study effort has been undertaken by members of the South King Regional Water Association (SKRWA), in cooperation with various County and State agencies. Extensive investigation of groundwater resources has been initiated by the SKRWA, Seattle Water Department, Tacoma Water Division, King County, and the U.S. Geological Survey (USGS). These studies are not yet completed and may only yield partial understanding of the complex groundwater resources of the area. However, some of the preliminary findings indicate that lowering of water tables and depletion of aquifers may be occurring in selected areas.

In order to increase supply options for South King County, the SKRWA has also contracted with the City of Tacoma for the purchase of 15 MGD from the City's Pipeline No. 5 which diverts water from the Green River and is routed through South King County. The supply contract calls for the delivery of water from Pipeline No. 5 by January 1993. Additional supply from Seattle has also been discussed. One near-term option may be for the "wheeling" of water from Seattle's Cedar River Pipeline No. 4 through the Cedar River Water and Sewer District to King County Water District No. 111 and Covington Water District.

A larger scale supply solution adding greater flexibility is the importation of water from Seattle or areas further to the north. This could be accomplished through an intertie with Pipeline No. 5 and the Cedar River supply system.

This Section outlines the future demands of the area under various consumption scenarios, and focuses on a short- and long-term supply and resource management strategy to meet existing and future needs.

2. REGIONAL WATER SUPPLY REQUIREMENTS

A. Background and Approach

Planning for future water supply needs requires projection of demand for both near- and long-term periods. The near-term projections are generally necessary to define needed capital improvements anticipated within the near future. Such improvements require lead time for financing, design, and construction. Long-term forecasts are necessary to quantify probable water resource requirements. Such forecasts guide the sizing and identification of long-range supply facilities, the water rights reservation process, and management of water resources necessary to meet future demands.

Population growth is the single most influencing factor in future water demand. Not only does the magnitude of future population have an impact, but the location of new population centers will greatly affect delivery of future water supplies. Therefore, population growth has to be coordinated and based on approved land use plans and policies.

Water demand projections for the next 10, 25, and 50 years were based on existing studies, population projections, current water use figures, and land use patterns. Categories of existing water use were identified, when possible. They included residential, commercial, industrial, and other significant water users. Future demand forecasts are expressed as average day demand and peak day demand. Data has been assembled from the utilities, the Department of Social and Health Services (DSHS), the Department of Ecology (Ecology), King County, PSCOG, and USGS.

A complete set of tables, Tables G-1 through G-9, used to prepare the population forecast for this analysis of regional water supply requirements has been included as Appendix G. However, a discussion of these tables and summary tables have been included herein.

B. Population Growth

Population projections were initially developed based on discussions with King County Planning Department staff, meetings with representatives from the PSCOG, and PSCOG's Population and Employment Report, 1984. These projections were then refined based upon the PSCOG's Draft 1987 Report. They were finally revised based on PSCOG data made available in June, 1988, which has been used in this report.

PSCOG forecasts are developed using a four-county regional econometric model and yields a low-, mid-, and high-range population forecast through 2020. The expected growth in population, employment, income,

and other components is based on economic and demographic forecasts of the United States as a whole. The PSCOG model also uses the mid-range County-wide figures to project trends in smaller areas. These are called Forecast and Analysis Zones (FAZs) which are shown in Exhibit VII-1. The FAZs include groupings of census tracts which give a more accurate reference population, using the most recent census data. The FAZ breakdown provides a convenient basis for locating areas within King County which may be expected to show relatively higher or lower growth rates than the County average. The high and low region-wide population forecasts have not been allocated to FAZs; therefore, corresponding demand scenarios have not been developed. Population projections beyond PSCOG estimates of 2020 were linearly extrapolated to 2040.

Population estimates are shown on Table VII-1 at the back of this Section and on Table G-3 found in Appendix G. These values are calculated on the total households shown in Table G-1 and average household sizes projected in the June, 1988 PSCOG report, and shown in Table G-2, through the year 2020. Average household sizes were assumed to remain constant between the years 2020-2040. The total population within the CWSP study area is estimated to increase from its current level of approximately 273,445 people in 1989 to 408,100 in 2010, and 617,270 in 2040. Exhibit VII-2 is a graph of historical and future population growth from 1970 to 2040.

C. Water Demand Projections

Water usage values were selected for three categories of water consumption patterns that reflect varying mixes of residential commercial, and industrial customers. Per capita average day demands of either 120 gallons per capita per day (gpcd) for rural areas, 140 gpcd for transitional areas, or 180 gpcd for urban areas were selected based upon historical water use records of utilities throughout the area and South King County. The demands were assigned to FAZs to reflect increasing influence of commercial/industrial activities representing existing conditions in South King County. The designation of urban, transitional, and rural FAZs was coordinated with the County. Peaking factors of 2.2, 2.4, and 2.8 were selected based upon local utility water use records and prior work in similar areas of Pierce County for urban, transitional, and rural areas. Scenario 1 represents demand under existing conditions.

Demand scenarios were developed for existing conditions and three other scenarios of varying assumptions regarding conservation and multi-family impacts. The other three scenarios considered were:

- Scenario 2, with an increase in multi-family units, assumes a gradual reduction in per capita consumption of 1.5 percent in the urban areas and 3.5 percent in the transitional areas for the year 1995, up to 3 percent and 7 percent, respectively, after the year 2000.

- Scenario 3, with water conservation, assumes savings in per capita consumption of 5 percent in 1995, up to 10 percent in 2000, and thereafter for all urban, transition, and rural areas.

- Scenario 4 is a combination of Scenarios 2 and 3.

Tables G-4, -5, -6, and -7 show the consumption values assigned to each FAZ and the resultant average daily demands for the study area for four different scenarios. Current average day demands of approximately 40.4 MGD in 1989 for the Coordinated Water System Plan (CWSP) study area are estimated to increase to a range of 51.0 MGD to 60.0 MGD in 2010, and 76.7 MGD to 90.3 MGD in 2040, depending upon the Scenario. Average day demand under the different scenarios is summarized in Table VII-2 and presented as a graph in Exhibit VII-3.

Peak day demand is also shown for the CWSP study area on Tables G-4, -5, -6 and -7. Based upon the analysis, the potential peak day demand within the study area could increase from current levels of approximately 96.1 MGD in 1989 to the following:

- Scenario 1 - Existing - 143.1 MGD in 2010 and 215.8 MGD in 2040;

- Scenario 2 - Multi-Family - 135.9 MGD in 2010 and 205.0 MGD in 2040; and,

- Scenario 3 - Conservation - 128.8 MGD in 2010 and 194.2 MGD in 2040;

- Scenario 4 - Conservation and Multi-Family - 121.6 MGD in 2010 and 183.4 MGD in 2040.

Exhibit VII-4 is a graph of peak day demand under each of the four different scenarios as summarized in Table VII-2.

Water demand projections have also been recently completed for the East King County CWSP and the City of Seattle's 1990 Comp Plan Update using a demand model and data from utilities in that area. It is

recommended that the results of the study and the on-going forecasts be compared and unified to coordinate supply requirements throughout the area.

D. Water Supply Needs Assessment

Needs are developed by contrasting average and peak day demands to approximate levels of existing source capacities. Installed source capacity data was estimated from individual utility data, DSHS, Ecology data, and DSHS Water Facility Inventory forms. Existing installed source capacity was estimated at 132.8 MGD for Class 1, 2, 3 and 4 water systems, the breakdown of which is shown on Table VII-3. The totals do not include non-municipal nor single family domestic water source capacities. However, it does include Seattle's existing supply to Water District No. 75.

Seattle's four interties with Water District No. 75 have a combined pumping capacity of approximately 25.2 MGD, however, the maximum capacity of the transmission line is hydraulically limited to approximately 22.5 MGD. Current supply from Seattle is less than 15 MGD, and the contracted amount is for 20 MGD.

Table VII-4 identifies a potential peak day resource deficiency of 10.3 MGD by the year 2010 under existing conditions, and 50.7 MGD to 83.0 MGD with an increase in multi-family units and water conservation by the year 2040, using the data and assumptions stated above.

Peak day source deficiencies under existing conditions (Scenario 1) and multi-family increase (Scenario 2) is first shown to occur between 2000 and 2010 if you consider the total study area as a single unit or as an integrated supply system. With Conservation (Scenario 3) the area would need additional source capacity shortly after 2010. Under Scenario 4, additional resources are not needed until closer to 2020. Exhibit VII-4 shows the relationship between existing source capacity and projected peak day demand requirements for each scenario. The supply strategy presented in the CWSP is based on Scenario 3.

3. EXISTING SYSTEM SUPPLY CAPACITIES

A. Background and Approach

Although there are numerous individual private wells in the South King County area, the vast majority of water users are supplied by public water systems. These systems are regulated and monitored by DSHS, which maintains an inventory of all public water supplies. The inventory shows a total of approximately 623 public water systems in the South King

County CWSP area, which break down by number of customers as follows:

Public Water System Size		No. of Systems
Class 1	(100 or more connections or more than 1000 transient people)	16
Class 2	(10-99 connections or transient population 300 to 999 on any one day)	42
Class 3	(transient population of 25 to 299 on any one day), and	
Class 4	(2-9 connections or transient less than 25 on any one day)	525
TOTAL		623

The Class 1 and 2 water systems participating in the CWSP process were listed in Table II-6. Six of the larger utilities have formed a consortium called the SKRWA. These utilities are Auburn, Covington Water District, Federal Way Water and Sewer, Kent, and King County Water Districts 75 and 111.

The capacities of SKRWA utilities have been evaluated more closely by the CWSP due to their size and regional significance. These utilities have the largest demands and potentially the largest deficits. In addition, they have the financial capability, and planning resources necessary to implement a regional water supply system. They also serve approximately 86 percent of the population in the South King County CWSP study area.

A detailed inventory of all Class 1 and 2 water systems in the South King County area was prepared for the CWSP. A questionnaire was provided to these utilities. The results were compiled and analyzed. This analysis focused heavily on the sources of supply for the utilities in the area. The individual utility responses to the questionnaires are incorporated into the CWSP by reference as Appendix H. The information from some of the utilities was subsequently updated through phone calls and with information presented in draft and final copies of comprehensive water system plans.

B. Regional Supply Capacities

An analysis of the six SKRWA utilities' supply capacities was performed. The analysis was based on existing and proposed supply capacities in rela-

tion to projected average and peak day demands. The tables describing each of the individual utilities' population, demand, and supply forecast are described in detail and included in Appendix I. The four demand scenarios described previously for the regional analysis were used to analyze these larger utilities as well. Summary tables, Tables VII-5a through VII-5d, combine the results of each utilities' data for the different demand scenarios.

The projected population for these six utilities for 2010 and 2040 is 360,931 and 508,762 people, respectively. The existing population for these utilities is approximately 239,100 people. Presently, these six utilities account for approximately 86 percent of the total estimated population in the South King County CWSP study area based on PSCOG figures. The approximate population and percentage of the six-utility population in 1989 is as follows:

Name of Utility	Estimated 1989 Population	Percentage of Total Population of the Six Utilities
Auburn	35,484	14.8%
Covington Water Dist.	22,413	9.4%
Federal Way W&S	80,404	33.6%
Kent	38,018	15.9%
KCWD No. 75	52,409	21.9%
KCWD No. 111	10,372	4.3%
Total Population	239,100	

Total Peak Day Demands are also summarized on Tables VII-5a,-b,-c, and -d. Peak Day is estimated to range from approximately 82.1 MGD in 1989, to 120.5 MGD in 2010, and 165.8 MGD in 2040, under existing conditions. This was taken directly from the most recent version of water system plans. In comparison, demand is reduced by about 4.4 MGD in 2010, and 4.3 MGD in 2040, with an assumed increase in multi-family units for transitional and urban areas of each of these utilities. Water conservation results in a savings of about 13 MGD in 2010, to 17.8 MGD in 2040. Therefore, total peak day demand under water conservation is estimated to be 107.5 MGD in 2010 and 148.0 MGD in 2040. Assuming a combination of water conservation and an increase in multi-family units results in an estimated total savings in water use of 17.4 MGD in 2010, and 22.1 MGD in 2040.

A summary of Total Deficit and Surplus of Capacity is also shown on these Tables. Auburn, Kent, and KCWD No. 75 both show surplus throughout the planning period. KCWD No. 75 surplus is attributable to

the available supply from Seattle, of 22.5 MGD. In addition, the installed capacity of 6.3 MGD from their two wells is also shown, although the District operationally limits the wells to 3.25 MGD. On the other hand, Federal Way, Covington Water District, and KCWD No. 111 show deficits beginning around 1995. The contracted amount for 15 MGD from Pipeline No. 5 would satisfy their combined deficit to about year 2010 under existing conditions. With water conservation having an impact on demand, this deficit could be met by Pipeline No. 5 to approximately 2015.

If water is wheeled from the utilities with surplus supplies, then the picture is less bleak, even without Pipeline No. 5 being constructed. If 100 percent of the excess supply is assumed to be available, then a short-fall in supply does not occur until after the year 2015 under existing conditions and until after 2025 with full water conservation. Exhibit VII-5 shows projected demand under the four scenarios in relation to 100-percent of the total existing and proposed sources of supply (i.e. new and existing capacity).

However, this objective is not practical or probable. Not all water would be available for transfer because of physical limitations. The exact amount available for transfer has not been quantified. Although with existing and proposed interties, and existing and planned transmission facilities improvements, some transfer of water is possible. Therefore, an assumption of 50 percent of the excess supply being available for transfer was used in the analysis. Under this assumption, the combined net deficit would be about 3.0 MGD in 2010 under existing conditions or 2.2 MGD in 2020 with conservation.

C. Existing Interties

The majority of the interties identified in South King County are for emergency supply of water, while some serve as primary and secondary sources of supply. These interties serve as essential links for emergency service and help ensure reliable service for a large area. Table VII-6 presents a summary of existing and proposed interties by system, location, connection size, maximum capacity, and hydraulic grade, if known.

These interties range in size from 4 to 12 inches in diameter. Some have pressure reducing valves (PRV) or pumps in connection with the intertie to make the systems compatible. Other interties are operated on the premise that flow will only be in one direction, such as supply from Seattle to King County Water District No. 75.

4. REGIONAL WATER SUPPLY INVESTIGATIONS

A. Regional Supply Requirements

The previous sections focus on demand forecasts throughout South King County and specifically for each of the six major utilities within the area. Exhibits VII-3 and VII-4 graphically compare the average and peak daily demands under varying assumptions to the installed capacity of Class 1, 2, 3, and 4 utilities.

It appears that within the urbanizing areas, the area encompassed by King County Water District No. 75 will approach build out at an earlier year due to high densities and low quantities of available vacant property. Covington Water District, however, has large quantities of vacant land classified as transitional or rural. Therefore, it has a large growth potential. However, both Covington Water District and King County Water District No. 111 appear to lag the remaining urbanizing areas in terms of the growth rate and demand during the 10-, 25-, and 50-year planning horizon.

B. Water Resource Studies and Supply Alternatives

(1) Water Supply Bulletin No. 28

Until recently, one regional study entitled Water Supply Bulletin No. 28 "Geology and Groundwater Resources of Southwestern King County, Washington" by J. E. Luzier in 1969, served as the framework of most groundwater information for the area. The character and distribution of groundwater aquifers was limited by the availability of data at that time.

Individual utilities have initiated independent studies to supplement water system planning efforts and identify local resource alternatives. The City of Auburn, City of Kent, Covington Water District, and Federal Way Water and Sewer District have sponsored such studies.

(2) City of Auburn

Hydrogeologic investigations in the Auburn area indicate a shallow and deeper unconfined aquifer of large capacity. This aquifer exists at what was the confluence of the Green and White Rivers. The shallow aquifer occurs between 25-100 feet. The

deeper aquifer resembles a wedge varying from a 300-foot thickness near the downtown Auburn area to a 100-foot thickness at areas to the north and west. Well production varies from 1,000 to 3,000 gpm and experiences only seasonal water level fluctuations.

(3) Federal Way Water and Sewer District

The Federal Way studies indicate the presence of an upper aquifer called the Redondo-Milton channel running north and south, as well as an intermediate aquifer about 200 feet below sea level and a deep aquifer approximately 600 feet below sea level. The boundaries of all three aquifers are undefined as yet. Production wells of 2,000 gpm and 3,000 gpm have been developed, respectively, in the Redondo-Milton and intermediate aquifers. Only one well of 1,100 gpm has been drilled into the deep aquifer. Water level declines have been noted in both the upper and intermediate aquifers. The Redondo-Milton aquifer declines may have stabilized. However, the intermediate aquifer has experienced local decline of approximately 20-40 feet in the last 6 years.

(4) Covington Water District

Covington Water District appears to be withdrawing water from an aquifer in the Lake Sawyer area that is 0-200 feet in depth. It is unknown if there is a deeper aquifer of significance due to the lack of deep wells needed to characterize the aquifer. Seasonal water level fluctuations have been noted and production has ranged from 1,000-2,000 gpm on existing wells.

(5) King County Water District No. 111

King County Water District No. 111 obtains supplies from a series of shallow wells all under 200 gpm output. Some water level reduction has been noted but is stabilized with balanced pumping by the utility. It is unknown if there is a deeper aquifer of significance.

(6) King County Water District No. 75

King County Water District No. 75 area aquifers appear to provide yields of 1-1,000 gpm per well. However, this area has abandoned a series of wells over the past due to reduced output and other performance problems. The area has also experienced a steady decline of water levels in local aquifers during the past 15 year.

(7) U.S. Geological Survey

An extensive investigation of groundwater resources was initiated by USGS with funding shared by SKRWA, Seattle Water Department, Tacoma Water Division, King County, and Ecology. The USGS study has focused on regional groundwater characterization and availability over an area that encompasses most of the CWSP planning area. The draft USGS report is not expected until late 1989. Definite conclusions regarding groundwater recharge and capacities are not anticipated by USGS until a recharge model is funded and developed.

(8) Ground Water Management Plan (GWMP)

A GWMP process was initiated and funded by Ecology, SKRWA, and King County, with the intent of developing methods to protect the quality and quantity of groundwater, meet future resource needs while recognizing existing water rights, and provide effective and coordinated management of groundwater resources. The focus of the GWMP is to more closely evaluate four specific subareas within the same area used for the USGS study.

In combination, the USGS study will characterize the groundwater supplies, the GWMP will establish methods to properly monitor and manage the resource, and the CWSP provides administrative procedures to ensure the coordinated utilization of resources and a regional strategy to ensure that public water supplies can meet the future demands created by adopted King County land use policies.

It was originally intended for the CWSP, GWMP, and USGS studies to be initiated and conclude simultaneously. However, each has a different completion schedule. The CWSP is the first study to be completed. A draft of the GWMP is under review. The draft USGS report is not expected until late 1989. As a result, information to complete the Water Right Reservation application is unavailable and this CWSP has limited itself to a thorough analysis of existing rights and projected demands but has not specified groundwater areas or quantities for future reservation action.

The GWMPs preliminary findings regarding aquifer characteristics and an estimated range of optimum yields in South King County create doubt that sole reliance upon groundwater will be adequate to meet future demands. In addition, total reliance on groundwater may jeopardize stream flows, wetlands, and interrelated aquifer withdrawals if over pumping is allowed. The GWMP data

indicate that conjunctive ground and surface water programs, along with potential artificial recharge sites in Auburn and Federal Way may be suitable supply alternatives.

(9) Pierce County CWSP

The CWSP for the Pierce County area discussed a water supply deficiency in the region surrounding the City of Tacoma. Utilities other than the City of Tacoma in this area currently rely exclusively on groundwater from local aquifers. However, analysis of aquifer water quality and growth projections for these utilities show that supply from the aquifers will not be sufficient to meet future needs. Therefore, the Green River is identified in the Plan as a source of additional water supply.

(10) City of Tacoma

The City of Tacoma has conducted several studies impacting the regional supply strategy of South King County. The 1980 Tacoma Water System Plan and its EIS evaluated the need for additional water, alternatives for meeting the need, the impacts of additional water withdrawn on the Green River, and alternative routes for conveying water from the Green River diversion to Tacoma.

An EIS process has been completed by King County on the construction of Pipeline No. 5. This project includes alternatives to existing headworks on the Green River, and constructing approximately 33 miles of pipeline through South King County to the Tacoma tideflats. An additional 100 cfs, or 64.6 MGD, would be available, of which 15 MGD has been contracted to South King County utilities. Adherence with minimum instream flow considerations and the confirmation of additional water rights have already been given to the project by Ecology and the Departments of Fisheries and Wildlife.

Further study of enhancement projects to the Howard Hansen dam have been proposed by Tacoma but not yet undertaken. Dam enhancement would provide an additional storage allowing an additional 50 cfs, or 32.3 MGD, of withdrawal from the Green River above the permitted right of 210 cfs.

Tacoma has also conducted a hydraulic analysis of potential piping configurations and operational schemes for an intertie between the Seattle system and Pipeline No. 5. Tacoma has also initiated

an artificial recharge investigation program of the South Tacoma aquifer to provide additional flexibility in the conjunctive use of surface and groundwater.

(11) City of Seattle

Seattle has begun preparation of its 1990 COMPLAN. This document is addressing several near and long-term supply options that could be of benefit to South King County and Tacoma.

Of a near-term consequence, the City is currently conducting on-site investigation of artificial recharge of aquifers in the Highline area lying just to the north of the CWSP study boundary with Cedar River water. A well field has been developed to supplement the existing surface water supply system. The wells would be operated during the four summer months of the year as a peaking supply. Well field development would include approximately four wells in the Riverton Heights area, north and east of the Sea-Tac Airport. Wells would be completed in the intermediate aquifer at the depth of 275 to 375 feet below the ground surface. Each well would be capable of producing approximately 2,000 gpm, with a well field capacity of 12 MGD. For a peak demand supply, the wells would be continuously pumped for up to four months. The aquifer recharge rate is being investigated as part of the Highline well field project. The groundwater withdrawal rate for the 3-4 month production period would be designed so as not to exceed the safe yield of aquifer recharge. This project is substantially funded by the U.S. Bureau of Reclamation. Its approach and success may have direct application to sites in Auburn, Federal Way, or elsewhere suggested by the South King County GWMP.

From a long-range perspective, Seattle and many of the larger nearby utilities have actively discussed an integrated hydraulic network for wheeling water to areas lying between Everett and Tacoma. Interties exist between many utilities, but may not currently sustain wheeling activities without improvements to reach hydraulic compatibility.

(12) Other Supply Options

Other supply options were evaluated by the Water Utility Coordinating Committee (WUCC) to meet long-term demands. Potential surface water supplies from the Puyallup and Nisqually Rivers were thoroughly evaluated in the City of Tacoma's Water System Plans in 1980 and 1985. This option was also reviewed before the Pollution Control Hearings Board during evaluation of

water rights and surface withdrawal for Pipeline No. 5. These prior evaluations discounted the viability of economical supply from either of these two river systems.

Desalinization of Puget Sound seawater was also investigated. Current desalinization technologies and costs are summarized in Exhibit VII-6. As explained in the Exhibit, the technology for large-scale seawater desalinization does not appear to be feasible at this time.

C. Water Rights

Groundwater rights within the area are described in detail in Section VIII. There are no shortages of total water rights currently held by the South King County utilities. In fact, some utilities have retained rights on inactive groundwater supplies. Updated water rights information is needed. Surface water right issues regarding withdrawals of Green River supplies have been addressed and resolved in support of the additional 100 cfs Pipeline No. 5 withdrawal. Additional investigation is needed to address the importation of water from other areas further to the north and for artificial recharge of aquifers with surface water from another surface drainage basin.

5. REGIONAL WATER SUPPLY STRATEGY

Based on the resource studies discussed previously, it is apparent that peak day demands will exceed total existing source capacity within all of South King County by the year 2025. This includes the 15 MGD purchased from the City of Tacoma through the Pipeline No. 5 project. This is true for all of the four demand scenarios previously displayed in Exhibit VII-4. The water supply available to the South King County area, as shown on Exhibit VII-4, is overstated. The total source capacity cannot be viewed as available for the entire area due to hydraulic limitations that currently do not provide transmission capabilities between systems. Both surplus and shortfalls of source capacity exist in different areas, as shown in the analysis of the individual regional utilities. Therefore, a supply strategy was developed which incorporates continued development of sources by each utility in the near-term but relies upon expanded regional supply options for the future. The objectives used to guide the strategy are shown below.

A. Supply Objectives

The objectives promoted by the WUCC for development and implementation of a regional supply strategy in South King County include:

(1) Efficient use of existing sources;

(2) Implementation of an effective conservation program;

(3) Effective development of groundwater aquifers;

(4) Conjunctive use of groundwater and surface water within the study area, including the use of Pipeline No. 5 supplies;

(5) Importation of supplies from other regions outside the study area, if needed.

B. Proposed Supply Strategy

Several elements of a comprehensive supply strategy were developed by the CWSP to fulfill the objectives listed above. These elements include operational, resource management, and new source development. These elements are presented both for immediate and long-term implementation.

The long-term source solution for South King County is development of a conjunctive program for proper utilization of ground and surface water supplies. The construction of Pipeline No. 5 provides the backbone of a regional supply network that will integrate resources from the City of Tacoma, South King County, the City of Seattle, the City of Everett, and potential interties with the supply development on the Skagit River to meet the long-term needs of the urbanizing Puget Sound area.

Of a more immediate nature, each utility is expected to continue development of local source options, as outlined in their individual comprehensive water system plans. The ongoing development of the GWMP will assist in the characterization of local aquifers and the ability to continually schedule their development capacities until the potential development yield of their area is in conflict with the interests and beneficial use of other competing user groups. Continued resource development will also necessitate the active implementation of prudent utility and water resource management practices by all utilities, county, and State agencies.

The refinement of demand information and an aggressive and ongoing program of water resource management and investigation are critical to developing an acceptable resource strategy. The sequence of priority of implementing this resource strategy has already received much investigation and merits further coordinated effort.

C. Implementation of Regional Supply Strategy

The components of both the near- and long-term implementation program will be partially predicated by ongoing USGS and GWMP studies, along with the final construction date for the Pipeline No. 5 project. Both the near-term and long-term components are outlined below:

Near-Term (present to year 2000)

(1) Conservation

During preparation of the CWSP, the WUCC endorsed conservation as a necessary management tool which must be vigorously pursued simultaneously with the development of future resources. Reduced consumption through operational, technical, and management alternatives will serve to delay the need for new source development. However, it is unlikely that these efforts will permanently eliminate the need for future sources of supply unless growth moratorium or bans on high use industry is endorsed by land use policies.

The WUCC believes that an effective conservation effort is a long-term program which should be fashioned in an effective and reasonable manner for utility implementation. Short-term mandatory restrictions, more associated with droughts, are not considered to be a true conservation element. Instead, the WUCC joined with East King County WUCC in endorsing a three-tiered program which recognized the varying capabilities of differently sized water utilities to implement such a program.

Table VII-7 summarizes the recommended water conservation program. The program relies upon activities both at a utility and regional level. Major program elements include public education, technical assistance, policy adjustments, and other special components which merit future consideration. In combination, these provide a comprehensive program estimated to provide approximately an 8 percent reduction in overall consumption. Moderate and base level conservation incorporates fewer of the program elements with a corresponding reduction in conservation to 6 and 4 percent, respectively. It is the intent that a conservation program will be in place and operational by 1995 and achieve the desired levels of reduction by the year 2000.

Coupled with this are industrial process changes, water reuse, price elasticity effects from increased water and sewer bills, and

other efforts to reduce consumption. An example of effective conservation efforts are demonstrated by reduced water demands exerted by the Boeing facilities in the Kent and Auburn area. Another potential example is that of the Simpson Lumber Company in Tacoma using recycled wastewater effluent to substitute for approximately 8-15 MGD of process water. The magnitude of such decreases and the reliability of their implementation is unknown. To account for this uncertainty, water demand forecasts by the CWSP assumed a 10 percent overall decrease by the year 2000 due to conservation efforts of all degree throughout rural, transitional, and urban areas.

(2) Individual Wells

Continued reliance upon development of individual wells will be a key solution in the near-term, with the possible exception of King County Water District No. 75. As with KCWD No. 75 and Federal Way, evidence of aquifer depletion will require a more intense management program of local aquifers. Close coordination with hydrogeologists are needed to ensure that proper location and depth of aquifers are tapped. The location and recommended construction of specific individual wells has not been addressed in the Regional Supplement, but are identified in individual comprehensive water system plans prepared by the utilities.

(3) Test Wells and Water Resource Monitoring

A comprehensive test well drilling and water resource monitoring program should be developed and actively implemented by the utilities. The GWMP will assist in identifying areas where additional information is needed. Currently, there are areas where inadequate information exists regarding the recharge potential and aquifer capacities. Reliable conclusions are unavailable at this time primarily due to the lack of water resource data needed to completely characterize the aquifers and their capacities.

The GWMP recommended that water levels from many utility wells in South King County be measured on a regularly scheduled basis. The WUCC should also encourage the USGS to resume monitoring water levels and test wells they have located throughout the South King County area.

(4) Design and Construction of Regional Supply Network

The backbone of the regional supply network for South King County is the construction of the City of Tacoma's Pipeline No. 5.

Construction of Pipeline No. 5 is a project encompassing approximately 33 miles of pipe ranging in size from 54 inch and 48 inch pipe. The Pipeline was designed to accommodate at least 65 MGD of flow, which is equivalent to the 100 cfs water right provided to Tacoma for the project. Fifteen MGD of the capacity has been purchased by SKRWA members. Their purchase quantities are: Covington Water District - 3.46 MGD; KCWD 111 - 2.31 MGD; Federal Way Water and Sewer District - 4.62 MGD; and City of Kent - 4.62 MGD. The contract with these utilities in the city requires that water supply requirements of the SKRWA be delivered by January 1, 1993. Sharing the cost of construction for Pipeline No. 5 will be on a prorated basis based upon their contracted purchase volume.

Commensurate with the construction of this regional transmission system is the continued development of interties between the adjacent water utilities. Due to the extensive hydraulic network already operated by the SKRWA member utilities, their interties with each other and with adjacent utilities are of the largest regional significance. Table VII-6 provides a summary of the existing interties with these major regional utilities. As noted, the majority of these interties are for emergency purposes.

Table VII-6 also identifies three proposed interties. A future intertie between Covington Water District and KCWD No. 111 at Kent-Kangley Road and another between Covington Water District and Cedar River Water and Sewer District at Maple Valley-Black Diamond Highway are proposed. Also, the City of Tacoma Water Division and the City of Seattle Water Department are proposing a major water supply intertie between the two systems referred to as the Sea-Tac Intertie. See item (6) under this sub-section for additional discussion of this intertie.

Hydraulic analysis conducted for these major utilities during preparation of the CWSP indicate that current interties are suitably located to provide the capacities shown in Table VII-6.

It was determined by the hydraulic analysis that most utilities need only concern themselves with internal piping improvements to distribute water purchased from Pipeline No. 5 throughout their system. This is due in part, because each utility is conveniently located near the Pipeline No. 5 route. The exception to this situation is KCWD No. 75 which lies north of Federal Way. However, an evaluation of Federal Way's distribution system indicated that minor piping improvements would be needed in order to "wheel"

flows above 1.8 MGD through Federal Way to KCWD No. 75. An evaluation of "wheeling" 2,4, and 6 MGD of water from Seattle through KCWD No. 75 to Federal Way was also performed. The results showed that wheeling even as much as 2 MGD on a sustained basis would negatively impact KCWD No. 75 distribution system pressures without some upsizing of transmission lines. A number of improvements would be necessary including pumping facilities within KCWD No. 75 system as well. These facilities are described in the cost of implementation in the sub-section directly following.

The Pipeline does provide flexibility for implementing other regional resource alternatives. As an example, it may be possible to develop well fields along the pipeline route and co-mingle groundwater with Green River surface water. An excellent opportunity exists in Auburn where local aquifers are estimated to have a yield ranging from 30-40 MGD. Current peak demands of Auburn are approximately 16 MGD. Development of this aquifer could occur in early years and be pumped into the Pipeline No. 5 facilities as other regional sources are developed.

The Pipeline No. 5 project has just completed an EIS review required by King County. Permits have been filed with appropriate agencies for the construction of the pipeline. There is some uncertainty regarding project delays by permitting objections filed by the Muckleshoot Indian Tribe or other local interest groups over impacts to the Tribal fishing rights or other competing uses for Green River water. Lengthy litigation has already occurred in which the City of Tacoma prevailed in its request for issuance for water rights for the Pipeline No. 5 diversion. These water rights have been issued by Ecology. In addition, the Department of Fisheries has responded in writing that the remaining review of the project will be limited to construction impacts in surface waters during installation of Pipeline No. 5.

Notwithstanding potential delays, the City of Tacoma is proceeding with plans to have the Pipeline operational in 1993. Should delays occur, it may be possible to construct pipeline by segments in reverse sequence to pump and backfeed water from the Tacoma tideflats to South King County. The completion of remaining segments would occur at a later date. An adjustment in the financing and cost sharing of construction of these segments would need to be resolved at that time. During this interim period of

potential delay, increased reliance upon interties with Seattle will provide supplies of lesser quantities especially for utilities abutting Seattle on the northern edge of the study area.

A hydraulic analysis was conducted by the CWSP to establish the sizing criteria and operational conditions serving utilities intertied with Pipeline No. 5. This analysis supplemented a previous evaluation conducted for the City of Tacoma. Appendix J provides a description of the approach and the results of the hydraulic analysis. Table VII-8 and Exhibit VII-7 summarize and illustrate the location of these interties and the results of the analysis.

The evaluation concludes that current sizing of Pipeline No. 5 is capable of providing 88 MGD flows to the City of Tacoma. The placement of a flow regulating valve along Pipeline No. 5 is critical in establishing its maximum capabilities. Currently, the regulating valve is to be installed near Lake Sawyer in anticipation of a future intertie down gradient with the City of Seattle. Table VII-8 summarizes the flow and hydraulic gradient requirements of SKRWA utilities contracted for supplies from Pipeline No. 5. The Table also summarizes the requirements of potential supplies from a Seattle intertie.

The analysis concluded that excessive pressures would require receipt of water through a pressure reducing valve at all interties when water is supplied by the Green River. The reverse is true if water is supplied from the Lake Youngs/Soos Reservoir from the Seattle Cedar supply system, in which case, booster stations would be needed for all interties.

(5) Investigate Artificial Recharge Options

The City of Seattle has initiated an investigation of artificial recharge within the Highline area. Preliminary results of the GWMP indicate that artificial recharge may also be an option in Auburn and near well 20, 23, and 25 in Federal Way. If technically supported by further field investigation, artificial recharge appears to provide an important resource alternative. Artificial recharge would replenish aquifers during winter months when stream flows exceed minimum instream flow requirements. Replenished aquifers could be pumped during summer periods to meet local peak demands. This would reduce seasonal demands placed on the River system during the summer and late fall months.

An extensive evaluation of the groundwater hydrology and aquifer characteristics is necessary prior to implementation. Water quality considerations will be an important focus to establish the compatibility of the surface and groundwaters.

(6) Seattle/Tacoma Intertie/Wholesale Purchase

Also shown in Exhibit VII-7 is a potential intertie with Seattle. This would entail a 32 inch main from Pipeline No. 5 located near Big Soos Creek, running north through KCWD 111 to Lake Youngs. An alternative alignment was evaluated by the CWSP. The alternative alignment connected the headworks of the Tacoma Green River Pipeline No. 5 near Palmer with Seattle's Cedar River system near Taylor Creek. This alternative has been evaluated in the event Seattle decides to relocate its Cedar River intake from Landsburg to a point upstream at the confluence of the Cedar River and Taylor Creek. Although there may be some advantages to this location from the standpoint of flexibility if future surface water treatment requirements are imposed on Seattle and Tacoma, there are significant pumping expenses associated with this option.

An intertie with Seattle will provide increased reliability and flexibility in the management of regional water resources. It would allow the wheeling of water between regional utilities during emergencies or when needed to accommodate additional resource development activities.

Water quality considerations are a significant issue to be resolved before intertie of this magnitude can be viewed with complete reliance. Currently, both the Cities of Tacoma and Seattle provide protected watersheds without surface water treatment compared to primarily groundwater supplies utilized by South King County utilities.

Wholesale purchase agreements are already in place between South King County utilities and the City of Seattle. KCWD No. 75 purchases the majority of its water from Seattle. In addition, the City of Kent receives Cedar River water, which is "wheeled" through KCWD No. 75 at quantities which are contractually limited to 1.42 MGD. Kent also has a contract with Tukwila for up to 2 MGD supply of water which also is "wheeled" from the Cedar River supply system. Covington Water District and KCWD 111 are currently pursuing a potential "wheeling" opportunity of

Seattle's Cedar River supply water through the Cedar River Water and Sewer District. The terms of this arrangement are nearing completion.

Long-Term (beyond the year 2000)

(1) Importation of Water

Projected source deficiencies by the year 2020, coupled with unknown reliance upon additional groundwater resources within the area, support the evaluation of projects of a larger regional nature. Wholesale supply arrangements already exist between Seattle and East King County utilities. However, major supply capabilities between the City of Seattle and the City of Everett are not currently hydraulically available. A new major transmission facility is needed to transfer significant quantities of water.

Of a larger perspective, the potential development and importation of surface water from the Skagit River to the lower Puget Sound urbanizing region has been discussed. Preliminary engineering work has not been conducted on this alternative. A project of this magnitude would be complex and require a commensurate level of engineering, environmental, and financial evaluation prior to implementation. A project of this magnitude provides a State-wide and regional significance. Therefore, it appears appropriate to evaluate financing alternatives which would include State participation.

(2) Howard Hansen Dam Enhancement

The South King water utilities should continue to encourage investigations leading to the enhancement of Howard Hansen Dam. The enhancement project would improve the condition of the existing dam and enlarge the storage capacity. It is estimated that an additional 50 cfs, 32.3 MGD, would become available by this project. An allocation of the increased supply capacity would need to be negotiated with the City of Tacoma.

D. Cost of Implementation

Cost estimates to implement the proposed regional water supply strategy are shown in Table VII-9. Estimated costs are presented in this Table based upon Engineering News Record construction cost index for Seattle of 4,748.24 representing May, 1989, expenditures.

It should be noted that specific cost estimates have been included for facilities needed to be constructed by individual utilities connecting to the Pipeline No. 5. This includes costs for a combined pressure reducing and booster pump station at each location in anticipation that an intertie with Seattle will be eventually developed, as well as that with Pipeline No. 5. Additional piping improvements required to adequately distribute Pipeline No. 5 water throughout the utility's distribution system have been included within the individual comprehensive water system plans, with lengths of transmission facilities needed to connect with the intertie. Cost are also shown separately for the Pipeline No. 5 project and for the Seattle-Tacoma intertie. Estimates of annual database management for groundwater resources information, as well as a range of costs anticipated for the investigation of artificial recharge efforts are also shown.

Costs for the construction of Pipeline No. 5 in segments are also provided in Table VII-10, in the event that phased construction of Pipeline No. 5 is considered. Table VII-11 provides a detailed cost estimate of the Seattle-Tacoma Intertie. Table VII-12 provides a detailed cost of KCWD No. 75 improvements for supply to Federal Way Water and Sewer District.

TABLE VII-1

SOUTH KING COUNTY CWSP STUDY AREA
POPULATION PROJECTION (1)

FAZ NO.	% IN STUDY AREA (2)	YEAR 1970	1980	1985 (3)	1990	1995 (3)	2000	2010 (3)	2020	STRAIGHT LINE 2030 (4)	STRAIGHT LINE 2040(4)
3010	100%	7,773	18,598	23,609	28,620	33,784	38,948	46,111	53,273	61,980	70,687
3020	100%	11,692	13,827	15,578	17,329	19,116	20,902	23,810	26,717	30,397	34,077
3030	100%	14,184	17,470	20,187	22,904	26,005	29,106	34,566	40,026	46,663	53,300
3040	100%	18,874	25,118	28,311	31,504	34,106	36,707	41,383	46,059	52,089	58,119
3110	100%	2,946	3,502	4,319	5,135	6,138	7,141	8,863	10,585	12,581	14,577
3120	100%	12,258	14,442	15,824	17,205	18,907	20,608	24,158	27,707	32,012	36,317
3130	100%	10,080	11,838	13,268	14,698	16,253	17,808	20,129	22,449	25,398	28,347
3200	100%	9,248	12,843	13,838	14,833	16,182	17,531	19,176	20,821	23,140	25,459
3310	80%	3,452	5,486	6,606	7,725	8,869	10,013	13,151	16,290	19,826	23,362
3320	70%	2,595	6,515	8,818	11,121	12,890	14,659	19,139	23,619	28,700	33,780
3411	5%	918	1,362	1,610	1,858	2,202	2,546	3,310	4,074	4,941	5,808
3420	100%	13,147	21,997	25,737	29,476	35,298	41,119	55,711	70,302	86,574	102,845
3500	95%	13,832	17,980	22,404	26,829	28,978	31,128	33,525	35,921	39,449	42,976
3600	100%	10,501	9,577	10,750	11,922	14,077	16,232	19,885	23,538	27,786	32,034
3700	80%	31,254	30,332	31,804	33,276	34,752	36,227	37,612	38,996	41,611	44,225
3810	5%	1,926	1,729	1,802	1,876	1,890	1,905	1,916	1,927	2,006	2,084
3900	20%	635	701	768	834	927	1,019	1,163	1,306	1,480	1,655
4110	5%	499	553	645	737	787	838	922	1,005	1,120	1,234
6900	33%	1,080	1,459	1,740	2,021	2,362	2,702	3,576	4,450	5,417	6,384
TOTAL:		166,893	215,328	247,615	279,903	313,521	347,139	408,102	469,066	543,168	617,270

(1) Based on the number of households estimated in Table G-1 and household size shown in Table G-2 in Appendix G.
(2) Corresponds to Coordinated Water System Plan Study Area boundaries. FAZ 6900 adjusted to include about 1/3 of FAZ population living within the study area.
(3) Linearly extrapolated between forecasted figures from PSCOG.
(4) Straight-line projection from 2020.

SOURCE: Adapted from the Puget Sound Council of Governments June 1988 Population and Employment Forecasts

TABLE VII-2

SOUTH KING COUNTY CWSP STUDY AREA
SUMMARY OF AVERAGE AND PEAK DAY DEMAND
(MGD)

	YEAR						STRAIGHT LINE	
	1985	1990	1995	2000	2010	2020	2030	2040
SCENARIO 1 - EXISTING CONDITION								
Projected Average Day Demand (1)	36.6	41.4	46.3	51.2	60.0	68.8	79.5	90.3
Projected Peak Day Demand (2)	87.0	98.4	110.2	121.9	143.1	164.3	190.0	215.8
SCENARIO 2 - MULTI-FAMILY INCREASE (3)								
Projected Average Day Demand (1)	36.6	41.4	45.1	48.6	57.0	65.3	75.5	85.7
Projected Peak Day Demand (2)	87.0	98.4	107.4	115.8	135.9	156.1	180.5	205.0
SCENARIO 3 - WITH CONSERVATION (4)								
Projected Average Day Demand (1)	36.6	41.4	44.0	46.1	54.0	61.9	71.6	81.2
Projected Peak Day Demand (2)	87.0	98.4	104.6	109.7	128.8	147.8	171.0	194.2
SCENARIO 4 - WITH CONSERVATION & MULTI-FAMILY INCREASE (5)								
Projected Average Day Demand (1)	36.6	41.4	42.8	43.5	51.0	58.5	67.6	76.7
Projected Peak Day Demand (2)	87.0	98.4	101.9	103.6	121.6	139.6	161.5	183.4

(1) Assumes 180, 140 and 120 gallons per capita per day (gpcd) for existing conditions for urban, transitional and rural areas, respectively. These numbers are consistent with water utilities in South King County of similar development.

(2) Assumes peak to average day factors of 2.2, 2.4, and 2.8 for urban, transitional and rural areas, respectively. These numbers are consistent with water utilities in South King County of similar development.

(3) Assumes conservation savings in gallons per capita per day (gpcd) of 5% in 1995 up to 10% in 2000 and thereafter for all urban, transitional and rural customers. This reduction utlimately results in average gallons per capita per day (gpcd) of 162, 126 and 108, respectively for urban, transitional and rural areas after the year 2000.

(4) Assumes increase in multi-family units in both the urban and transitional areas resulting in gradual reduction in per capita water consumption of 1.5% in the urban area and 3.5% in the transitional area for the year 1995 up to 3% and 7%, respectively for the year 2000 and thereafter. This reduction ultimately results in average gallons per capita per day (gpcd) of about 175, 130 and 108, respectively for urban, transitional and rural areas after 2000.

(5) Combination of (3) and (4).

TABLE VII-3

SOUTH KING COUNTY CWSP STUDY AREA
EXISTING INSTALLED SOURCE CAPACITY

PUBLIC WATER SYSTEM SIZE	NO. OF WATER SYSTEMS	INSTALLED CAPACITY GPM	MGD	(1)
CLASS 1 (100 or more connections or more than 1000 transient people)	16	85,194	122.7	(2)
CLASS 2 (10-99 connections or transient 300 to 999 on any one day)	42	2,161	3.1	(3)
CLASS 3 (transient population of 25 to 299 on any one day)	(4)	1,389	2.0	(3)
CLASS 4 (2-9 connections or transient less than 25)	(4)	3,472	5.0	(3)
	623	92,217	132.8	

(1) Estimated from individual data requests, DSHS files, Ecology material, Water Resource Facility forms, and phone conversations.

(2) Seattle's available supply to Water District No. 75 of 22.5 MGD is included above.

(3) Estimated. Incomplete records for Water System Class 2, 3 and 4.

(4) Combined total of Class 3 and 4 is about 565 water systems.

TABLE VII-4

SOUTH KING COUNTY CWSP STUDY AREA
SUMMARY OF PROJECTED SOURCE REQUIREMENTS
(MGD)

	YEAR						STRAIGHT LINE	
	1985	1990	1995	2000	2010	2020	2030	2040
SCENARIO 1 - EXISTING CONDITION (1)								
Projected Peak Day Demand	87.0	98.4	110.2	121.9	143.1	164.3	190.0	215.8
Existing Source Capacity (2)	132.8	132.8	132.8	132.8	132.8	132.8	132.8	132.8
Cumulative Source Deficiency	(45.8)	(34.4)	(22.6)	(10.9)	10.3	31.5	57.3	83.0
SCENARIO 2 - MULTI-FAMILY INCREASE (3)								
Projected Peak Day Demand	87.0	98.4	107.4	115.8	135.9	156.1	180.5	205.0
Existing Source Capacity (2)	132.8	132.8	132.8	132.8	132.8	132.8	132.8	132.8
Cumulative Source Deficiency	(45.8)	(34.4)	(25.4)	(17.0)	3.2	23.3	47.8	72.3
SCENARIO 3 - WITH CONSERVATION (4)								
Projected Peak Day Demand	87.0	98.4	104.6	109.7	128.8	147.8	171.0	194.2
Existing Source Capacity (2)	132.8	132.8	132.8	132.8	132.8	132.8	132.8	132.8
Cumulative Source Deficiency	(45.8)	(34.4)	(28.1)	(23.1)	(4.0)	15.1	38.3	61.5
SCENARIO 4 - WITH CONSERVATION & MULTI-FAMILY INCREASE (5)								
Projected Peak Day Demand	87.0	98.4	101.9	103.6	121.6	139.6	161.5	183.4
Existing Source Capacity (2)	132.8	132.8	132.8	132.8	132.8	132.8	132.8	132.8
Cumulative Source Deficiency	(45.8)	(34.4)	(30.9)	(29.1)	(11.1)	6.8	28.8	50.7

Footnotes:

(1) Assumes on the average 180, 140 and 120 gallons per capita per day (gpcd) and peak to average day factors of 2.2, 2.4, and 2.8 for urban, transitional and rural areas, respectively.
(2) Estimated from individual data requests, DSHS files, Ecology material and Water Resource Facility forms. Seattle's available supply to King County Water District No. 75 of 22.5 MGD has been included.
(3) Assumes increase in multi-family units in both urban and transitional areas resulting in gradual reduction in per capita water use of 1.5% and 3% in 1995, and 3.5% and 7% in 2000 and thereafter for urban and transitional areas, respectively.
(4) Assumes water conservation savings of 5% by 1995, and 10% by 2000 and thereafter for all areas.
(5) Combination of (3) and (4).

TABLE VII-5a
SOUTH KING COUNTY CWSP
SUMMARY OF POPULATION, DEMAND, AND SUPPLY PROJECTIONS
EXISTING CONDITION (1) FOR SKRWA REGIONAL UTILITIES

ASSUMES ALL SURPLUS SUPPLY IS AVAILABLE FOR WHEELING

Year	1985	1990	1995	2000	2010	2020	2030	2040
TOTAL POPULATION	209,708	246,449	279,924	313,877	360,931	409,959	459,019	508,762
NEW CAPACITY (MGD):								
Auburn	8.8	1.0	4.0	3.0	2.0	-	-	-
Federal Way	-	5.3	-	-	-	-	-	-
Kent (2)	-	1.8	-	-	10.0	4.0	-	-
KCWD NO. 75	6.3	-	-	-	-	-	-	-
Covington WD	-	0.7	-	-	-	-	-	-
KCWD NO. 111	-	0.4	-	-	-	-	-	-
TOTAL NEW CAPACITY (MGD):	15.1	9.2	4.0	3.0	12.0	4.0	0.0	0.0
TOTAL CUMULATIVE CAPACITY (MGD)	101.3	110.5	114.5	117.5	129.5	133.5	133.5	133.5
LESS TOTAL PEAK DAY DEMANDS (MGD)	71.9	84.6	95.1	106.3	120.5	135.4	150.5	165.8
TOTAL SUPPLY SURPLUS OR (DEFICIT) (MGD)	29.4	26.0	19.4	11.3	9.1	(1.9)	(17.0)	(32.3)

ASSUMES ONLY 50% OF SURPLUS SUPPLY IS AVAILABLE FOR WHEELING

DEFICITS (MGD):								
Auburn	-	-	-	-	-	-	-	-
Federal Way	-	-	(0.7)	(3.8)	(7.3)	(10.7)	(15.7)	(20.6)
Kent	-	-	-	-	-	-	-	-
KCWD NO. 75	-	-	-	-	-	-	(0.6)	(2.6)
Covington WD	-	-	(0.8)	(2.2)	(6.0)	(9.7)	(12.8)	(15.8)
KCWD NO. 111	-	-	-	(0.7)	(1.8)	(2.9)	(4.0)	(5.1)
TOTAL DEFICIT (MGD)	0.0	0.0	(1.5)	(6.7)	(15.0)	(23.3)	(33.0)	(44.1)
SURPLUS (MGD):								
Auburn	8.6	7.4	10.1	11.6	10.4	7.4	4.4	1.2
Federal Way	3.0	3.3	-	-	-	-	-	-
Kent	4.6	5.5	3.1	0.7	9.7	12.7	11.7	10.6
KCWD NO. 75	12.5	8.8	7.8	5.7	4.0	1.4	-	-
Covington WD	0.3	0.4	-	-	-	-	-	-
KCWD NO. 111	0.5	0.6	0.0	-	-	-	-	-
TOTAL SURPLUS (MGD) (4)	29.4	26.0	21.0	18.0	24.1	21.5	16.0	11.9
NET SURPLUS/(DEFICIT) (4)	14.7	13.0	8.9	2.3	(3.0)	(12.6)	(25.0)	(38.2)

NOTES:
(1) As described in most recent version of water system plans.
(2) Includes the loss of use of Kent's interties with KCWD #75 and Tukwila as primary sources of supply after 1990.
(3) Includes maximum capacity available from Seattle to KCWD #75 of 22.5 MGD.
(4) The net surplus/(deficit) assumes that 50% of any purveyor's surplus is mobile, i.e. accessible to deficit purveyors. New capacity is included in total supply surplus/deficit balance.

TABLE VII-5b
SOUTH KING COUNTY CWSP
SUMMARY OF POPULATION, DEMAND, AND SUPPLY PROJECTIONS
WITH AN INCREASE IN MULTI-FAMILY UNITS (1) FOR SKRWA REGIONAL UTILITIES

ASSUMES ALL SURPLUS SUPPLY IS AVAILABLE FOR WHEELING

Year	1985	1990	1995	2000	2010	2020	2030	2040
TOTAL POPULATION	209,708	246,449	279,657	313,877	365,162	416,784	468,241	521,219
NEW CAPACITY (MGD):								
Auburn	8.8	1.0	4.0	3.0	2.0	-	-	-
Federal Way	-	5.3	-	-	-	-	-	-
Kent (2)	-	1.8	-	-	10.0	4.0	-	-
KCWD NO. 75	6.3	-	-	-	-	-	-	-
Covington WD	-	0.7	-	-	-	-	-	-
KCWD NO. 111	-	0.4	-	-	-	-	-	-
TOTAL NEW CAPACITY (MGD):	15.1	9.2	4.0	3.0	12.0	4.0	0.0	0.0
TOTAL CUMULATIVE CAPACITY (MGD)	101.3	110.5	114.5	117.5	129.5	133.5	133.5	133.5
LESS TOTAL PEAK DAY DEMANDS (MGD)	71.9	84.5	93.2	101.5	116.1	131.0	146.1	161.5
TOTAL SUPPLY SURPLUS OR (DEFICIT) (MGD)	29.4	26.0	21.3	16.0	13.4	2.5	(12.6)	(28.0)

ASSUMES ONLY 50% OF SURPLUS SUPPLY IS AVAILABLE FOR WHEELING

DEFICITS (MGD):								
Auburn	-	-	-	-	-	-	-	-
Federal Way	-	-	(0.1)	(2.2)	(5.5)	(8.7)	(13.4)	(18.1)
Kent	-	-	-	-	-	-	-	-
KCWD NO. 75	-	-	-	-	-	-	-	-
Covington WD	-	-	(0.8)	(2.2)	(6.0)	(9.8)	(12.8)	(15.8)
KCWD NO. 111	-	-	-	(0.4)	(2.4)	(3.9)	(5.5)	(7.3)
TOTAL DEFICIT (MGD)	0.0	0.0	(1.0)	(4.8)	(13.8)	(22.4)	(31.8)	(41.2)
SURPLUS (MGD):								
Auburn	8.6	7.4	10.4	12.3	11.3	8.3	5.5	2.4
Federal Way	3.0	3.3	-	-	-	-	-	-
Kent	4.6	5.5	3.7	1.6	10.7	13.7	12.8	11.8
KCWD NO. 75	12.5	8.8	8.1	6.9	5.3	2.9	0.9	(1.0)
Covington WD	0.3	0.4	-	-	-	-	-	-
KCWD NO. 111	0.5	0.6	0.1	-	-	-	-	-
TOTAL SURPLUS (MGD)	29.4	26.0	22.2	20.8	27.2	24.9	19.2	13.2
NET SURPLUS/(DEFICIT) (4)	14.7	13.0	10.2	5.6	(0.2)	(10.0)	(22.2)	(34.6)

NOTES:
(1) Assumes water savings of 1.5%, and 3% in 1995, and 3.5% and 7% in 2000 and thereafter for urban, and transitional areas, respectively.
(2) Includes the loss of use of Kent's interties with KCWD #75 and Tukwila as primary sources of supply after 1990.
(3) Includes maximum capacity available from Seattle to KCWD #75 of 22.5 MGD.
(4) The net surplus/(deficit) assumes that 50% of any purveyor's surplus is mobile, i.e. accessible to deficit purveyors. New capacity is included in total supply surplus/deficit balance.

TABLE VII-5c
SOUTH KING COUNTY CWSP
SUMMARY OF POPULATION, DEMAND, AND SUPPLY PROJECTIONS
WITH WATER CONSERVATION (1) FOR SKRWA REGIONAL UTILITIES

ASSUMES ALL SURPLUS SUPPLY IS AVAILABLE FOR WHEELING

Year	1985	1990	1995	2000	2010	2020	2030	2040
TOTAL POPULATION	209,708	246,449	279,924	313,877	360,931	409,959	459,019	508,762
NEW CAPACITY (MGD):								
Auburn	8.8	1.0	4.0	3.0	2.0	-	-	-
Federal Way	-	5.3	-	-	-	-	-	-
Kent (2)	-	1.8	-	-	10.0	4.0	-	-
KCWD NO. 75	6.3	-	-	-	-	-	-	-
Covington WD	-	0.7	-	-	-	-	-	-
KCWD NO. 111	-	0.4	-	-	-	-	-	-
TOTAL NEW CAPACITY (MGD):	15.1	9.2	4.0	3.0	12.0	4.0	0.0	0.0
TOTAL CUMULATIVE CAPACITY (MGD)	101.3	110.5	114.5	117.5	129.5	133.5	133.5	133.5
LESS TOTAL PEAK DAY DEMANDS (MGD)	71.9	84.5	89.9	94.8	107.5	120.8	134.3	148.0
TOTAL SUPPLY SURPLUS OR (DEFICIT) (MGD)	29.4	26.0	24.6	22.7	22.0	12.7	(0.8)	(14.5)

ASSUMES ONLY 50% OF SURPLUS SUPPLY IS AVAILABLE FOR WHEELING

DEFICITS (MGD):								
Auburn	-	-	-	-	-	-	-	-
Federal Way	-	-	-	(0.5)	(3.6)	(6.7)	(11.2)	(15.6)
Kent	-	-	-	-	-	-	-	-
KCWD NO. 75	-	-	-	-	-	-	-	-
Covington WD	-	-	(0.5)	(1.4)	(4.7)	(8.1)	(10.8)	(13.5)
KCWD NO. 111	-	-	-	(0.3)	(1.3)	(2.2)	(3.2)	(4.3)
TOTAL DEFICIT (MGD)	0.0	0.0	(0.5)	(2.2)	(9.6)	(17.1)	(25.2)	(33.4)
SURPLUS (MGD):								
Auburn	8.6	7.4	11.0	13.6	12.7	9.9	7.3	4.4
Federal Way	3.0	3.3	0.8	-	-	-	-	-
Kent	4.6	5.5	4.2	2.8	11.9	15.0	14.2	13.3
KCWD NO. 75	12.5	8.8	9.0	8.5	7.0	4.8	3.0	1.2
Covington WD	0.3	0.4	-	-	-	-	-	-
KCWD NO. 111	0.5	0.6	0.1	-	-	-	-	-
TOTAL SURPLUS (MGD)	29.4	26.0	25.1	24.9	31.7	29.8	24.4	18.9
NET SURPLUS/(DEFICIT) (4)	14.7	13.0	12.1	10.3	6.2	(2.2)	(13.0)	(23.9)

NOTES:
(1) Assumes water savings of 5% in 1995, and 10% in 2000 and thereafter.
(2) Includes the loss of use of Kent's interties with KCWD #75 and Tukwila as primary sources of supply after 1990.
(3) Includes maximum capacity available from Seattle to KCWD #75 of 22.5 MGD.
(4) The net surplus/(deficit) assumes that 50% of any purveyor's surplus is mobile, i.e. accessible to deficit purveyors. New capacity is included in total supply surplus/deficit balance.

TABLE VII-5d
SOUTH KING COUNTY CWSP
SUMMARY OF POPULATION, DEMAND, AND SUPPLY PROJECTIONS
WITH CONSERVATION AND INCREASE IN MULTI-FAMILY UNITS (1)
FOR SKRWA REGIONAL UTILITIES

ASSUMES ALL SURPLUS SUPPLY IS AVAILABLE FOR WHEELING

Year	1985	1990	1995	2000	2010	2020	2030	2040
TOTAL POPULATION	209,708	246,449	279,924	313,877	360,931	409,959	459,019	508,762
NEW CAPACITY (MGD):								
Auburn	8.8	1.0	4.0	3.0	2.0	-	-	-
Federal Way	-	5.3	-	-	-	-	-	-
Kent (2)	-	1.8	-	-	10.0	4.0	-	-
KCWD NO. 75	6.3	-	-	-	-	-	-	-
Covington WD	-	0.7	-	-	-	-	-	-
KCWD NO. 111	-	0.4	-	-	-	-	-	-
TOTAL NEW CAPACITY (MGD):	15.1	9.2	4.0	3.0	12.0	4.0	0.0	0.0
TOTAL CUMULATIVE CAPACITY (MGD)	101.3	110.5	114.5	117.5	129.5	133.5	133.5	133.5
LESS TOTAL PEAK DAY DEMANDS (MGD)	71.9	85.7	88.6	90.8	103.0	115.8	128.8	141.9
TOTAL SUPPLY SURPLUS OR (DEFICIT) (MGD)	29.4	24.9	25.9	26.7	26.5	17.7	4.7	(8.4)

ASSUMES ONLY 50% OF SURPLUS SUPPLY IS AVAILABLE FOR WHEELING

DEFICITS (MGD):								
Auburn	-	-	-	-	-	-	-	-
Federal Way	-	-	-	-	(1.8)	(4.7)	(8.9)	(13.1)
Kent	-	-	-	-	-	-	-	-
KCWD NO. 75	-	-	-	-	-	-	-	-
Covington	-	-	(0.5)	(1.4)	(4.7)	(8.1)	(10.8)	(13.5)
KCWD NO. 111	-	-	-	(0.0)	(0.9)	(1.8)	(2.7)	(3.7)
TOTAL DEFICIT (MGD)	0.0	0.0	(0.5)	(1.4)	(7.5)	(14.6)	(22.5)	(30.3)
SURPLUS (MGD):								
Auburn	8.6	7.4	11.3	14.4	13.7	11.0	8.5	5.8
Federal Way	3.0	2.2	1.4	1.1	-	-	-	-
Kent	4.6	5.5	4.5	3.5	12.6	15.8	14.9	14.0
KCWD NO. 75	12.5	8.8	9.2	9.1	7.7	5.5	3.8	2.1
Covington	0.3	0.4	-	-	-	-	-	-
KCWD NO. 111	0.5	0.6	0.1	-	-	-	-	-
TOTAL SURPLUS (MGD)	29.4	24.9	26.4	28.1	34.0	32.3	27.2	21.9
NET SURPLUS/(DEFICIT) (4)	14.7	12.4	12.7	12.6	9.5	1.5	(8.9)	(19.4)

NOTES:

(2) Assumes combined water savings of 6.5%, 7%, and 5% in 1995, and 13.5%, 17%, and 10% in 2000 and thereafter for urban, transitional and rural areas, respectively.

(2) Includes the loss of use of Kent's interties with KCWD #75 and Tukwila as primary sources of supply after 1990.

(3) Includes maximum capacity available from Seattle to KCWD #75 of 22.5 MGD.

(4) The net surplus/(deficit) assumes that 50% of any purveyor's surplus is mobile, i.e. accessible to deficit purveyors. New capacity is included in total supply surplus/deficit balance.

TABLE VII-6

INVENTORY OF EXISTING AND PROPOSED INTERTIES

NAME OF WATER SYSTEM (A)	INTERTIE WITH SYSTEM (B)	LOCATION OF INTERTIE	DESCRIPTION OF USE	SIZE (in.)	MAXIMUM CAPACITY (gpm)	HYDRAULIC GRADE (Ft) (A)	(B)
Kent, City of	Auburn	277th St west of BN Railroad	Standby for 75	6" Valve	200-300	240	240
	K.C.W.D. No. 75	S 240th St and I-5	Secondary for Kent	8" Meter	400	589	560
	Tukwila	Todd Blvd & Cascade Avenue	Secondary for Kent	12" Meter	1,000-1,400	368	368
	Renton	80th Avenue and 180th St	Standby for Kent	12" Meter	2,094	196	196
	K.C.W.D. No. 111	SE 124th Ave at SE 282nd St	Secondary for 111	8" Meter	?	590	590
	K.C.W.D. No. 111	SE 277th Place	Secondary for 111	8" Meter	?	590	590
	K.C.W.D. No. 111	SE 256th St	Secondary for 111	8" Meter	?	590	590
Auburn, City of	Algona	17th St SW and Celery	Standby for Algona	4" Meter	1,250	240	240
	Pacific	Ellingston Rd	Standby for Pacific	4" Meter	1,250	240	240
	Kent	277th St west of BN Railroad	Standby for Kent	6" Valve	?	240	240
Algona, City of	Auburn	17th St SW and Celery	Standby for Algona	4" Meter	1,250	240	240
	Pacific	Milwaukie and 5th	Standby for Algona	8" Valve	?	?	?
Enumclaw, City of	Tacoma	Hwy. 410/#727 Gravity Line E.	Stdby for Enumclaw	4" Valve	500	120 lbs	?
Pacific, City of	Auburn	Ellingston Rd	Standby for Pacific	4" Meter	1,250	240	240
	Algona	Milwaukie and 5th	Standby for Algona	8" Valve	?	?	?
K.C.W.D. No. 111	Kent	SE 124th Ave at SE 282nd St	Secondary for 111	8" Meter	?	590	590
	Kent	SE 277th Place	Secondary for 111	8" Meter	?	590	590
	Kent	SE 256th St	Secondary for 111	8" Meter	?	590	590
	Covington Water Dist.	Kent-Kangley Rd	Future Intertie	12" Meter	?	590	6??
Covington Water District	K.C.W.D. No. 94	SE 212th Avenue	Standby for 94	?	?	?	?
	Cedar River Water & Sewer District	Witte Road and SE 248th St	Standby for Both	?	?	?	?
		Maple Valley-Black Diamond Hwy	Future Intertie	?	?	?	?
	K.C.W.D. No. 111	Kent-Kangley Rd	Future Intertie	12" Meter	?	590	6??
K.C.W.D. No. 75	Supply from Seattle	Des Moines Way & 7th Ave S	Primary for 75	10" Meter	3,800	490	355
	Supply from Seattle	Des Moines Way & S 208th St	Primary for 75	10" Meter	4,900	490	365
	Supply from Seattle	S 160th St & Military Rd	Primary for 75	12" Meter	5,000	560	445
	Supply from Seattle	Des Moines Way & Normandy Rd	Primary for 75	10" Meter	3,800	490	385
	Port of Seattle	S 188th St @ Runway	Standby for 75	12" Valve	?	?	?
	K.C.W.D. No. 49	Ambaum Blvd & Des Moines Way S	Standby for 75	8" Meter	?	?	?
	K.C.W.D. No. 85	SW 156th Ave and Maplewild	Standby for 75	4" Meter	?	?	?
	K.C.W.D. No. 54	S 216th St and 8th Ave S	Standby for 75	8" Meter	?	?	?
	City of Kent	S 240th St and I-5	Standby for 75	8" Meter	400	560	589
	Federal Way W&S Dist.	S 274th St & Pacific Highway S	Standby for 75	8" Meter	?	?	?
	Normandy Park Water	Marine View Dr SW & 4th Pl SW	Standby for 75	6" Meter	?	?	?
	City of Tukwila	Andover Park W. & S 180th St	Standby for 75	12" Meter	?	?	?
	Federal Way W&S Dist.	Pacific Highway S at S 276th St	Standby for 75	?	?	560	578
	Federal Way W&S Dist.	22nd Ave S and S 279th St	Standby for 75	?	?	560	578
Federal Way Water & Sewer	City of Tacoma	SW 325th St near 35th Ave SW	Standby for FWWS	12" Valve	?	440	557
	City of Tacoma	SW 349th St near 30th Ave SW	Standby for both	6" Valve	?	538	?
	K.C.W.D. No. 75	Pacific Highway S at S 276th St	Standby for 75	?	?	578	560
	K.C.W.D. No. 75	22nd Ave S and S 279th St	Standby for 75	?	?	578	560

TABLE VII-7

SOUTH KING COUNTY CWSP
RECOMMENDED WATER CONSERVATION PROGRAM

Element (4)	Program Elements: Comprehensive (1) Utility	Comprehensive (1) Region	Moderate (2) Utility	Moderate (2) Region	Base (3) Utility	Base (3) Region	Reduction In Water Use(8): Comp. %	Mod. %	Base %
A. Public Education							1	1 (9)	1 (9)
1. School Outreach		X		X		X			
2. Speakers Bureau	X	X (5)		X		X			
3. Program Promotion	X	X	X	X	X	X			
4. Theme Shows and Fairs	X	X		X		X			
B. Technical Assistance							4	3.5	2
1. Single-Family/Multi-Family Kits	X	X	X	X		X			
2. Purveyor Assistance/Customer Assistance	X	X	X	X		X			
3. Technicsl Studies	X	X		X					
4. Limit Unaccounted Water/Leak Detection	X	X	X						
5. Nurseries/Agriculture	X	X	X	X		X			
6. Bill Showing Consumption History	X		X						
7. High Technology Meters	X								
C. Policy							3	2	1
1. Require Meters (including all public use, customer meters, and/or master source meters)	X		X						
2. Plumbing Code		X (6)		X		X			
3. Landscape Management/Playfields	X	X	X	X					
4. Seasonal Pricing/Inverted Rates	X	X	X						
5. Irrigation/Private Wells	X	X		X		X			
6. Utility Financed Retrofit	X								
7. Master Source Meters					X				
D. Meriting Consideration (7)									
1. Mandatory Seasonal Restriction	X								
2. Recycling/Reuse	X								
3. No Water for Golf Courses/Major Use	X								
4. Conservation Program Performance Audit		X							
5. Reduce Pressure to 45 psi	X		X						

(1) Cities with 10,000 or more water customers.
(2) Cities with fewer than 10,000 customers and all other water utilities serving 500 or more customers.
(3) Water utilities with less than 500 customers.
(4) Implementation of program elements assumed to be initiated by the year 1990.
(5) Where both a utility and regional program are indicated, it is intended that the utility program is lead and the regional program supportive.
(6) Code to be established at state and/or county level.
(7) Elements recommended for further consideration on an optional basis.
(8) Percent reduction assumed to be achievable by the year 2000.
(9) Regional public education program assumed to be equal to the combined utility/regional program under Comprehensive.

TABLE VII-8

SUMMARY OF HYDRAULIC ANALYSIS RESULTS (1)

Flow from Green River - Fixed Grade Elevation 900 Feet

System Name	NODE ID No.	Elevation (Feet)	Green River Flow (MGD) Minimum	Green River Flow (MGD) Maximum	SKC Flow (MGD) Minimum	SKC Flow (MGD) Maximum	Hydraulic Grade (2) (Feet) Minimum	Hydraulic Grade (2) (Feet) Maximum	Operating Head(2) (Feet) Minimum	Operating Head(2) (Feet) Maximum
Auburn	Z13	510	15	88	0	34	678	893	-	-
Federal Way	Z22	460	15	88	0	34	646	892	570	580
Kent	Z14	425	15	88	0	34	672	893	400	590
KCWD #75	-	-	15	88	0	34	-	-	-	-
Covington	Z08	530	15	88	0	34	732	894	640	660
KCWD #111	Z12	450	15	88	0	34	679	893	460	590

Flow from Seattle-Soos Creek - Fixed Grade Elevation 610 Feet

System Name	NODE ID No.	Elevation (Feet)	Seattle (3) Flow (MGD) Minimum	Seattle (3) Flow (MGD) Maximum	SKC Flow (MGD) Minimum	SKC Flow (MGD) Maximum	Hydraulic Grade (2) (Feet) Minimum	Hydraulic Grade (2) (Feet) Maximum	Operating Head(2) (Feet) Minimum	Operating Head(2) (Feet) Maximum
Auburn	Z13	510	15	20	0	15	517	593	-	-
Federal Way	Z22	460	15	20	0	15	511	592	570	580
Kent	Z14	425	15	20	0	15	516	593	400	590
KCWD #75	-	-	15	20	0	15	-	-	-	-
Covington	Z08	530	15	20	0	15	518	593	640	660
KCWD #111	Z12	450	15	20	0	15	517	593	460	590

FOOTNOTES:

(1) See Appendix K for detailed results of hydraulic analysis.

(2) Assumes no headloss through a flow control valve in Pipeline No. 5. At 65 MGD headloss would be about 26 to 40 feet.

(3) Higher flows result in negative pressures in Pipeline No. 5.

TABLE VII-9

REGIONAL WATER SUPPLY STRATEGY
COST OF IMPLEMENTATION
(in 1989 dollars)

DESCRIPTION OF IMPROVEMENT PROJECT	CONSTRAINTS	ESTIMATED COST (1)
PIPELINE NO. 5 - from Headworks to Pipeline No. 4 near Portland Avenue Reservoir. See Table VII-10 for cost by segment.	Headworks fixed grade elevation @ 900'. Discharge head from 540' to 590'.	$44,445,000 (2)
SEATTLE-TACOMA INTERTIE - from Pipeline No. 5 to Lake Youngs 36,000 linear feet of 32-inch transmission main. See Table VII-11 for unit cost.	Lake Youngs fixed grade elevation @ 493'. Soos Creek fixed grade elevation @ 610'.	$ 8,816,000 (3)
CITY OF AUBURN, PIPELINE NO. 5 CONNECTION		Not Estimated
FEDERAL WAY WATER AND SEWER PIPELINE NO. 5 CONNECTION		
PRV - Pump Station @ Military & BPA	4.6 to 8 MGD in 578' pressure zone.	$ 260,000 (4)
PRV - Pump Station @ Campus Drive & Well #19	4.6 to 8 MGD in 538' pressure zone.	$ 260,000 (4)
PRV - Pump Station @ BPA & intersection of First Way S.	12 MGD in 538' pressure zone.	$ 260,000 (4)
Transmission Main Improvements	Existing transmission facilities adequate.	-
CITY OF KENT PIPELINE NO. 5 CONNECTION @ 124th Ave SE to serve both 590' high pressure zone and 400' Valley pressure.	Maximum operating head @ 590' and Minimum operating head @ 400'.	Not Estimated
FEDERAL WAY INTERTIE WITH KCWD NO. 75 (2-4 MGD from FWWS to KCWD 75)		
Metered Connection	Existing transmission facilities adequate for 1.8 MGD.	(see KCWD No. 75)
Transmission Main Improvements		-

TABLE VII-9 (continued)

DESCRIPTION OF IMPROVEMENT PROJECT	CONSTRAINTS	ESTIMATED COST (1)
KCWD NO. 75 INTERTIE WITH FEDERAL WAY (2-6 MGD from KCWD 75 to FWWS) See Table VII-12 for detailed cost estimate.	Existing transmission facilities not adequate.	$ 6,384,000 (5)
COVINGTON WATER DISTRICT PIPELINE NO. 5 CONNECTION		
PRV - Pump Station @ 188th Ave SE	Maximum operating head @ 660'	$ 260,000 (4)
PRV - Pump Station @ 188th Ave SE	and Minimum operating head @ 640'	$ 260,000 (4)
Transmission Main Improvements	Existing transmission facilities adequate	-
KCWD NO. 111 PIPELINE NO. 5 CONNECTION		
PRV - Pump Station @ 132nd Ave SE	Maximum operating head @ 590'	$ 260,000 (4)
2,650 linear feet of 12-inch transmission main from Pipeline No. 5 up 132nd.	and Minimum operating head @ 460'.	$ 103,000 (4)
ANNUAL DATABASE MANAGEMENT FOR GROUNDWATER RESOURCES INFORMATION		$ 25,000 (6)
AQUIFER RECHARGE INVESTIGATION PROGRAM		$100,000 - $200,000 (7)

Footnotes:

(1) Engineering News Record (ENR) Construction Cost Index (CSI) for Seattle = 4,745.34 (May, 1989).
(2) Cost escalated from City of Tacoma Water Division estimate of Pipeline No. 5 cost. Cost estimated rounded to the nearest $1,000.
(3) Cost escalated from Sea-Tac "Low-Level" Intertie cost estimate, prepared by Charles Howard & Associates, Ltd., for City of Tacoma Water Division. Assumes original costs were in 1986 dollars. Cost estimate rounded to nearest $1,000.
(4) Cost estimated by URS.
(5) Cost estimated by CH2M-Hill. See Table VII-12 for detailed cost estimate.
(6) Annual estimated cost.
(7) Depends on the level of detail final scope of work requires. Cost estimate does not include full scale pilot study of aquifer recharge program.

TABLE VII-10

DETAILED COST OF PIPELINE NO. 5
(in 1989 Dollars) (1)

Item	Segment A1	Segment A2	Segment B	Segment C	Segment D	Segment E	EST. COST (2)
1 Clear & grub 40 acres of R/W (3)	$13,233	$18,195	$14,887	$5,789		$30,600	$82,703
2 River & stream crossings							
Sta 0 to sta 1430		$59,642	$238,568	$238,568		$238,568	$775,344
Sta 1430 to sta 1767	$1,033,793						$1,033,793
3 Freeway crossing		$516,896					$516,896
4 Restoration							
Sta 0 to sta 1430		$403,179	$341,152	$124,055		$682,303	$1,550,689
Sta 1430 to sta 1767	$516,896						$516,896
5 Air Valve & Blow-off Chambers (3):							
176,700 l.f.	$58,455	$80,375	$65,762	$25,574		$135,177	$365,342
6 Excavation & backfill (4)							
60" 6600'						$130,661	$130,661
54" 82100'			$415,969	$157,781		$860,626	$1,434,377
48" 88,000'	$673,206	$673,206					$1,346,411
7 Sand bedding (4)							
60" 6600'						$56,290	$56,290
54" 82100'			$175,987	$66,754		$364,111	$606,852
48" 88,000'	$277,697	$277,697					$555,395
8 Spoil							
60" 6600'						$10,985	$10,985
54" 82100'			$36,920	$14,004		$76,387	$127,312
48" 88,000'	$63,227	$63,227					$126,453
8 Install pipe (4)							
60" 6600'						$286,567	$286,567
54" 82100'			$959,929	$364,111		$1,986,060	$3,310,100
48" 88,000'	$1,637,527	$1,637,527					$3,275,055
9 Weld field joints (5)							
Auburn Valley		$156,361	$156,361				$312,722
Tideflats	$326,937						$326,937
10 Pipe costs							
60" x 1/4" 6600						$609,979	$609,979
54" x 1/4" 56400						$4,658,058	$4,658,058
54" x 5/16" 25700				$2,364,328			$2,364,328
48" x 1/4" 45300			$3,121,273				$3,121,273
48" x 3/8" 26700	$1,237,271	$1,237,271					$2,474,543
48" x 7/16" 16000	$828,936	$828,936					$1,657,872
11 Fittings 5% of Pipe Cost	$119,088	$163,747	$133,974	$52,101		$275,392	$744,303
12 Overhead & Profit @ 15% of Pipe	$375,129	$515,802	$422,020	$164,119		$867,485	$2,344,554
13 Total Construction Cost	$7,161,395	$6,632,061	$6,082,801	$3,577,184		$11,269,249	$34,722,690
14 Sales tax @ 8%	$444,450	$611,119	$500,007	$194,447		$1,027,792	$2,777,815
15 Contingencies @ 10%	$555,563	$763,899	$625,008	$243,059		$1,284,740	$3,472,269
16 Engineering @ 7%	$388,894	$534,729	$437,506	$170,141		$899,318	$2,430,588
17 Legal & Financing @ 3%	$166,669	$229,170	$187,503	$72,918		$385,422	$1,041,681
19 Project Cost Estimate	$8,716,971	$8,770,979	$7,832,825	$4,257,749		(6) $14,866,520	$44,445,043

DESCRIPTION OF SEGMENTS:

A1 Inside City of Tacoma.
A2 From Tacoma to Federal Way connection point.
B From Federal Way connection point to Kent.
C From Kent to Seattle-Tacoma Intertie.
D Seattle-Tacoma Intertie from Pipeline No. 5 to Lake Youngs.
E From Seattle-Tacoma Intertie to Headworks at Palmer.

NOTES:
(1) Engineering News Record (ENR) Construction Cost Index (CCI) for Seattle = 4,745.34 (May, 1989).
(2) Estimated costs furnished by Tacoma Water Division; allocations and escalation by Economic and Engineering Services, Inc.
(3) Allocated in proportion to estimated length of pipeline segment.
(4) Allocation based on estimated lengths of different pipe diameters in each segment.
(5) Extra allowance for working in wet conditions.
(6) See Table VII-11 for detailed cost estimate of Seattle-Tacoma Intertie.

TABLE VII-11

DETAILED COST ESTIMATE OF SEATTLE-TACOMA INTERTIE
(in 1989 dollars) (1)

Description	Estimated Cost (2)	
Construction of Transmission Facilities 36,000 linear feet of 32-inch pipe	$7,443,306	(3)
Pump Station/Intertie	827,034	(4)
Subtotal	8,270,340	
Right-of-Way Costs	218,405	(5)
Hearing Costs	327,608	(5)
TOTAL Project Cost Estimate	$8,816,353	

Footnotes:

(1) Engineering News Record (ENR) Construction Cost Index (CCI) for Seattle = 4,745.34 (May, 1989).

(2) Cost escalated from Sea-Tac "low level" intertie cost estimate prepared by Charles Howard and Associates, Ltd. for City of Tacoma Water Division. Assumes original costs were in 1986 dollars.

(3) Based on estimated cost of $200 (1986 dollars) per linear foot.

(4) Based on estimated cost of $1,000 (1986 dollars) per kw of pump capacity.

(5) Estimated average inflation rate of 4.5 percent per year from 1986 to 1988.

TABLE VII-12

DETAILED COST OF KCWD NO. 75 IMPROVEMENTS
FOR SUPPLY TO FEDERAL WAY (1)
(in 1989 dollars)(2)

DESCRIPTION	ESTIMATED COST (3)
Demand meter improvements	$ 100,000 (4)
24-inch main from meter station to P.S. No. 5 (3,000 l.f.)	270,000 (5)
27-inch main from Mansion Hill to proposed Booster Pump (12,000 lf)	1,296,000 (5)
24-inch main from proposed Booster Pump Station to Star Lake tank (13,500 lf)	1,215,000 (5)
Additional 300 installed hp at Pump Station No. 5	215,000 (6)
Additional 100 installed hp at Pump Station No. 1	110,000 (7)
Additional 100 installed hp installed at proposed Star Lake Booster Station	110,000 (8)
Pump Station between KCWD No. 75 and FWWSD	600,000 (9)
SUBTOTAL CONSTRUCTION	$ 3,916,000
Contingencies @ 30%	1,175,000
Engineering, Legal, & Admin. @ 25%	980,000
Washington Sales Tax @ 8%	313,000
TOTAL PROJECT COST	$ 6,384,000

Footnotes:

(1) Excluding water from KCWD No. 75's wells, flow to the District's 560 zone must be pumped from Seattle's Des Moines Way South supply line into the 490 zone. From there, it is again pumped to the 560 zone. In addition, Seattle would have to accelerate, and possibly upsize its planned second Des Moines Way South pipeline.

(2) Engineering News Record (ENR) Construction Cost Index (CCI) for Seattle = 4,745.34 (May, 1989).

(3) Cost estimated by CH2M-Hill.

(4) Seattle's demand meter capacity upstream of the District's P.S. No. 5 would have to be increased, as would the transmission line between the demand meter station and the pump station.

(5) In order to get system pressures within desirable operating ranges, it would be necessary to provide transmission capacity between the Mansion Hill Tank and the booster station equivalent to a 27-inch transmission main. Downstream of the booster station, a 24-inch main would be required all the way to the Star Lake Tank.

(6) Additional pump capacity would be required at Pump Station No. 5.

(7) Additional pump capacity would be required at the District's Pump Station No. 1, where water is lifted from the 490 zone to the 560 zone. Additional transmission improvements might also be needed between P.S. No. 5 and P.S. No. 1, however, not specified.

(8) Additional pump capacity would be required at the proposed Star Lake booster station.

(9) Build a pump station to move water from KCWD No. 75's Star Lake Tank into FWWSD's 578 zone.

EXHIBIT VII-1

PUGET SOUND COUNCIL OF GOVERNMENTS
FORECAST ANALYSIS ZONES

LEGEND

FORECAST ANALYSIS ZONES
CLASS 1 WATER SERVICE AREAS
CWSP PLANNING BOUNDARY

ECONOMIC AND ENGINEERING SERVICES, INC.

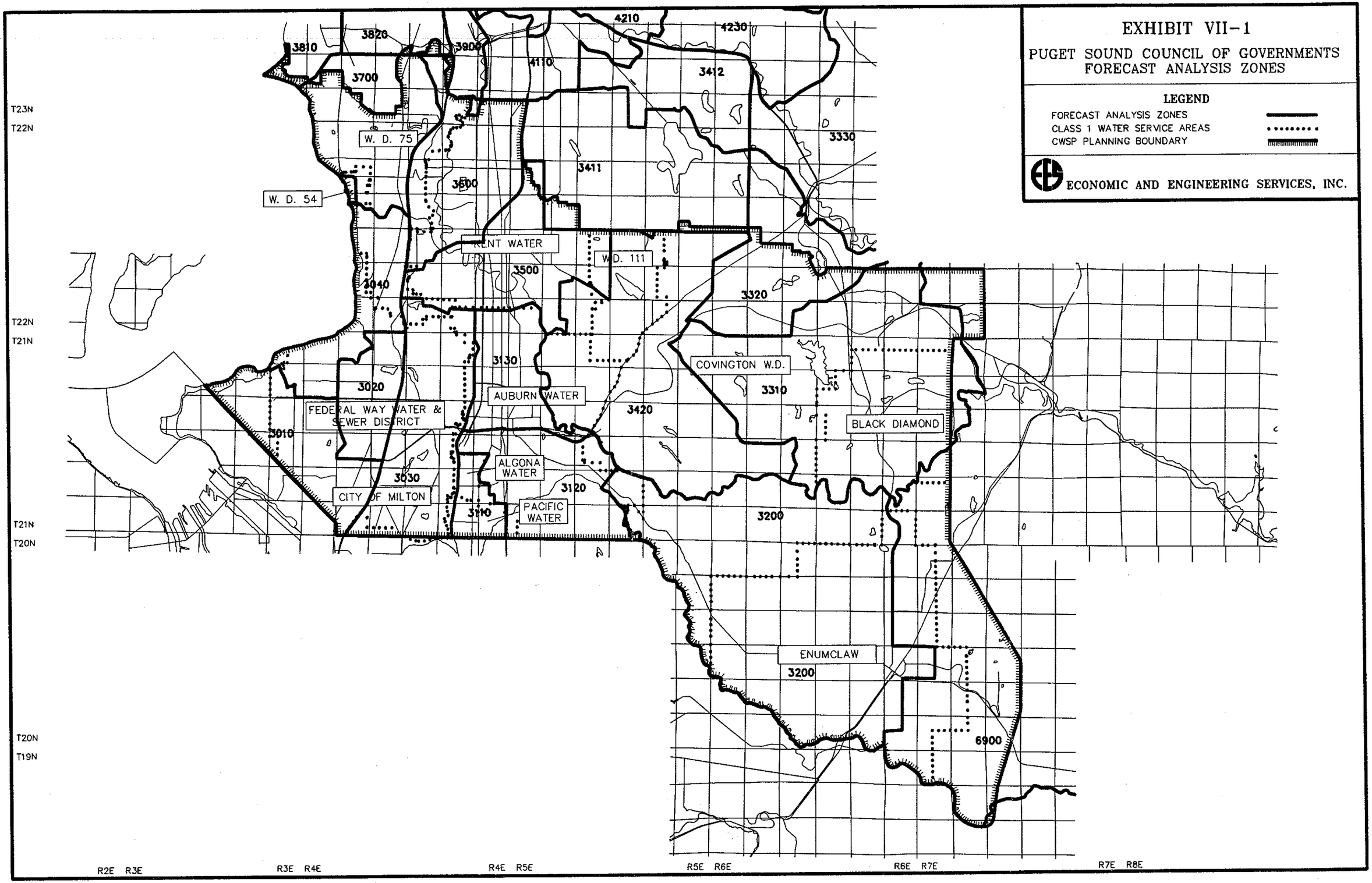
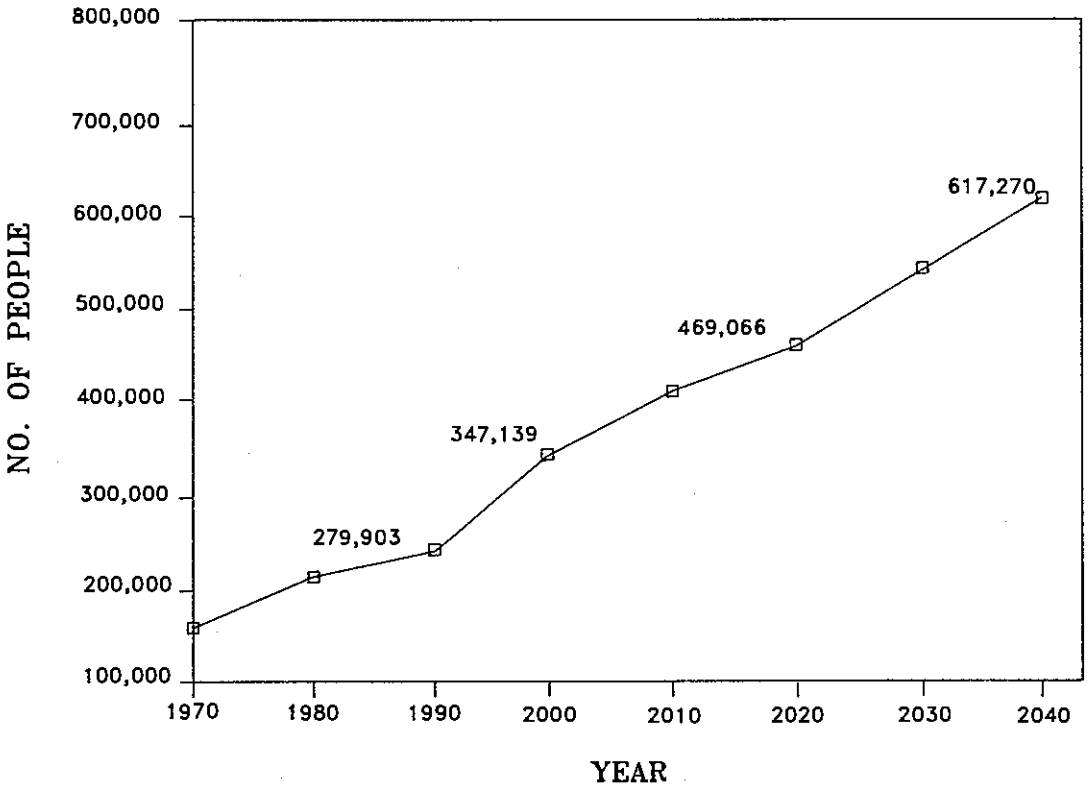


EXHIBIT VII-2

SOUTH KING COUNTY CWSP AREA POPULATION PROJECTIONS (1,2)



(3,4)

(1) Based on population projections for moderate growth as estimated by Puget Sound Council of Governments (PSCOG) for 1970 through 2020 in April 1988 Population and Employment Forecast report.

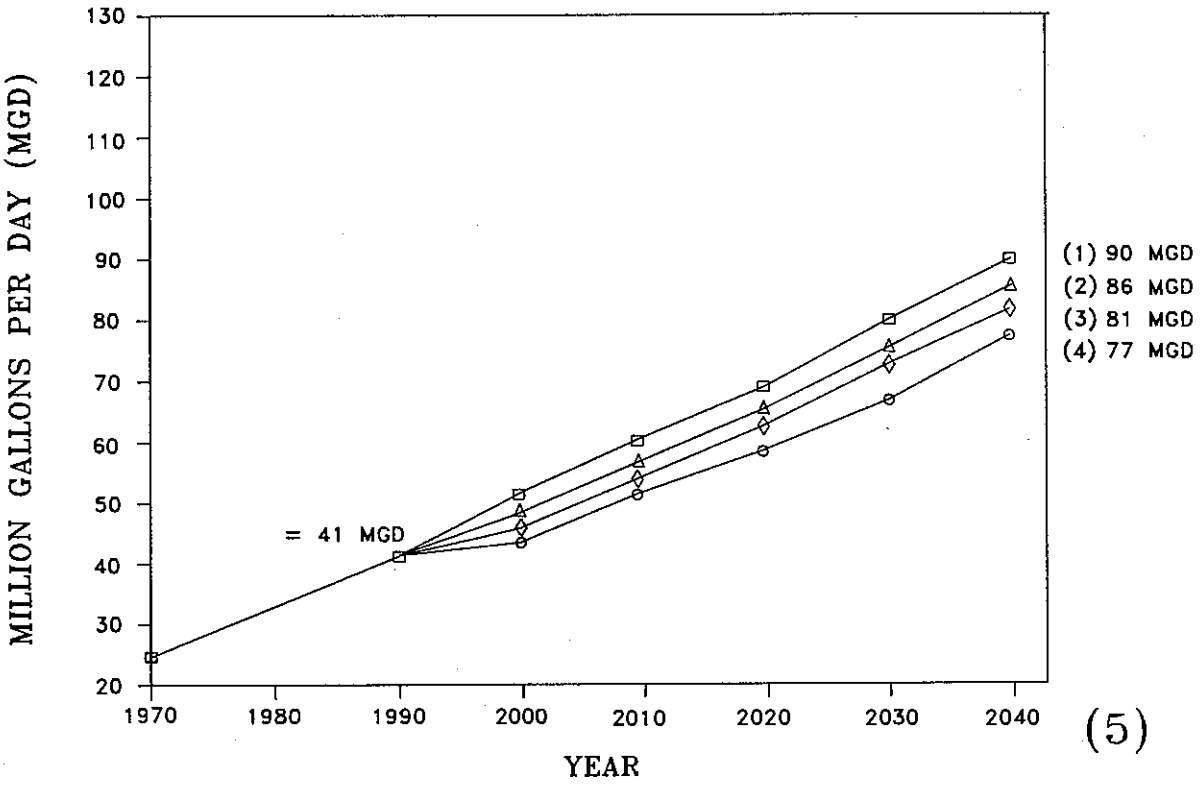
(2) Straight line projection from 2020 through 2040.

(3) Saturation estimated by assuming all vacant developable land available beyond 1986 is developable in proportion to the ratio of employment to residential property shown in the year 2000 by PSCOG's 1984 Population and Employment Forecast report.

(4) Assumes 8 units/acre utilizing King County's 1985 Comprehensive Land Use Plan with the exception of FAZ 3200 and 3700. FAZ 3200 adjusted to reflect 600 acres of undeveloped property in the City of Enumclaw at 4 units/acre. FAZ 3700 assumes all developable property at multi-family densities of 20 units/acre. Average household size taken from PSCOG's 1988 report for 2020 and assumed to be constant thereafter.

EXHIBIT VII-3

SOUTH KING COUNTY CWSP AREA
AVERAGE DAY WATER DEMAND PROJECTIONS



(5)

(1) Scenario 1 Existing Conditions – Assumes 180, 140 and 120 gallons per capita per day (gpcd) for average day and peak to average day factors of 2.2, 2.4 and 2.8 for urban, transitional and rural areas, respectively.

(2) Scenario 2 Multi – Family Increase – Assumes increase in multi-family units in both urban and transitional areas resulting in gradual reduction of water consumption of 1.5% and 3.5% in 1995 and up to 3% and 7% for the year 2000 and thereafter for urban and transitional areas, respectively.

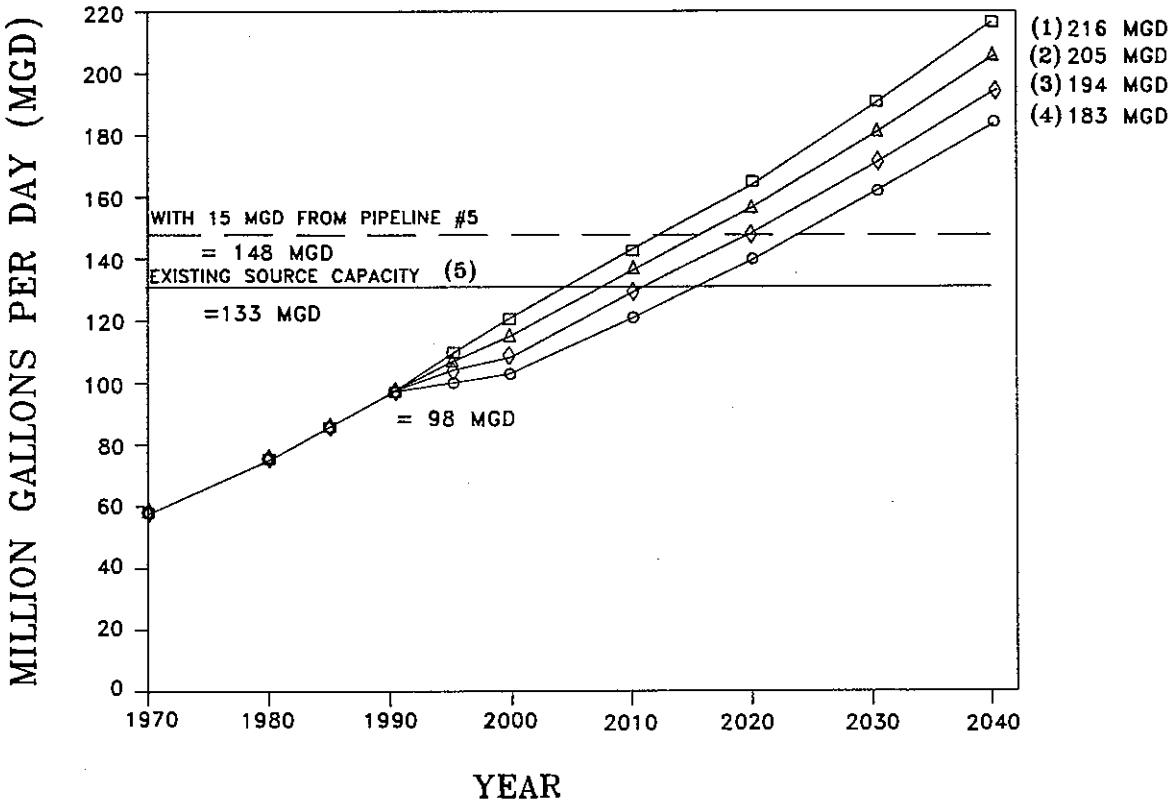
(3) Scenario 3 Conservation – Assumes conservation savings of 5% in 1995 and 10% in 2000 and thereafter for all urban, transitional and rural water consumption.

(4) Scenario 4 – Combination of Scenario 2 (Multi-Family Increase) and Scenario 3 (Conservation).

(5) See footnotes (3) and (4) of Exhibit VII-2.

EXHIBIT VII-4

SOUTH KING COUNTY CWSP AREA PEAK DAY WATER DEMAND PROJECTIONS VS. EXISTING CAPACITY



(1) Scenario 1 Existing Conditions – Assumes 180, 140 and 120 gallons per capita per day (gpcd) for average day and peak to average day factors of 2.2, 2.4 and 2.8 for urban, transitional and rural areas, respectively.

(2) Scenario 2 Multi – Family Increase – Assumes increase in multi-family units in both urban and transitional areas resulting in gradual reduction of water consumption of 1.5% and 3.5% in 1995 and up to 3% and 7% for the year 2000 and thereafter for urban and transitional areas, respectively.

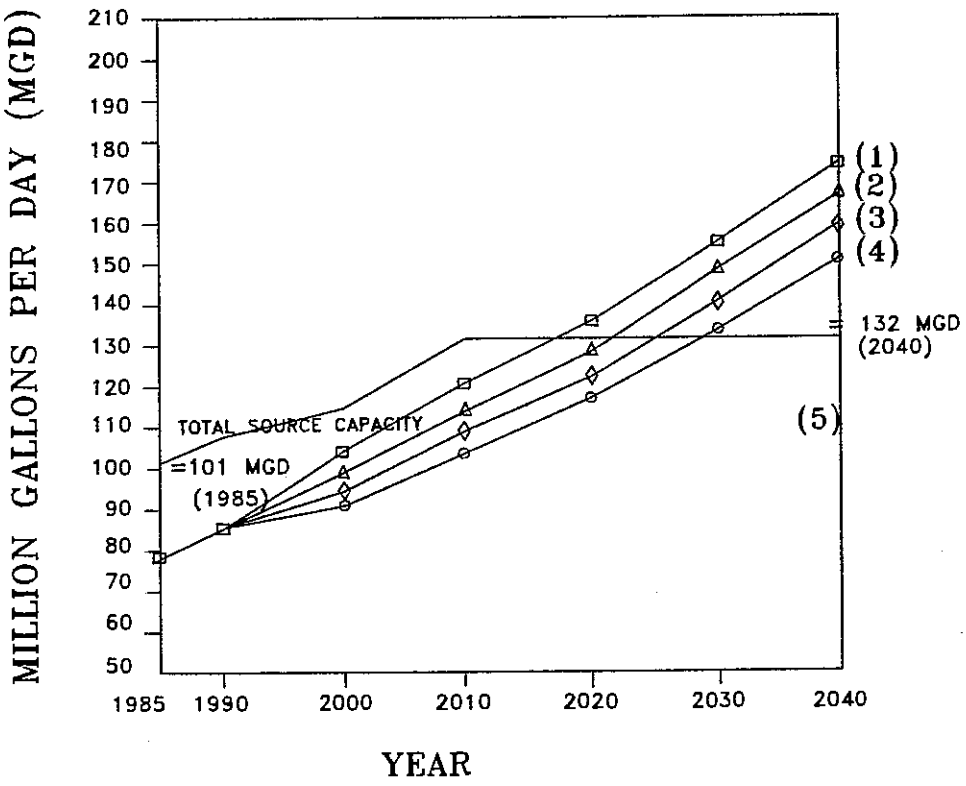
(3) Scenario 3 Conservation – Assumes conservation savings of 5% in 1995 and 10% in 2000 and thereafter for all urban, transitional and rural water consumption.

(4) Scenario 4 – Combination of Scenario 2 (Multi-Family Increase) and Scenario 3 (Conservation).

(5) Existing source capacity for public water sytems (Class 1 – 4) only. Estimated from individual data requests, DSHS files, DOE material and Water Resource Facility forms.

EXHIBIT VII-5

PEAK DAY DEMANDS PROJECTIONS VERSUS SOURCE CAPACITY FOR SKRWA UTILITIES



(1) As described in most recent version of individual water system plans and projected thru 2040 and summarized from Tables XII-5a,b,c and d.

(2) Assumes increase in multi-family units in both urban and transitional areas resulting in gradual reduction of water consumption of 1.5% and 3.5% in 1995, and 3% and 7% in 2000 and thereafter for urban and transitional area, respectively.

(3) Assume conservation saving of 5% in 1995 and 10% in 2000 and thereafter for all urban, transitional, and rural water consumtion.

(4) Combination of (2) and (3).

(5) Includes existing and proposed sources of supply. Also includes Seattle's available supply to King County Water District No. 75 of 22.5 MGD.

EXHIBIT VII-6

SOUTH KING COUNTY REGIONAL WATER SUPPLY PLAN
PRELIMINARY EVALUATION OF DESALINIZATION

SOURCE:

Puget Sound seawater

CONCEPT:

Desalination process to treat Puget Sound seawater for municipal water supply.

DISCUSSION:

The technologies for desalinating seawater in order to produce drinking water has increased throughout the world. The total cost for desalination processes has decreased over time, yet still is not at competitive levels with costs of conventional methods for water treatment as seen on Attachment A. Also, total costs for desalination vary greatly with geographic location.

Five desalination technologies for treatment of seawater exist: distillation, ion exchange, freeze distillation, electrodialysis, and reverse osmosis. Distillation plants typically have very high capital costs and depend largely on energy costs; ion exchange is more effective in treating relatively dilute solutions; the engineering involved in constructing and operating a freeze desalination plant is quite complicated; and seawater electrodialysis is not yet commercially available. Thus, the most viable alternative is reverse osmosis (RO).

Recent analyses indicate seawater reverse osmosis costs run approximately $4 to $6 per 1,000 gallons under near-optimum operating conditions. Without efficient operation, these costs can increase to as much as $10 per 1,000 gallons (1985 dollars). In comparison, current costs for existing, conventional, major water supplies range from $0.40 (Seattle) to $1.15 (Everett) per 1,000 gallons.

The costs involved in desalination processes decrease as plant sizes increase, as shown in Attachment B. However, as seen in Attachment C, the costs shown are theoretical, since no plants larger than 3 MGD are operating in the United States.

With future water demand forecasts for South King County increasing in the range of 100 MGD, the technology for large-scale seawater desalination does not appear to be feasible at this time.

INSTITUTIONAL/PERMIT CONSIDERATIONS:

- o Salinity of raw water
- o Government approval
- o Environmental Impact Statement

FACILITY/FEASIBILITY CONSIDERATIONS:

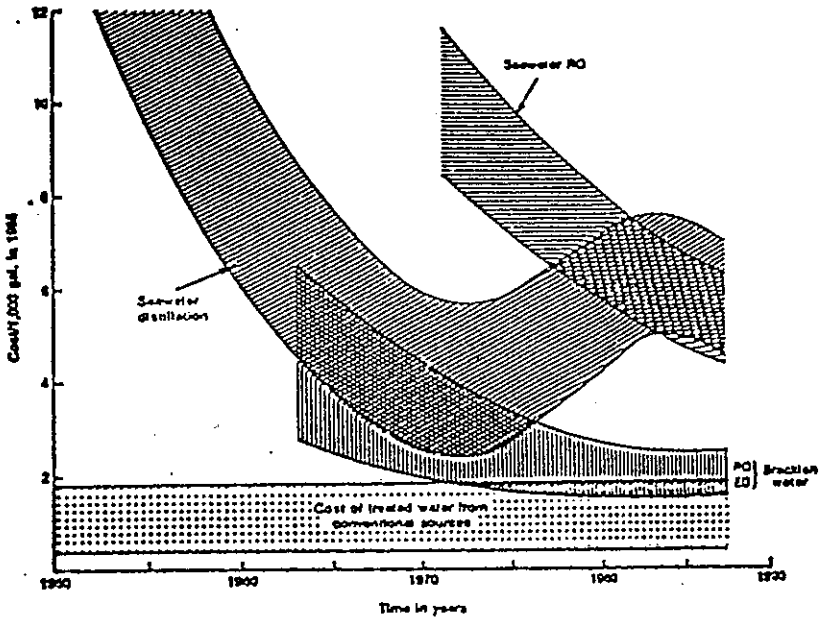
- o Location of a new plant
- o Product water feed to municipal system
- o Energy source

PRELIMINARY FINDING:

Further consideration of this concept appears to be unwarranted.

ATTACHMENT A

Approximate Desalination Costs

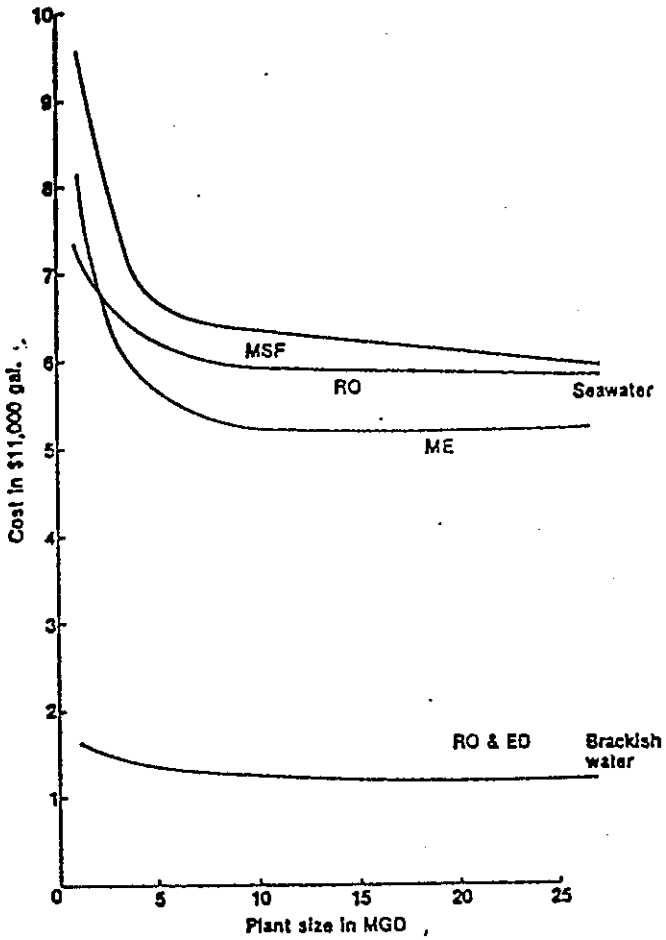


Desalination costs (including capital and operating costs) for distillation and RO over the last 40 years for plants producing 1 mgd to 5 mgd of "polished" water ready to drink. Costs may be higher than the curves indicate when desalination equipment is not operated efficiently. The increasing distillation costs during the 1970s primarily reflect rising capital and energy costs.

SOURCE: Lamb, 1962; U.S. Office of Saline Water, 1971; Koelzer, 1972; U.S. Bureau of Reclamation, 1972; Robinson et al., 1983; Schroeder, 1978; U.S. General Accounting Office, 1979; Toups, 1982; Reed, 1982; Bechtel Group, 1983; United Nations, 1985; Leitner, 1987 (WDR), and discussions with desalination experts. (See Bibliography.)

ATTACHMENT B

Desalination Costs v. Plant Size



This graph shows how the cost of "polished" product water decreases with size of plant for all desalination processes. Although it is also clear that the costs of desalinating seawater are about 5 times comparable costs for brackish water, this graph should not be used as evidence that one desalination technique is more cost effective than another for seawater and brackish water.

SOURCE: S.A. Reed, "Desalting Seawater and Brackish Water: 1981 Cost Update," DE82020482, ORNL/TM-8191, Office of Water Research and Technology, Washington, DC, August 1982; and United Nations, "Progress Report on the International Drinking Water Supply and Sanitation Decade," 1985.

ATTACHMENT C

Present Desalination Costs in the United States

	Plant size (mgd)	Overall cost (1985 dollars/1,000 gal.)
Brackish water:		
Reverse osmosis ...	1	1.67
	3	1.41
	5	1.33
	10	1.23
	25	1.21
Electrodialysis	1	1.72
(reversing)	5	1.47
	10	1.37
	25	1.26
Seawater:		
Distillation		
Multi-stage flash .	1[a]	9.73
	5[a]	6.78
	10[a]	6.50
	25[a]	6.10[b]
Multiple-effect ...	1	8.31
	5[a]	5.70
	10[a]	5.36
	25[a]	5.36[b]
Reverse osmosis ...	0.01	13.42
	0.1	9.88
	1	7.40
	3	6.64
	5[a]	6.36
	10[a]	6.03[c]
	25[a]	5.96[c]

[a]Theoretical costs since no plants of this size are operating in the United States
[b]Approximated from Reed (57).
[c]Extrapolated cost

SOURCE: United Nations, "The Use of Nonconventional Water Resources in Developing Countries," (77); adopted from Reed, S.A., "Desalting Seawater and Brackish Water: 1981 Cost Update," (57).

SECTION VIII

WATER SUPPLY RESERVATION

EXHIBIT VII-7

PIPELINE NO. 5 ALIGNMENT AND POINTS OF WITHDRAWL

LEGEND

PIPELINE NO. 5

CLASS 1 WATER SERVICE AREAS

CWSP PLANNING BOUNDARY

ECONOMIC AND ENGINEERING SERVICES, INC.

T23N
T22N
T22N
T21N
T21N
T20N
T20N
T19N

R2E R3E R3E R4E R4E R5E R5E R6E R6E R7E R7E R8E

W. D. 75
W. D. 54
KENT WATER
W.D. 111
SEGMENT D (INTERTIE)
KENT CONNECTION HEAD-MAX 590' HEAD-MIN 400'
KCWD 111 CONNECTION HEAD-MAX 590' HEAD-MIN 480'
KCWD 105 CONNECTION HEAD-MAX 660' HEAD-MIN 640'
SEGMENT B (FWWS TO KENT)
FWWS CONNECTION HEAD-MAX 580' HEAD-MIN 570'
FWWS AQUIFER RECHARGE AREA
AUBURN AQUIFER RECHARGE AREA
AUBURN WATER
SEGMENT C (KENT TO INTERTIE)
TACOMA PIPELINE #5
FEDERAL WAY WATER & SEWER DISTRICT
COVINGTON W.D.
BLACK DIAMOND
SEGMENT E (INTERTIE TO HEADWORKS)
SEGMENT A (TACOMA TO FWWS)
ALGONA WATER
CITY OF MILTON
PACIFIC WATER
ENUMCLAW

NOTES

KCWD #105
THE PRELIMINARY CONNECTION LOCATION IS AT 188TH AVE. S.E. NEAR THE EX. STORAGE TANKS AT 660'. THE OPERATING HEAD WILL NOT VARY SIGNIFICANTLY DUE TO THE PRESENCE OF THE TANK.
Q = 2100 GPM = 3.0 MGD
HEAD RANGE = 600' – 640'

KCWD #111
THE CONNECTION WILL BE MADE AT 132ND AVE. S.E. (WILL NEED A COUPLE THOUSAND FEET OF NEW PIPE TO CONNECT TO THE NORTH.
Q = 730 GPM = 1.05 MGD
HEADS –
NORMAL OPERATING HEAD (TANK OVERFLOW) = 590'
PEAK NORMAL DEMAND (YEAR 2000) = 550'
ABSOLUTE MIN. (FIRE NEAR INTERTIE) = 460'

FEDERAL WAY WATER/SEWER
CONNECTION AT MILITARY ROAD CROSSING
Q = 1100 GPM = 5.9 MGD
HEAD RANGE 570' – 580'

CITY OF KENT
CONNECTION WILL BE MADE AT 124TH AVE. S.E. AND MAY SERVE BOTH THEIR HIGH (590') SYSTEM & THEIR VALLEY SYSTEM.
Q = 3200 GPM = 4.61 MGD
MAX. HEAD = 590'
MIN. HEAD AT LEAST AS LOW AS 400' MAY BE EXPERIENCED IF WATER IS DISCHARGED INTO THE CITY'S PROPOSED IMPOUNDMENT.

SECTION VIII

WATER SUPPLY RESERVATION

1. RESERVATION PROCESS

The Water Resources Act of 1971, Chapter 90.54 RCW, sets forth the fundamentals of the State's water resource policies. The policies are designed to protect and fully utilize the waters to the greatest benefit of the people of the State of Washington. This Act directed the Department of Ecology (Ecology) to develop and implement a water resources program which provides a process for making decisions on future water resource allocations and use. Pursuant to this Act, Ecology adopted WAC 173-590, outlining procedures for the reservation of water for future public water supply.

Any individual, municipality, public or private entity who operates a public water supply system may request that Ecology reserve a certain amount of surface or groundwater within a given geographical area. One objective of this Coordinated Water System Plan (CWSP) has been to initiate procedures for the reservation of water to accommodate projected public water supply demands in the County over the next 50 years, in order to assure that the populace of South King County has an adequate future water supply.

In order to apply for a reservation of future public water supply, it is necessary to submit to Ecology the following items:

- A Department of Social and Health Services (DSHS) approved CWSP,
- A satisfactorily completed "Petition for Reservation of Public Waters",
- An appropriate environmental document to support the Petition.

Water supply reservation, as defined by RCW 90.03.345, is an appropriation that requires documentation similar to a water right permit application before it can be approved. The reservation petition must also comply with Chapter 173-590 WAC, "Procedures Relating to the Reservation of Water for Future Public Water Supply."

In processing and evaluating public water supply reservation petitions, Ecology uses the following criteria:

A. Public Water Supply Need

Documentation must be provided for the projected need for future public water supply in a given geographical area for 10, 25, and 50 years.

B. Evaluation of Alternatives

Documentation must be provided that all reasonable sources of supply have been evaluated and the selected source is the best source to meet the identified need.

C. Available Resource

Documentation must be provided that there is water available from the selected source in excess of the amount necessary to satisfy existing rights and minimum instream flows, if a surface water reservation is required, and in sufficient quantities to satisfy the identified requirements. Water supply reservations are allocations for future beneficial use, and when they involve surface water sources, the reservation may not be approved until minimum instream flows (base flows) are established to protect and preserve instream resource values. Base flows are not the same as optimum or fishery enhancement flows.

D. Maximum Net Benefit

Documentation must be provided that setting aside a reserved block of water for future public water supply is necessary and will provide maximum net benefits to the people of the State. It must also be shown that the utilization of such waters for public water supply constitutes the highest feasible use of the waters in question.

Since it is difficult to forecast long-term future water demands and availability of water supply, WAC 173-590-140 provides for the projections and the State's water resource management program to be reviewed and changed, as necessary, at least every 10 years. All interested parties are to be consulted prior to any modification of the established regulation for water supply reservation or instream flow requirements. The CWSP will be updated every 5 years to incorporate the findings of the on-going field studies.

Major water resource legislation affecting the reservation process was enacted into law during the 1988 session of the Washington State Legislature. Under Engrossed Second Substitute Bill 6724, Ecology was precluded from adopting any water reservation under RCW 90.54.050, or from adopting any new rules or changes to Chapter 173-590 WAC, or other existing rules to reserve or set aside waters until July 1, 1989, or until the Legislature has passed new legislation, whichever comes first. That moratorium has now lifted.

ESSB 6724 required that a study be conducted to analyze existing water laws and policies for clarity and consistency. A Fact Finder was retained to prepare a legislative report for a Joint Select Committee on Water Resource Policy, which was also formed by ESSB 6724. In January, 1989, the Committee submitted its

report to the Legislature summarizing the results of its fact finding effort and stating the Committee's objectives and plan of action through June, 1991. A Public Advisory Group and Technical Advisory Group have been formed to assist in the evaluation and development of State water resource policy.

It is anticipated that future results from the Committee's activities may impact existing water resource criteria, requirements, and procedures regarding surface supplies, groundwater, conjunctive use, and water rights.

2. DETERMINATION OF RESERVATION REQUIREMENTS

The CWSP presents information that supports a need for Ecology's consideration of a petition for a reservation of water for future public water supply in the CWSP area. Although the short-term need does not appear critical, the long-term needs beyond the year 2020 should be recognized now in order to direct policy making, comprehensive planning, and operational efforts.

It should be noted that preparation of this CWSP was to occur simultaneously with preparation of studies by the U.S. Geologic Survey (USGS) and Ground Water Management Plan (GWMP) characterizing groundwater within South King County. A draft report summarizing the GWMP Grant No. 1 activities regarding aquifer characteristics and existing data has been prepared. A USGS document has not been finalized at this time. Until results of the USGS study are available and a professional concensus is reached regarding the probable quantity and location of groundwater throughout the area, it is unlikely that adequate documentation can be provided to specify the available resource for reservation. Submittal of a reservation application is anticipated within the next 2 years. Therefore, the CWSP has focused on projecting future 10-, 25-, and 50-year water demands for the area, evaluating the sufficiency of existing water rights, and identifying special water right considerations that may impact further resource development options.

A. Public Water Supply Need

Section VII presents the projected water needs for the South King County CWSP area. The methodology and assumptions used are also explained in that Section. A range of projected demands based on four different scenarios, including existing use conditions, water conservation, multi-family increase and a combination of conservation and multi-family increase were developed. For the purpose of a reservation petition, the appropriate years for specific need identification would be 2000, 2015, and 2040.

A water conservation program has been endorsed by the water utilities of South King County, with the objective of being fully implemented by the year 2000. Therefore, the conservation scenario shown in Appendix G

and Section VII appears to best represent water demands for the near-term future.

Under the Conservation Scenarios, the projected average day needs for the CWSP area are 46.1 MGD for the year 2000; 57.95 MGD for the year 2015; and, 81.2 MGD for the year 2040. The peak day projected demands are 109.7 for year 2000; 138.3 MGD for year 2015; and 194.2 MGD for the year 2040.

B. Evaluation of Existing Water Rights

(1) General

Data for Recorded water rights was obtained from Ecology and the utilities and reviewed with the Water Utility Coordinating Committee (WUCC). These water rights were established under the permitting system of the State water codes, enacted in 1917, for surface water and for groundwater. The water right analysis in South King County was complicated due to several reasons. Water right ownership changes or the merger of adjacent utilities since the issuance of original rights were numerous. In addition there are a large number of rights that are presently not in use.

However, a joint review of water right records with the utilities has facilitated the creation of a summary table of the water right situation in South King County. Class 1 systems' records were found to be generally complete. In the case of Class 2, 3, and 4 systems, Ecology data was relied upon predominantly due to inadequate utility data.

(2) Water Rights and Claims

Table VIII-1 is a summary of Class 1 systems comparing utility in-service capacity and their water rights. The data has been compiled from the listing of the individual Class 1 utilities with associated water rights and in-service capacities shown in Table VIII-2.

Records from DSHS, USGS, and Ecology were reviewed along with responses to questionnaires sent to the utilities to compile these tables. Where there were variances or discrepancies in the data, additional utility contacts were made. Their response determined the final data. A complete listing of all water rights in

the CWSP area that could be identified as serving multiple domestic or other public water supply purposes in amounts of 25 gpm or greater are listed in Table VIII-3. This listing also includes surface water rights.

There are water rights other than those established under the permit system of the water codes. These are generally referred to as claims to vested right and are recorded with Ecology. However, the actual validity and extent of water right that exists under a claim is unknown. It can only be determined with certainty through a general adjudication of water rights.

The only claims to water rights included in any of the listings or analysis were those specifically identified for inclusion by a utility. An analysis of water right claims was not conducted.

(3) Reservation Database

Tables G-10 and G-11 of Appendix G and Tables VIII-4, VIII-5, and VIII-6 correlate future reservation requirements. Exhibit VIII-1 illustrates the comparison of existing instantaneous water rights with peak day demand projections. The data on Tables VIII-5 and VIII-6 indicate only a modest need for a reservation to assure the public water supply needs for the CWSP area through the year 2040 are met. However, there are inherent problems in using "paper" water rights for anything other than to describe the possible maximum legal appropriations that can be made under the water rights. Some of the problems are:

(a) Certificates of water rights have often been issued in amounts greater than actually developed.

(b) Numerous rights are considered active although they are currently unused or totally abandoned and have never been relinquished.

(c) Originally developed well capacities have permanently diminished to a point below the water right due to system deficiencies or source deterioration.

(d) New permits have been processed instead of changing ownership or point of withdrawal for an existing water right.

(e) The "existing instantaneous water right" as reported in MGD on Table VIII-5 can not be used everywhere within the area due to piping limitations.

Using the existing source capacity shown on Table G-11 of Appendix G is more realistic than using water rights to identify future supply deficiencies. Regardless of whether water rights or existing capacities are used, there are some underlying factors that should be mentioned. It is important to remember the CWSP area is large and has, in effect, been treated as one homogeneous unit for the reservation assessment. This approach is generally consistent with the trend for greater cooperation among the CWSP area utilities in planning, management, and operational activities. Without an awareness of hydraulic limitations though, it can also lead toward some incorrect conclusions from the data presented.

By using totals of all utilities, the excesses and deficiencies are, in effect, being spread equally throughout the CWSP area. This is, of course, not the case. The transferability of water rights, aquifer characteristics, transmission facilities, system capacities, and the political and economic considerations are some of the factors which may limit the transfer of excess waters into another part of the area.

(4) Water Right Relinquishment

Concerning unused water rights, questions arise as to whether the rights have been relinquished, in accordance with Chapter 90.14 RCW even though the relinquishment has not been formally documented.

The State's relinquishment statutes cite that a water right that has been abandoned or voluntarily not used, in whole or in part, for any period of 5 successive years, is relinquished to the extent of such non use and reverts to the State. However, there are exemptions to such relinquishment with definitions of sufficient cause for non-relinquishment set forth in RCW 90.14.140. The two exemptions most applicable to public water supplies relate to water rights for standby or reserve water supply or rights claimed for municipal water supply purposes.

(5) Interties

The concept of physical interties between adjacent utilities is being increasingly endorsed throughout the waterworks industry as a

technique to improve the reliability and performance of adjacent utilities. Basically, there are three common types of interties:

Emergency - Standby source in case of power outage or other crisis situations, increasing the reliability of the benefiting system.

Supplemental Source - Intermittent use in instances where demand outstrips available supply for a utility which has limited source capacity.

Continuous Source - Permanent source of supply for a water utility, in lieu of developing wells, springs, or surface water or in combination with other sources within the system.

It has been Ecology's policy to identify a point of use for water rights which corresponds to the service area for the individual water utility. The promotion of interties, regional supplies, and other shared facilities may conflict with State law if water right certificates do not reflect the potential of water supply transfers beyond the utility service area.

It appears that some modification of Ecology's water right place of use procedures will be necessary to encourage an effective program for interties and regionally shared facilities. Currently, these procedures and fee structures could result in a complicated and costly process to achieve this objective. A change in place of use for supplemental, continuous, or emergency interties would require public notification of the change for each water right. In addition, an administrative fee, which fluctuates with the amount of water, would create excessive costs for the utilities interested in improving system reliability and updating their water right records. Therefore, the WUCC should pursue "blanket" changes on existing water rights to encourage regional "wheeling" of water through interties.

C. Conclusions and Recommendations

The projected average and peak day needs, respectively, for the CWSP area, including conservation impacts, are 81.2 and 194.2 MGD for the year 2040. This compares to annual and instantaneous water right totals for the CWSP area of 83.3 and 170.6 MGD, respectively. It is not accurate to directly compare available water rights and the theoretical installed source capacity of 132.8 MGD, as shown on Table VIII-3. This is due to the large number of inactive or abandoned wells with rights which have not been relinquished. It is recognized that some local areas will have deficiencies and others apparent excesses in water rights and

source capacities. However, the projected deficiency in source versus demand during the 10-, 25- and 50-year horizon support the need to firmly establish the ability to develop future supplies through water right reservation. A conjunctive use program of surface and groundwater supplies, including artificial aquifer recharge, is anticipated to fulfill these demands. Therefore, the following specific recommendations are offered:

(1) Data from the GWMP and USGS study should be used to help prepare an initial reservation petition of local groundwater supplies. The results of ongoing monitoring by local utilities, GWMP, and USGS should be used when available to define a deficit value.

(2) Clarify variances between points of use, use of water, system capacities, and water rights. It is very important that the public water suppliers work individually and collectively to minimize these variances and clarify the public record concerning their existing and prospective water right needs. In many cases, the water right utility records need to be updated and reported to Ecology to influence policy decisions.

(3) Develop more information regarding specific water sources, including identification of aquifers, their water bearing characteristics, and long-term yield capabilities. The ongoing groundwater studies will have to provide good site specific information.

(4) Water suppliers should review their water right records, particularly for those inactive or abandoned sources of supply. The utilities should not relinquish existing rights until a thorough hydrogeologic investigation has been made to establish if the point of withdrawal can be moved to a new well at a different location in the same aquifer.

(5) The utilities and King County should request a waiver from Ecology or the State Legislature regarding the administrative processing fee for a change in the place of use on water rights where interties exist or are proposed. Instead, a fee which reflects the actual cost of processing these changes should be considered. In addition, public notification of these changes could be accomplished by a single public notice accompanied with a mass listing of water rights within the CWSSA. It is recommended that these changes be pursued actively in cooperation with Ecology, DSHS, the County, and the water utilities.

(6) In addition, it is recommended that water utilities interested in participating in interties, regional supplies, or other shared facilities should identify their appropriate CWSSA boundary as the point of use for all new water right applications. This should be implemented immediately to reduce future confusion in addressing water right issues.

TABLE VIII-1

SUMMARY OF CLASS 1 SYSTEMS(1)
INSERVICE CAPACITY AND WATER RIGHTS

	Inservice Capacity (2)		Water Rights	
	GPM	MGD	Inst. (MGD)	AF/YR
KCWD No. 54	970	1.40	5.12	1,299
KCWD No. 75	4,400	6.34	19.03	13,041
KCWD No. 94	130	.19	.44	125
Covington WD	3,300	4.75	6.19	6,318
KCWD No. 111	1,975	2.84	1.84	1,476
Algona	500	.72	.72	175
Auburn	16,100	23.18	27.44	12,880
Black Diamond	550	.79	5.17	551
Cherokee Bay C.C.	550	.79	.70	285
Enumclaw	2,700	3.89	5.38	2,150
Federal Way W&S	20,965	30.19	41.88	28,258
Kent	13,964	20.11	40.79	20,129
Pacific	700	1.01	2.88	2,080
	66,804	96.20	157.58	88,767 (3) (79.25 MGD Avg.)

(1) Class 1 systems have more than 100 services.

(2) Inservice capacity represents water sources that are equipped and on-line.

(3) This total does not include the annual quantity where it was not identified on the surface water right.

TABLE VIII-2

SPECIFIC WATER RIGHT INFORMATION FOR CLASS 1 SYSTEMS

KCWD NO. 54

Source I.D.	Location	Water Right Control No.	GPM (cfs)	MGD	AF/YR(s)	Inservice Cap. (1) GPM	MGD	Variances
Well No. 1	22N 04E 08K	G1*00078S	150	.22	244			
Well No. 2	22N 04E 08K	G1*00089C	300	.43	490			
Wesley Gardens	22N 04E 08K	G1*00751S	75	.11	15			
Wesley Gardens	22N 04E 08K	G1*02001C	100	.14	28			
Well No. 3	22N 04E 08K	G1*03600C	250	.26	410 (s)			
Well No. 4	22N 04E 08K	G1*08089C	2,250	3.24	162	470	.68	a.
					734 (s)			
Well No. 5	22N 04E 08K	G1*23881C	500	.72	360	500	.72	
TOTALS			3,625	5.12	1,299 (2)	970	1.40	

KCWD NO. 75

Source I.D.	Location	Water Right Control No.	GPM (cfs)	MGD	AF/YR(s)	Inservice Cap. (1) GPM	MGD	Variances
	22N 04E 04F	G1*01065C	400	.58	560			
	22N 04E 04F	G1*03218C	750	1.08	600			
	22N 04E 04C	G1*03843C	350	.50	560			
	22N 04E 04L	G1*04120C	1,000	1.44	1,600(s)			
	22N 04E 04N	G1*04999C	450	.65	720(s)			
	22N 04E 08A	G1*05425C	1,750	2.52	2,500			
	22N 04E 08J	G1*05426C	500	.72	800			
Des Moines Well	22N 04E 08A	G1-24214C	2,500	3.60	1,760	2,500	3.60	a. c.
	22N 04E 09P	G1*05423C	750	1.08	1,300			
	22N 04E 09A	G1*05424C	750	1.08	1,300			

TABLE VIII-2 continued

KCWD NO. 75 continued

Source I.D.	Location	Water Right Control No.	GPM (cfs)	MGD	AF/YR(s)	Inservice Cap. (1) GPM	Inservice Cap. (1) MGD	Variances
Angle Lake Well	22N 04E 09A	G1-24212C	2,200	3.17	1,600	1,900	2.74	a. c.
	22N 04E 16N	G1-04579C	400	.58	215			
	22N 04E 27N	G1*00568C	16	.02	21			
	22N 04E 27N	G1*01765C	200	.29	80			
	22N 04E 27P	G1-24213A	2,500(4)					
	22N 04E 28G	G1*05107C	600	.86	960			
	22N 04E 28P	G1*05786C	600	.86	785			
TOTALS			13,216	19.03	13,041(2)	4,400	6.34	

KCWD NO. 94

Source I.D.	Location	Water Right Control No.	GPM (cfs)	MGD	AF/YR(s)	Inservice Cap. (1) GPM	Inservice Cap. (1) MGD	Variances
	22N 06E 28F	G1*03778C *	80	.12	125	130	.19	a. c.
		G1*23579C *	220	.32	125 (s)			
TOTALS			300	.44	125 (2)	130	.19	

* These two rights on one well.

TABLE VIII-2 continued

Covington WD

Source I.D.	Location	Water Right: Control No.	GPM (cfs)	MGD	AF/YR(s)	Inservice Cap. (1): GPM	MGD	Variances
Wells C & D	21N 06E 04B	G1-00629C	1,200	1.73	1,613	1,000	1.44	a.
Wells A & B	21N 06E 04B	G1-21694C	1,200	1.73	1,920	900	1.30	
Well E	21N 06E 04B	G1-23250P	1,600	2.30	2,560	1,300	1.87	
Aqua Vista Well	22N 06E 29R	G1*05269C	200	.29	180			
Ravensdale Well	22N 06E 36A	G1-24502P	100	.14	45	100	.14	
TOTALS			4,300	6.19	6,318	3,300	4.75	

KCWD NO. 111

Source I.D.	Location	Water Right: Control No.	GPM (cfs)	MGD	AF/YR(s)	Inservice Cap. (1): GPM	MGD	Variances
Well No. 5	22N 05E 21Q	G1-24299C	275	.40	308	275	.40	c.
Wells 1 & 2	22N 05E 22R	G1-23817C	300	.43	384	300	.43	
Well No. 4	22N 05E 22J	G1-24301C	300	.43	336	300	.43	c.
Well No. 3	22N 05E 23M	G1-24302C	400	.58	448	400	.58	
Well No. 6	22N 05E 33J	G1-24568A	750 (4)			700	1.01	a. c.
TOTALS			1,275	1.84	1,476	1,975	2.85	

TABLE VIII-2 continued

CITY OF ALGONA

Source I.D.	Location	Water Right Control No.	GPM (cfs)	MGD	AF/YR(s)	Inservice Cap. (1) GPM	MGD	Variances
	21N 04E 25M	G1-22769C	500	.72	175	500	.72	

CITY OF AUBURN

Source I.D.	Location	Water Right Control No.	GPM (cfs)	MGD	AF/YR(s)	Inservice Cap. (1) GPM	MGD	Variances
Well No. 2	21N 05E 18B	G1-00277C	2,400	3.46	3,840	3,000	4.32	b.
Well No. 1	21N 05E 19A	G1*04731C	2,200	3.17	1,120	2,100	3.02	
Well No. 4	21N 05E 30B	G1-20391P	2,800	4.03	3,600	3,000	4.32	b.
Well No. 3A	21N 05E 30L	G1-23629P	2,800	4.03	3,600	1,500	2.16	
Well No. 3B						1,300	1.87	
Well No. 5	21N 05E 31Q	G1-23633P	1,500	2.16	720	900	1.30	
Subtotal			11,700	16.85	12,880	11,800	16.99	
Coal Creek Springs	21N 05E 28P	S1*01304C	6,732(15)	9.69	Und. (3)	3,850	5.54	a. c.
West Hill Spring	21N 04E 13	*	625	0.90		450	0.65	
TOTALS			19,057	27.44	12,880	16,100	23.18	

* Water Right Claim 049354 based on vested right due to continuous use prior to 1907. Claim filed December 11, 1973.

TABLE VIII-2 continued

TOWN OF BLACK DIAMOND

Source I.D.	Location	Water Right Control No.	GPM (cfs)	MGD	AF/YR(s)	Inservice Cap. (1) GPM	MGD	Variances
	21N 07E 19	S1-00506C	3,590 (8.0)	5.17	551	550	.79	

CHEROKEE BAY COMMUNITY CLUB

Source I.D.	Location	Water Right Control No.	GPM (cfs)	MGD	AF/YR(s)	Inservice Cap. (1) GPM	MGD	Variances
	22N 06E 28	G1-23546C	488	.70	285.4	550	.79	

CITY OF ENUMCLAW

Source I.D.	Location	Water Right Control No.	GPM (cfs)	MGD	AF/YR(s)	Inservice Cap. (1) GPM	MGD	Variances
P.C. Johnson Well	20N 07E 18L	G1-23600C	550	.79	880	500	.72	
	20N 07E 19	G1*09339C	1,500	2.16	1,220(s)			
Watercress Springs	20N 07E 19C	S1*06308C	336(.75)	.48	(3)	1,500	2.16	
	20N 07E 19C	S1*10594C	450(1.0)	.65	(3)			
Boise Springs	20N 07E 29F	S1-22798C	900(2)	1.30	1,270	700	1.01	
TOTALS			3,736	5.38	2,150(2)	2,700	3.89	

TABLE VIII-2 continued

FEDERAL WAY WATER AND SEWER

Source I.D.	Location	Water Right: Control No.	GPM (cfs)	MGD	AF/YR(s)	Inservice Cap. (1): GPM	MGD	Variances
T21N, R3E								
Well No. 6	21N 03E 12J	G1*05814C	200	.29	320			
T21N, R4E								
Well No. 9	21N 04E 04J	G1*06654C	500	.72	768	420	.69	a. c.
Well No. 7N	21N 04E 04R	G1*06701C	400	.58	640			
W.D. No. 56 (3)	21N 04E 05L	G1-24499A (4)	1,500					
W.D. No. 56 (3)	21N 04E 05L	S1*04892C	1,346	1.94	1,206			
			(3.0)					
W.D. No. 56 (3)	21N 04E 05L	S1-21594C	1,346	1.94	1,500			
			(3.0)					
Well No. 4	21N 04E 07Q	G1*04387C	850	1.22	1,360			
Well No. 23	21N 04E 07Q	G1-24591P	1,500	2.16	2,400(s)	1,500	2.16	a.
Well No. 23A	21N 04E 07Q	G1-24592P	1,000	1.44	1,600(s)	1,000	1.44	
Well No. 20	21N 04E 07R	G1-23442C	3,000	4.32	3,900(s)	2,600	3.74	
Well No. 20A	21N 04E 07R	G1-23443C	1,000	1.44	1,300(s)	1,000	1.44	
Well No. 7	21N 04E 08P	G1*06125C	400	.58	640	160	.23	a. c.
Well No. 8	21N 04E 15B	G1*06469C	250	.36	400(s)	190	.27	a.
Well No. 10B	21N 04E 15L	G1*07112C	1,000	1.44	1,600	325	.47	
Well No. 18	21N 04E 17N	G1-20545C	1,000	1.44	1,600	860	1.24	a.
Well No. 17	21N 04E 18C	G1-00484C	1,000	1.44	1,600	1,080	1.56	a. c.
Well No. 17A	21N 04E 18C	G1-00483C	1,000	1.44	1,600	1,080	1.56	a. c.
Well No. 19	21N 04E 19B	G1-20544P	2,000	2.88	3,200	1,000	1.44	
Well No. 10	21N 04E 20L	G1*06237C	2,000	2.88	895	2,200	3.17	a. b.
					2,305(s)			
Well No. 10A	21N 04E 20L	G1-00485C	3,000	4.32	4,800	2,500	3.60	a.
Well No. 15	21N 04E 20Q	G1*07476C	1,900	2.74	2,671	1,525	2.20	a.
Well No. 15A	21N 04E 20Q	G1-00492C	1,200	1.73	1,900	1,450	2.09	a.

TABLE VIII-2 continued

FEDERAL WAY WATER AND SEWER continued

Source I.D.	Location	Water Right Control No.	Water Right GPM (cfs)	Water Right MGD	Water Right AF/YR(s)	Inservice Cap. (1) GPM	Inservice Cap. (1) MGD	Variances
Well No. 16	21N 04E 27E	G1-00482C	950	1.37	1,600	450	.65	a.
Well #1 (LCWC)	21N 04E 29C	G1*00722C	500	.72	280			
Well No. 21	21N 04E 29D	G1-23853C	1,000	1.44	1,300(s)	1,000	1.44	
Well No. 22	21N 04E 34N	G1-23854C	400	.58	520(s)	400	.58	c.
Well No. 22A	21N 04E 34N	G1-23855C	125	.18	160(s)	125	.18	c.
T22N, R4E								
Ellenwood Water	22N 04E 33J	G1-20176C	200	.29	78	100	.14	
TOTALS			29,067	41.88	28,258(2)	20,965	30.29	

CITY OF KENT

Source I.D.	Location	Water Right Control No.	Water Right GPM (cfs)	Water Right MGD	Water Right AF/YR(s)	Inservice Cap. (1) GPM	Inservice Cap. (1) MGD	Variances
T22N, R5E								
S. 208 St. Well	22N 05E 06P	G1-24404P	1,500	2.16	600(s)			
Garrison Wells	22N 05E 07J	G1-23614C	500	.72	800(s)	500	.72	
S. 212 St. Wells	22N 05E 07F	G1-24190P	3,500	5.04	1,400(s)	2,000	2.88	a.
	22N 05E 17E	G1-23713C	7	.01	11	7	0.01	
Hamilton Rd. Water Co.	22N 05E 18K	G1*00594C	38	.05	30			
	22N 05E 19	G1*01562C	200	.29	320			
East Hill #1	22N 05E 20E	G1*00014C	90	.13	135			
East Hill #2	22N 05E 20E	G1*04435C	120	.17	146			
East Hill Well	22N 05E 20E	G1-23285C	1,900	2.74	3,040	2,000	2.88	a. b.

TABLE VIII-2 continued

CITY OF KENT continued

Source I.D.	Location	Water Right: Control No.	GPM (cfs)	MGD	AF/YR(s)	Inservice Cap. (1): GPM	MGD	Variances
Soos Creek Well	22N 05E 28E	G1-24073C	900	1.30	864(s)	900	1.30	a.
East Hill Wtr.	22N 05E 29B	G1*03022C	120	.17	36.4			
Company	22N 05E 29C	G1*00785C	60	.09	42			
	22N 05E 33F	G1-23814A (4)	1,000					c.
Armstrong A1+A2	22N 05E 36A	G1-24189C	1,300	1.87	500(s)	550	0.79	a. b.
						750	1.08	
T22N, R6E								
Clark Springs Nos. 1, 2, & 3	22N 06E 26P	G1*10006C	5,400	7.78	8,710	* 5,400	7.78	c.
Clark Springs Infil. Trench	22N 06E 26	G1*04526C	2,250	3.24	790 560(s)	* 2,250	3.24	c.
Kent Springs	22N 06E 33P	G1-22956C	3,690	5.31	5,904	**1,857	2.67	
Rock Creek (Clark Springs)	22N 06E 26	S1*03533C	(5.0) 2,250	3.24	Und (3)			
Kent Springs	22N 06E 33P	Claim 123225	4,500 (10)	6.48	965	**2,688	3.87	
TOTALS			28,325	40.79	20,129.4	13,964	20.11	

* Clark Springs is a dual system source. It has both a gravity flow infiltration gallery system (Water Right G1-04526C) and a well field system (Water Right G1-10006C). The water right for the well field system, however, restricts the total maximum yield from this source to 5,400 gpm. As such, the facilities are set up and operate accordingly. The In-service Capacity total does not include G1-04526C.

** Kent Springs is also a dual system source. It has both gravity flow infiltration gallery system (Water Right Claim 123225) and a well field system (Water Right G1-22956C). Operationally its an either/or situation because flows from the infiltration gallery dry up when the wells are used. The In-service Capacity total does not include Claim 123225.

TABLE VIII-2 continued

CITY OF PACIFIC

Source I.D.	Location	Water Right: Control No.	GPM (cfs)	MGD	AF/YR(s)	Inservice Cap. (1): GPM	MGD	Variances
	21N 04E 25Q	G1-04413C	300	.43	480			
	21N 04E 25Q	G1-21937C	1,000	1.44	1,600			
	21N 04E 24Q	G1-23344C	700	1.01	1,100(s)	700	1.01	b.
TOTALS			2,000	2.88	2,080(2)	700	1.01	

(1) In-service capacity represents wells that are equipped and on-line.
(2) Supplemental rights (s) not included in total.
(3) Undetermined (Und) because not specifically identified on water right.
(4) Application amount not in total.

Variance Categories:

a. Installed capacity reported by utility differs from DSHS and/or USGS records.
b. Installed capacity exceeds water rights (not including claims).
c. Inconsistent location description (water right, DSHS, USGS).

TABLE VIII-3

GROUNDWATER RIGHT INFORMATION - PUBLIC WATER SUPPLY
COORDINATED WATER SYSTEM PLAN AREA (5)

T20N, R6E

Source I.D. (1)	Location	Water Right: Control No.	GPM	MGD	AF/YR(s) (2)	In-service Capacity(4): GPM	MGD
*Sweeney	20N 06E 02R	G1-20398C	48	.07	41		
*Charters	20N 06E 02	G1-20529C	50	.07	7.5		
*Farrell	20N 06E 10L	G1-00229C	26	.04	9	25	.04
*Graddon	20N 06E 12K	G1-24136C	40	.06	4		
Subtotal			(164)	(.24)	(61.5)		

T20N, R7E

Source I.D. (1)	Location	Water Right: Control No.	GPM	MGD	AF/YR(s) (2)	In-service Capacity(4): GPM	MGD
*Enumclaw, City	20N 07E 18L	G1-23600C	550	.79	880	500	.72
*Enumclaw, City	20N 07E 19	G1-09339C	1,500	2.16	1,220 (s)		
*Graddon	20N 07E 19A	G1-24247C	37	.05	6.3	37	.05
Subtotal			(2,087)	(3.00)	(886.3)		

T21N, R3E

Source I.D. (1)	Location	Water Right: Control No.	GPM	MGD	AF/YR(s) (2)	In-service Capacity(4): GPM	MGD
Adwatco, Inc.	21N 03E 01K	G1*06198C	50	.07	20	100	.14
FWWS #6	21N 03E 12J	G1*05814C	200	.29	320		
Subtotal			(250)	(.36)	(340)		

TABLE VIII-3 continued

T21N, R4E

Source I.D. (1)	Location	Water Right: Control No.	GPM	MGD	AF/YR(s) (2)	In-service Capacity(4): GPM	MGD
McDaniel (Welch)	21N 04E 01M	G1*04302C	50	.07	10	200	.29
FWWS #9	21N 04E 04J	G1*06654C	500	.72	768	420	.60
FWWS #7N	21N 04E 04R	G1*06701C	400	.58	640		
KCWD #56 (FWWS)	21N 04E 05L	G1-24499A (3)	1,500	2.16			
FWWS #20	21N 04E 07R	G1-23442C	3,000	4.32	3,900 (s)	2,600	3.72
FWWS #20A	21N 04E 07R	G1-23443C	1,000	1.44	1,300 (s)	1,000	1.44
FWWS #4	21N 04E 07Q	G1*04387C	850	1.22	1,360	500	.72
FWWS #23	21N 04E 07Q	G1-24591P	1,500	2.16	2,400 (s)	1,500	2.16
FWWS #23A	21N 04E 07Q	G1-24592P	1,000	1.44	1,600 (s)	1,000	1.44
FWWS #7	21N 04E 08P	G1*06125C	400	.58	640	160	.23
FWWS #8	21N 04E 15B	G1*06469C	250	.36	400	190	.27
FWWS #10B	21N 04E 15L	G1*07112C	1,000	1.44	1,600 (s)	325	.47
FWWS #18	21N 04E 17N	G1-20545C	1,000	1.44	1,600	860	1.24
FWWS #17A	21N 04E 18C	G1-00483C	1,000	1.44	1,600	1,080	1.56
FWWS #17	21N 04E 18C	G1-00484C	1,000	1.44	1,600	1,080	1.56
FWWS #19	21N 04E 19B	G1-20544P	2,000	2.88	3,200	1,000	1.44
FWWS #10	21N 04E 20L	G1*06237C	2,000	2.88	895		
					3,305 (s)	2,200	3.17
FWWS #15	21N 04E 20Q	G1*07476C	1,900	2.74	2,671	1,525	2.20
FWWS #10A	21N 04E 20L	G1-00485C	3,000	4.32	4,800	2,500	3.60
FWWS #15A	21N 04E 20Q	G1-00492C	1,200	1.73	1,900	1,450	2.09
Pacific, Town of	21N 04E 25Q	G1*04413C	300	.43	480		
Pacific, Town of	21N 04E 25Q	G1-21937C	1,000	1.44	1,600	1,500	2.16
Algona	21N 04E 25M	G1-22769C	500	.72	175	350	.50
Pacific, Town of	21N 04E 25Q	G1-23344C	700	1.01	1,100 (s)	1,500	2.16
FWWS #16	21N 04E 27E	G1-00482C	950	1.37	1,600	450	.65
FWWS #1 (CCWC)	21N 04E 29C	G1*00722C	500	.72	280		
FWWS #21	21N 04E 29D	G1-23853C	1,000	1.44	1,300 (s)		
Milton, Town of	21N 04E 32P	G1-24927P	1,000	1.44	800		
FWWS #22	21N 04E 34N	G1-23854C	400	.58	520 (s)	400	.58
FWWS #22A	21N 04E 34N	G1-23855C	125	.18	160 (s)	125	.18
Pacific, Town of	21N 04E 35	G1-04266C	50	.07	80		
Subtotal			(29,575)	(42.6)	(27,099)		

TABLE VIII-3 continued

T21N, R5E

Source I.D. (1)	Location	Water Right: Control No.	GPM	MGD	AF/YR(s) (2)	In-service Capacity(4): GPM	MGD
Rudolph	21N 05E 02	G1-22177C	30	.04	2		
Pfaff	21N 05F 04G	G1*06358C	535	.77	94	357	.51
Wells Water	21N 05E 04B	G1-20430C	26	.04	13	20	.03
Eastridge Water	21N 05E 05K	G1*06976C	210	.30	157		
Fisher (Hazelwood)	21N 05E 05P	G1*09759C	30	.04	24	45	.06
King Co. Parks	21N 05E 06R	G1*07822C	50	.07	8	200	.29
Kempfer	21N 05E 12D	G1-00621C	50	.07	9.5		
Wash. Dept. of Fisheries	21N 05E 16H	G1-22819C	25	.04	6	305	.44
Auburn #2	21N 05E 18B	G1-00277C	2,400	3.46	3,840	3,000	4.32
Auburn #1	21N 05E 19A	G1*04731C	2,200	3.17	1,120	2,100	3.02
Auburn Academy	21N 05E 27B	G1*04249C	120	.17	136	150	.22
McMasters	21N 05E 30G	G1*06703C	200	.29	45		
Auburn #4	21N 05E 30B	G1-20391P	2,800	4.03	3,600	3,000	4.32
Auburn #3A	21N 05E 30L	G1-23629P	2,800	4.03	3,600	1,500	2.16
Auburn #3B	21N 05E 31L	G1-23629P				1,300	1.87
MinKema (Auburn East Mobile)	21N 05E 30G	G1-23688C	100	.14	55	250	.36
Crabtree #5 (Auburn)	21N 05E 31Q	G1-23633P	1,500	2.16	720	900	1.30
*Hegert	21N 05E 36M	G1-23740C	84	.12	2		
*Skyland Park Water Assn.	21N 05E 36G	G1-23828C	40	.06	16	25	.04
Subtotal			(13,200)	(19.0)	(13,447.5)		

TABLE VIII-3 continued

T21N, R6E

Source I.D. (1)	Location	Water Right: Control No.	GPM	MGD	AF/YR(s) (2)	In-service Capacity(4): GPM	MGD
Covington C & D	21N 06E 04B	G1-00629C	1,200	1.73	1,613	1,000	1.44
Covington A & B	21N 06E 04B	G1-21694C	1,200	1.73	1,920	900	1.30
Covington E	21N 06E 04B	G1-23250P	1,600	2.30	2,560	1,300	1.87
P.G. Properties	21N 06E 07F	G1-23822C	40	.06	7	60	.09
Holm	21N 06E 19H	G1-24748P	65	.09	5	18	.03
Diamond Springs Water Assn.	21N 06E 21M	G1-23628C	40	.06	24		
Weyerhaeuser Realty	21N 06E 29Q	G1-24742A (3)	150	.22			
*Farrell	21N 06E 31	G1-21156C	25	.04	9	25	.04
Blaker	21N 06E 32D	G1-00474C	100	.14	10		
*Todnem	21N 06E 32J	G1-00633C	25	.04	20	30	.04
*Avion, Inc.	21N 06E 32B	G1-23724C	34	.05	22	14	.02
*Walczak	21N 06E 34K	G1-23141C	85	.12	14		
*Hershberger	21N 06E 34R	G1-24479C	25	.04	5.4	25	.04
*Beckler	21N 06E 35N	G1-24452C	32	.05	4.5		
*Bray	21N 06E 35K	G1-24753C	37	.05	4.5	37	.05
*Remolif	21N 06E 36Q	G1-21691C	70	.10	13	40	.06
Subtotal			(4,578)	(6.60)	(6,231.4)		

T22N, R4E

Source I.D. (1)	Location	Water Right: Control No.	GPM	MGD	AF/YR(s) (2)	In-service Capacity(4): GPM	MGD
KCWD #75	22N 04E 04F	G1*01065C	400	.58	560		
KCWD #75	22N 04E 04F	G1*03218C	750	1.08	600		
KCWD #75	22N 04E 04C	G1*03843C	350	.50	560		
KCWD #75	22N 04E 04L	G1*04120C	1,000	1.44	1,600 (s)		
KCWD #75	22N 04E 04N	G1*04999C	450	.65	720 (s)		
KCWD #54 #1	22N 04E 08K	G1*00078S	150	.22	244		
KCWD #54 #2	22N 04E 08K	G1*00089C	300	.43	490		

TABLE VIII-3 continued

T22N, R4E continued

Source I.D. (1)	Location	Water Right: Control No.	GPM	MGD	AF/YR(s) (2)	In-service Capacity(4): GPM	MGD
Wesley Gardens (KCWD #54)	22N 04E 08K	G1*00751S	75	.11	15		
Wesley Gardens (KCWD #54)	22N 04E 08K	G1*02001C	100	.14	28		
KCWD #54 #3	22N 04E 08K	G1*03600C	250	.36	410 (s)		
KCWD #75	22N 04E 08A	G1*05425C	1,750	2.52	2,500		
KCWD #75	22N 04E 08J	G1*05426C	500	.72	800		
KCWD #54 #4	22N 04E 08K	G1*08089C	2,250	3.24	162	470	.68
					734 (s)		
KCWD #54 #5	22N 04E 08K	G1-23881C	500	.72	360	500	.72
KCWD #75 Des Moines	22N 04E 08A	G1-24214C	2,500	3.60	1,760	2,500	3.60
KCWD #75	22N 04E 09P	G1*05423C	750	1.08	1,300		
KCWD #75	22N 04E 09A	G1*05424C	750	1.08	1,300		
KCWD #75	22N 04E 09A	G1-24212C	2,200	3.17	1,600	1,900	2.74
KCWD #75 (Angle Lake)	22N 04E 16N	G1-04579C	400	.58	215		
Grand Lodge Masonic	22N 04E 17Q	G1*01712C	100	.14	81	135	.19
Grand Lodge Masonic	22N 04E 17D	G1*00205	74	.11	28	100	.14
Mackey	22N 04E 26M	G1-23894P	60	.09	10		
KCWD #75 (Star Lake)	22N 04E 27N	G1*00568C	16	.02	21		
KCWD #75 (Star Lake)	22N 04E 27N	G1*01765C	200	.29	80		
KCWD #75	22N 04E 27P	G1-24213A (3)	2,500	3.60			
KCWD #75	22N 04E 28G	G1*05107C	600	.86	960		
KCWD #75	22N 04E 28P	G1*05786C	600	.86	785		
Ellenwood (FWWS)	22N 04E 33J	G1-20176C	200	.29	78	100	.14
Logandale Water	22N 04E 35R	G1*05031C	200	.29	67	45	.06
Subtotal			(17,475)	(25.17)	(14,604)		

TABLE VIII-3 continued

T22N, R5E

Source I.D. (1)	Location	Water Right: Control No.	GPM	MGD	AF/YR(s) (2)	In-service Capacity(4): GPM	MGD
Van Dyke	22N 05E 06N	G1-21743C	60	.09	8.1	1,730	2.49
Kent, S. 208 St. Wells	22N 05E 06P	G1-24404P	1,500	2.16	600 (s)		
Kent, Garrison Well	22N 05E 07J	G1-23614C	500	.72	800 (s)	500	.72
Lewis	22N 05E 07N	G1*01212C	100	.14	6	10	.01
O'Brien Water Users	22N 05E 07P	G1*01787C	243	.35	45	100	.14
Unico	22N 05E 07M	G1*05267C	40	.06	64	40	.06
Novak	22N 05E 07N	G1*10616C	30	.04	5.5	600	.86
Kent Nursery	22N 05E 07L	G1-21106C	400	.58	4	150	.22
Kent, S. 212 St. Wells	22N 05E 07F	G1-24190P	3,500	5.04	1,400	2,000	2.88
Gerber	22N 05E 17J	G1*06700C	35	.05	11		
Kent, S. 212 St. Well	22N 05E 17E	G1-23713C	7	.01	11	7	.01
Kent, Hamilton Road	22N 05E 18K	G1*00594C	38	.05	30		
Kent, City of	22N 05E 19	G1*01562C	200	.29	320		
East Hill Comm.	22N 05E 20	G1*00012S	60	.09	90		
Kent, E. Hill 1	22N 05E 20E	G1*00014S	90	.13	135		
Kent, E. Hill 2	22N 05E 20E	G1*04435C	120	.17	146		
Kent, E. Hill	22N 05E 20E	G1-23285C	1,900	2.74	3,040	2,000	2.28
Highland Water	22N 05E 21J	G1*08904C	80	.12	64	75	.11
KCWD #111 #5	22N 05E 21Q	G1-24299C	275	.40	308	275	.40
KCWD #111 #1,2	22N 05E 22R	G1-23817C	300	.43	384	300	.43
KCWD #111 #4	22N 05E 22J	G1-24301C	300	.43	336	300	.43
Fournier (Pac First Fed.)	22N 05E 23L	G1-21924C	50	.07	2	50	.07
KCWD #111 #3	22N 05E 23M	G1-24302C	400	.58	448	400	.58
Reilly	22N 05E 25H	G1*06937C	40	.06	10.6		
Sched	22N 05E 27D	G1-24434C	60	.09	35.7	137	.20
Meridian Meadow	22N 05E 28K	G1*04995C	37	.05	54	40	.06
Beagle	22N 05E 28F	G1-20530C	30	.04	6		

TABLE VIII-3 continued

T22N, R5E continued

Source I.D. (1)	Location	Water Right Control No.	GPM	MGD	AF/YR(s) (2)	In-service Capacity(4) GPM	MGD
Kent, Soos Creek	22N 05E 28E	G1-24073C	900	1.30	864 (s)	900	1.30
Kent, East Hill Water Co.	22N 05E 29C	G1*00785C	60	.09	42		
Kent, East Hill Water Co.	22N 05E 29B	G1*03022C	120	.17	36.4		
					42 (s)		
Fekkes	22N 05E 31	G1-22596C	80	.12	6		
Osborne	22N 05E 32Q	G1*05340C	85	.12	36	150	.22
Osborne	22N 05E 32R	G1*06614C	40	.06	30	30	.04
Osborne (Crestview)	22N 05E 32K	G1-22089C	25	.04	4.5	40	.06
Osborne (Alder Acres)	22N 05E 32H	G1-22738C	33	.05	6.3	40	.06
Osborne	22N 05E 32K	G1-22758C	25	.04	8	25	.04
Monstad Water	22N 05E 32B	G1-23785C	35	.05	4		
Derbyshire	22N 05E 33M	G1*04740C	50	.07	80	60	.09
Kent, City of	22N 05E 33F	G1-23814A (3)	1,000	1.44			
KCWD #111 #6	22N 05E 33H	G1-24568A (3)	750	1.08		700	1.01
Christofferson (Jaeger)	22N 05E 34L	G1*08357C	60	.09	5	20	.03
Welch's Water System	22N 05E 35P	G1*06918C	250	.36	56	150	.22
Kent, Armstrong A1 & A2	22N 05E 36A	G1-24189C	1,300	1.87	500 (s)	1,300	1.87
Subtotal			(13,458)	(19.41)	(7,278.1)		

TABLE VIII-3 continued

T22N, R6E

Source I.D. (1)	Location	Water Right: Control No.	GPM	MGD	AF/YR(s) (2)	In-service Capacity(4): GPM	MGD
Osborne (Forest Grove)	22N 06E 17P	G1-20335C	60	.09	96		
Puckett	22N 06E 19B	G1-24041C	35	.05	4	38	.05
Billington	22N 06E 20C	G1-23102C	34	.05	9	80	.12
*Kielland	22N 06E 25R	G1-23566C	40	.06	7.5	50	.07
Kent (Clark Springs Inf. Trench)	22N 06E 26	G1*04526C	2,250	3.24	790 560 (s)	2,250	3.24
Kent, (Clark Spring 1,2,3)	22N 06E 26P	G1*10006C	5,400	7.78	8,710	5,400	7.78
KCWD #94	22N 06E 28	G1*03778C	80	.12	125		
KCWD #94	22N 06E 28F	G1-23579C	220	.32	125 (s)	130	.19
Cherokee Bay Community	22N 06E 28	G1-23546C	488	.70	285.4		
Covington	22N 06E 29R	G1*05269C	200	.29	180	550	.79
Kent, Kent Springs	22N 06E 33P	G1-22956C	3,690	5.31	5,904	1,857	2.67
Covington (Ravensdale)	22N 06E 36A	G1-24502P	100	.14	45		
Subtotal			(12,597)	(18.15)	(16,155.9)		

T23N, R4E

Source I.D. (1)	Location	Water Right: Control No.	GPM	MGD	AF/YR(s) (2)	In-service Capacity(4): GPM	MGD
S. Seattle Land	23N 04E 27C	G1*00109S	150	.22	244	150	.22
S. Seattle Land	23N 04E 27C	G1*00110S	350	.50	566	350	.50
S. Seattle Land	23N 04E 27P	G1*00291C	400	.58	250	350	.50
S. Seattle Water	23N 04E 27P	G1*03450C	500	.72	60 740 (s)	600	.86

TABLE VIII-3 continued

T23N, R4E continued

Source I.D. (1)	Location	Water Right Control No.	Water Right GPM	Water Right MGD	Water Right AF/YR(s) (2)	In-service Capacity(4) GPM	In-service Capacity(4) MGD
Normandy Park Water Co. (KCWD #75)	23N 04E 30J	G1*02695C	250	.36	400	250	.36
KCWD #53	23N 04E 34N	G1*00082C	400	.58	320		
KCWD #75	23N 04E 34L	G1*04961C	400	.58	640		
KCWD #75	23N 04E 34C	G1*05781C	310	.45	496	400	.58
Subtotal			(2,760)	(3.99)	(2,976)		
TOTALS			96,144	138.52	89,107.7		

(1) Under source I.D. column, the entry is variable ranging from original water right holder to well identification number for some of the Class 1 systems.

* The well(s) is located within the CWSP area, but not within GWMA.

(2) (s)=Supplemental rights are not included in AF/YR subtotals or total.

(3) Applications not included in totals.

(4) In-service capacity has not been totalled because of the variance in source data and lack of any information on some of the small systems. Estimates of total capacity by system category are shown on Table VII-3.

(5) Table includes all recorded public supply water rights of 25 gpm or more.

TABLE VIII-3 continued

SURFACE WATER - PUBLIC WATER SUPPLY

T20N, R7E

Source I.D. (1)	Location	Water Right: Control No.	GPM (cfs)	MGD	AF/YR(s) (2)	In-Service Capacity(4): GPM	MGD
Enumclaw, City (Watercress Springs)	20N 07E 19C	S1-06308C	336 (.75)	.48	Und.	1,500	2.16
Enumclaw, City (Watercress Springs)	20N 07E 19C	S1-10594C	450 (1.0)	.65	Und.		
Enumclaw, City	20N 07E 29F	S1-22798C	900 (2.0)	1.30		700	1.01

T21N, R3E

Source I.D. (1)	Location	Water Right: Control No.	GPM (cfs)	MGD	AF/YR(s) (2)	In-Service Capacity(4): GPM	MGD
Lakota Coop Water Assn.	21N 03E 12G	S1-02393C	45 (.1)	.06	Und.		

T21N, R4E

Source I.D. (1)	Location	Water Right: Control No.	GPM (cfs)	MGD	AF/YR(s) (2)	In-Service Capacity(4): GPM	MGD
Logandale Water	21N 04E 02	S1*01928C	90 (.2)	.13	Und.		
KCWD #56 (FWWS)	21N 04E 05L	S1*04892C	1,346 (3.0)	1.94	1,206		
Lakehaven S.D.	21N 04E 05	S1-21022C	67 (.15)	.10	Und.		
KCWD #56 (FWWS)	21N 04E 05L	S1-21594C	1,346 (3.0)	1.94	1,500		
Barker	21N 04E 07K	S1*07916C	112 (.25)	.16	Und.		
Bain	21N 04E 14	S1*06316C	45 (.1)	.06	Und.		
Brooklake Comm.	21N 04E 29	S1*06261C	135 (.3)	.19	Und.		

TABLE VIII-3 continued

T21N, R5E

Source I.D. (1)	Location	Water Right: Control No.	GPM (cfs)	MGD	AF/YR(s) (2)	In-Service Capacity(4): GPM	MGD
KCWD #7	21N 05E 17	S1*13404A	(40.)				
Seventh Day Adv.	21N 05E 27	S1*09376C	31 (.07)	.04	Und.		
Auburn, City of	21N 05E 28P	S1*01304C	6,732 (15.)	9.69	Und.		

T21N, R6E

Source I.D. (1)	Location	Water Right: Control No.	GPM (cfs)	MGD	AF/YR(s) (2)	In-Service Capacity(4): GPM	MGD
WA Parks & Rec.	21N 06E 27R	S1*00631C	150 (.33)	.22	7		
W&S Enterprises	21N 06E 28B	S1*23057C	27 (.06)	.04	4.5		

T21N, R7E

Source I.D. (1)	Location	Water Right: Control No.	GPM (cfs)	MGD	AF/YR(s) (2)	In-Service Capacity(4): GPM	MGD
Black Diamond	21N 07E 19	S1-00506C	3,590 (8.0)	5.17	551	550	.79

T22N, R4E

Source I.D. (1)	Location	Water Right: Control No.	GPM (cfs)	MGD	AF/YR(s) (2)	In-Service Capacity(4): GPM	MGD
Benson	22N 04E 07	S1*03860C	54 (.12)	.08	Und.		

TABLE VIII-3 continued

T22N, R5E

Source I.D. (1)	Location	Water Right Control No.	GPM (cfs)	MGD	AF/YR(s) (2)	In-Service Capacity(4) GPM	MGD
King Co. School Dist. No. 415	22N 05E 23N	S1*08511C	112 (.25)	.16			

T22N, R6E

Source I.D. (1)	Location	Water Right Control No.	GPM (cfs)	MGD	AF/YR(s) (2)	In-Service Capacity(4) GPM	MGD
Kent, Clark Springs	22N 06E 26	S1-03533C	2,250 (5.0)	3.24			
Kent, Kent Springs	22N 06E 33P	Claim 123225	4,500 (10.0)	6.48	965	2,688	3.87
TOTAL			22,318 (49.68)	32.13	4,233.5		

(1) Under source I.D. column, the entry is variable ranging from original water right holder to well identification number for some of the Class 1 systems.

* The well(s) is located within the CWSP area, but not within GWMA.

(2) (s)=Supplemental rights are not included in AF/YR subtotals or total.

(3) Applications not included in totals.

(4) In-service capacity has not been totalled because of the variance in source data and lack of any information on some of the small systems. Estimates of total capacity by system category are shown on Table VII-3.

(5) Table includes all recorded public supply water rights of 25 gpm or more.

TABLE VIII-4

SOUTH KING COUNTY CWSP STUDY AREA
PRIMARY WATER RIGHTS (1)

Water System Size	Annual Water Right (2) : Acre-Ft	MGD	Instantaneous Right : GPM	MGD
Class 1	88,767	79.3	109,562	157.8
Class 2	682	0.6	1,597	2.3 (3)
Class 3 & 4	3,864	3.4	7,304	10.5
	93,313	83.3	118,463	170.6

(1) Includes both surface and groundwater rights.

(2) These totals do not include several surface water rights where annual quantity was not identified on water right.

(3) Several Class 2 systems are apparently operating under claims to vested rights so cannot be quantified for this table.

TABLE VIII-5

SOUTH KING COUNTY CWSP STUDY AREA
SUMMARY OF INSTANTANEOUS WATER RIGHT REQUIREMENTS
(MGD)

	YEAR						STRAIGHT LINE	
	1985	1990	1995	2000	2010	2020	2030	2040
SCENARIO 1 - EXISTING CONDITION								
Projected Peak Day Demand	87.0	98.4	110.2	121.9	143.1	164.3	190.0	215.8
Existing Instantaneous Water Right (1)	170.6	170.6	170.6	170.6	170.6	170.6	170.6	170.6
Cumulative Water Right Deficiency (2)	-83.6	-72.2	-60.4	-48.7	-27.5	-6.3	19.5	45.2
SCENARIO 2 - WITH CONSERVATION								
Projected Peak Day Demand	87.0	98.4	104.6	109.7	128.8	147.8	171.0	194.2
Existing Instantaneous Water Right (1)	170.6	170.6	170.6	170.6	170.6	170.6	170.6	170.6
Cumulative Water Right Deficiency (2)	-83.6	-72.2	-65.9	-60.9	-41.8	-22.8	0.5	23.7
SCENARIO 3 - MULTI-FAMILY INCREASE								
Projected Peak Day Demand	87.0	98.4	107.4	115.8	135.9	156.1	180.5	205.0
Existing Instantaneous Water Right (1)	170.6	170.6	170.6	170.6	170.6	170.6	170.6	170.6
Cumulative Water Right Deficiency (2)	-83.6	-72.2	-63.2	-54.8	-34.6	-14.5	10.0	34.4
SCENARIO 4 - WITH CONSERVATION & MULTI-FAMILY INCREASE								
Projected Peak Day Demand	87.0	98.4	101.9	103.6	121.6	139.6	161.5	183.4
Existing Instantaneous Water Right (1)	170.6	170.6	170.6	170.6	170.6	170.6	170.6	170.6
Cumulative Water Right Deficiency (2)	-83.6	-72.2	-68.7	-66.9	-49.0	-31.0	-9.0	12.9

(1) Assumes on the average 180, 140, and 120 gallons per capita per day (gpcd) and peak to average day factors of 2.2 2.4, and 2.8 for urban, transitional, and rural areas, respectively.

(2) Includes both surface and groundwater rights.

(3) Several Class 2 systems are apparently operating under claims to vested right so cannot be quantified for this table. It also does not inlcude several surface water rights where annual quantity was not identified on water right.

(4) Assumes increase in multi-family units in both urban and transition areas resulting in gradual reduction in per capita water use of 1.5% and 3% in 1995, and 3.5% and 7% in 2000 and thereafter for urban and transitional areas, respectively.

(5) Assumes water conservation savings of 5% by 1995, and 10% by 2000 and thereafter at all times.

TABLE VIII-6

SOUTH KING COUNTY CWSP STUDY AREA
SUMMARY OF ANNUAL WATER RIGHT REQUIREMENTS
(MGD)

	YEAR						STRAIGHT LINE	
	1985	1990	1995	2000	2010	2020	2030	2040
SCENARIO 1 - EXISTING CONDITION								
Projected Average Day Demand	36.6	41.4	46.3	51.2	60.0	68.8	79.5	90.3
Existing Annual Water Right (1)	83.3	83.3	83.3	83.3	83.3	83.3	83.3	83.3
Cumulative Water Right Deficiency (2)	-46.7	-41.9	-37.0	-32.1	-23.3	-14.5	-3.8	7.0
SCENARIO 2 - WITH CONSERVATION								
Projected Average Day Demand	36.6	41.4	44.0	46.1	54.0	61.9	71.6	81.2
Existing Annual Water Right (1)	83.3	83.3	83.3	83.3	83.3	83.3	83.3	83.3
Cumulative Water Right Deficiency (2)	-46.7	-41.9	-39.3	-37.2	-29.3	-21.4	-11.7	-2.1
SCENARIO 3 - MULTI-FAMILY INCREASE								
Projected Average Day Demand	36.6	41.4	45.1	48.6	57.0	65.3	75.5	85.7
Existing Annual Water Right (1)	83.3	83.3	83.3	83.3	83.3	83.3	83.3	83.3
Cumulative Water Right Deficiency (2)	-46.7	-41.9	-38.2	-34.7	-26.3	-18.0	-7.8	2.4
SCENARIO 4 - WITH CONSERVATION & MULTI-FAMILY INCREASE								
Projected Average Day Demand	36.6	41.4	42.8	43.5	51.0	58.5	67.6	76.7
Existing Annual Water Right (1)	83.3	83.3	83.3	83.3	83.3	83.3	83.3	83.3
Cumulative Water Right Deficiency (2)	-46.7	-41.9	-40.5	-39.8	-32.3	-24.8	-15.7	-6.6

(1) Assumes on the average 180, 140, and 120 gallons per capita per day (gpcd) for urban, transitional, and rural areas, respectively,

(2) Includes both surface and groundwater rights, except where several surface water rights where annual quantity was not identified on water right.

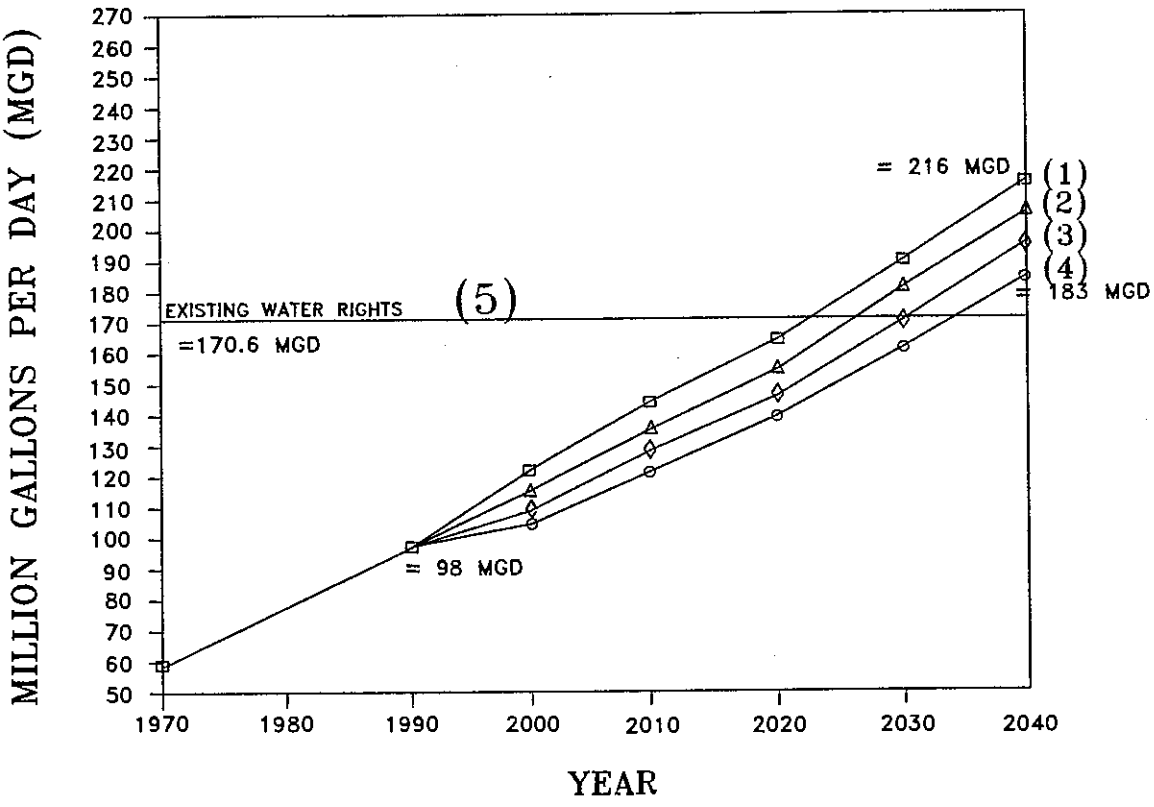
(3) Several Class 2 systems are apparently operating under claims to vested right so cannot be quantified for this table. It also does not inlcude several surface water rights where annual quantity was not identified on water right.

(4) Assumes increase in multi-family units in both urban and transitional areas resulting in gradual reduction in per capita water use of 1.5% and 3% in 1995, and 3.5% and 7% in 2000 and thereafter for urban and transitional areas, respectively.

(5) Assumes water conservation savings of 5% by 1995, and 10% by 2000 and thereafter for all areas.

EXHIBIT VIII-1

EXISTING WATER RIGHTS VERSUS PEAK DAY DEMANDS PROJECTIONS



(1) Scenario 1 Existing Conditions – Assumes 180, 140 and 120 gallons per capita per day (gpcd) for average day and peak to average day factors of 2.2, 2.4 and 2.8 for urban, transitional and rural areas, respectively.

(2) Scenario 2 Multi-Family Increase – Assumes increase in multi-family units in both urban and transitional areas resulting in gradual reduction of water consumption of 1.5% and 3.5% in 1995 and up to 3% and 7% for the year 2000 and thereafter for urban and transitional areas, respectively.

(3) Scenario 3 Conservation – Assumes conservation savings of 5% in 1995 and 10% in 2000 and thereafter for all urban, transitional and rural water consumption.

(4) Scenario 4 – Combination of Scenario 2 (Multi-Family Increase) and Scenario 3 (Conservation).

(5) Include Both Existing Surface and Groundwater Rights.

SECTION IX

PLAN IMPLEMENTATION

SECTION IX

PLAN IMPLEMENTATION

1. INTRODUCTION

The Coordinated Water System Plan (CWSP) was prepared to fulfill the requirements of the Public Water System Coordination Act, Chapter 70.116 RCW, and Procedures Relating to the Reservation of Water for Future Public Water Supply as empowered by the Water Resources Act of 1971, RCW 90.54. The completed Plan will serve as a CWSP, as provided for in the two statutes. This Section briefly outlines the approval process for the CWSP, a process of appealing CWSP procedures, how the CWSP is routinely updated, and provides the environmental review.

2. PLAN APPROVAL PROCEDURES

As outlined in Section II, the completed CWSP is presented in two parts: the Supplemental Provisions detailed in this document, and a compilation of individual Comprehensive Water Plans to be approved by the County and Department of Social and Health Services (DSHS). Completed plans are on file with DSHS and the County. It is the responsibility of each utility to fulfill its water system planning requirements. The level of effort required is based upon the system size, the expansion plans of the utility, and the type of system ownership. Guidelines for preparing water system plans are available from DSHS. All individual Comprehensive Water Plans are to be submitted for review within 1 year from the date of CWSP completion; the date of CWSP submittal to the King County Legislative Authority for review.

Preparation of the supplemental provisions is the responsibility of the County and the local utilities, acting through the Water Utility Coordinating Committee (WUCC). The WUCC identified local needs and gave direction to the development of the CWSP as it related to area-wide issues. Through the efforts of the WUCC and the County agency staff, the procedures, regional policies, and minimum standards have been completed for the Critical Water Supply Service Area (CWSSA).

The completed CWSP is submitted in sequence to the King County Utility Technical Review Committee; County Council's Parks, Planning, and Resources Committee; and, finally, the County Council. Each group reviews the document to ensure there are no inconsistencies with existing land use plans, shoreline master programs, and/or developmental policies. The Council has 60 days upon receipt of the CWSP to act on the document. The alternative actions the

Council may take are set forth in WAC 248-56-800, as shown in Exhibit IX-1. After Council action, the CWSP is submitted to DSHS, which must also act upon adoption within 60 days.

Any changes requested to procedures, service area boundaries, or other issues prior to the 5-year update of the CWSP need to follow the same process for amendment as that outlined above for CWSP approval.

It should be noted that future applications made to the Department of Ecology (Ecology) for water rights reservation are contingent on data contained in the CWSP, U.S. Geological Survey (USGS), and Ground Water Management Plan (GWMP) studies in South King County. A determination will need to be made then regarding the proper level of environmental review for reservation, i.e. environmental checklist or environmental impact statement.

3. APPEALS PROCESS

It may be expected that issues of protest or interpretation regarding requirements of the CWSP will be raised by either an applicant or a utility. An appeals process has been developed for the purpose of reviewing and resolving such issues. The Building and Land Division (BALD) will coordinate a two-step appeal process, as described below and shown on Exhibit IX-2.

A. Issues Subject to Appeal and Review - Only water service related issues are subject to appeal and review under this process. In most instances such issues will be identified when the applicant requests the Certificate of Water Service Availability from the water utility. Issues subject to review include, but are not necessarily limited to, the following:

(1) Interpretation and application of water utility service area boundaries.

(2) Proposed schedule for providing service.

(3) Conditions of service, excluding published rates and fees.

(4) Annexation provisions imposed as a condition of service; provided, however, existing authorities of City government are not altered by the CWSP, except where an interlocal agreement exists between a city and the County or as are specifically authorized by Chapter 70.116 RCW.

(5) Established minimum design standards under the conditions specified in Section IV.

B. Step 1 Review - If the applicant and utility are unable to agree on conditions of service, a written request may be made to the BALD by either party for review of the issues.

BALD will initiate this review by sending a copy of the request to the South King County Regional Water Association (SKRWA)/WUCC and providing an opportunity for resolution of the issues by the Association/Committee. At the same time the BALD will notify the Utility Technical Review Committee (UTRC) of the request for review for filing purposes.

The SKRWA/WUCC will establish a process for review which achieves the following objectives:

(1) Provides a forum for negotiation of the issues between the parties.

(2) Facilitates the negotiations.

(3) Where parties choose not to participate in the negotiations, identifies and evaluates the facts associated with the issues.

(4) Within 45 days of receipt of the request for review, provides a written report to the BALD which states the conditions of the agreement reached by the parties, or where no agreement was reached, a statement of findings and recommendations for disposition of the issues.

C. Step 2 Review - After the required waiting period or upon receipt of a report of findings and recommendations regarding unresolved appeals from the SKRWA/WUCC, the BALD will coordinate further review of the appeal with the King County UTRC. The UTRC is empowered under Chapter 13.24 King County Code to "...review and make recommendations to the King County executive and to the King County Council on the adequacy of all sewer and water comprehensive plans and related matters, and determination of their consistency with the King County Comprehensive Plan; provided, further, that the committee shall have the authority to approve additions and betterments to Council-approved sewer and water comprehensive plans without referral to the Council in order to serve developments which have received preliminary approval from the King County Council."

A legal determination should be made as to whether amendment of the UTRC authority is required to include review of appeals coordinated by the BALD.

Within 45 days of receipt of the report of the SKRWA/WUCC, the UTRC shall render its decision on the appeal. The findings and recommendations of the SKRWA/WUCC will be fully considered in arriving at this decision. The decision of the UTRC shall be binding on all parties, subject to any further appeal rights granted by statute.

D. Binding Arbitration - At any point in the two-step process, the parties may mutually agree to submit to binding arbitration. The process and time schedule to be followed will be stipulated through written agreement. When such agreement is reached, the appeal will be removed from the process described herein, resolved through binding arbitration, and the results be reported to the BALD.

4. RECOMMENDED DATABASE MANAGEMENT SYSTEM

A. Introduction

CWSPs are concurrently being developed by the East King Regional Water Plan (EKRWA) and SKRWA. In addition, the SKRWA is preparing a GWMP and participating in a USGS study. King County, in cooperation with Ecology, is preparing GWMPs for the Issaquah Creek Valley and the Redmond-Bear Creek areas and proposes to initiate in 1990 a larger GWMP within the East King County CWSSA. Considerable groundwater information and water utility data is, or will become, available through these studies. However, there is currently no unified program for developing a common utility planning database for storage and use of this and similar information.

For these reasons, it is proposed that the EKRWA, in cooperation with the SKRWA, establish a Database Management System that will combine existing and future collected data into a single computer database. This System will initially focus on King County groundwater and utility planning data. Central to this program will be a Utility Data Management Center (Center) operated by the EKRWA. A joint operating agreement will define responsibilities between the two RWAs. Interagency agreements will be necessary for data transfers between the Center and government agencies (e.g., USGS, EPA, Ecology, King County). User agreements will also be required to establish the conditions and fees for use of the Center by RWA members and others. Exhibit IX-3 is a flow chart depicting this overall program.

It is anticipated that a more limited database program will be maintained by the SKCHD for Class 2, 3, and 4 water systems and related regulatory information. This program, as designed for SKCHD use as a part of the South King County GWMP, is compatible with the System recommended herein and data may be readily exchanged.

B. Database Management System

The recommended System is designed to provide user access to the information in an economic and efficient manner. The System consists of three basic components: the Center, the protocol, and the database.

(1) The Center

The Center is the facility from which the System operates; consisting basically of hardware and software. Recommended hardware are: an IBM-compatible personal computer with 2 to 4 MB of RAM and 80386/7 CPU, a hard disk drive of at least 6 MB capacity, a 36-inch by 48-inch digitizer, a printer, and a plotter. Recommended software are dBASE III+ (relational database software) and AutoCAD (vector mapping software). The facility requires a system administrator/supervisor to oversee data building and retrieval activities and to continue any ongoing developments.

Informational database procedures have been developed with dBASE to allow a user to make selections and to key in data using menus. Consequently, the user does not need to have a programming background to use the system. The procedures serve five basic functions as follows:

- Data input procedures are designed to prompt the user for required data fields and to do limited error checking to confirm the data was properly entered.

- Data editing procedures allow the user to modify or update existing information that is already contained in the database.

- Data retrieval routines allow the user to prepare data reports for use in water-resource planning studies. Standardized report forms can be used (e.g., water levels, pumpage, etc.). Data retrieval can be accommodated by the following:

  - Retrieve by Site ID,
  - Retrieve by an Owner ID (e.g., DSHS number),
  - Retrieve by Township-Range-Section, and
  - Retrieve by Latitude-Longitude or State Plane Coordinate windows.

- o Data transfer routine allows the user to periodically extract all new or modified data and automatically build appropriately structured files for transfer to Ecology.

- o Data backup routine allows the user to periodically save the contents of the entire System to a set of floppy disks.

Geographical database procedures have been developed using the AutoCAD software. The AutoCAD mapping is based on the Washington State Plane Coordinate System, Lambert Projection (north zone). This automated mapping system provides a convenient medium for manipulation and presentation of the data for public forums and reports and facilitates future updating of maps as new information becomes available.

Additional software has been developed to allow the user to query the data in dBASE and plot the results in AutoCAD. Conversely, the user could "highlight" areas in an AutoCAD map and extract dBASE information for the entities residing in the highlighted areas.

(2) Protocol

Like any tool, the Center is most effective when used in a standard way. This standard should be explicitly defined in the System User Protocol. This protocol describes the data format within the database, system management procedures, and system use procedures. The resulting standard data formats and data conversions allow easy interface with major federal databases such as STORET and WATSTORE, as well as state-wide databases maintained within Ecology (Ground Water Management Program) and the Department of Natural Resources (ARC-INFO). Also, the same Protocol is being/has been adopted by other counties such as Pierce County (Utility Data Management Center), Kitsap County (Ground Water Management System), and South King County (Ground Water Management System).

Using the System User Protocol, therefore, provides the Data Management System a "roadmap" for maintaining database system integrity as well as allowing for easy data exchange with Protocol users of different systems.

(3) Database

Water resource information contained within the USGS WATSTORE computer system may be downloaded and transferred to the personal computer system. The USGS database contains site, construction, water level, and well yield data. Additional sites from consultant reports, purveyor files, and other sources can also be entered into the database as well as owner and water rights information.

EPA's STORET data, like the USGS data, may also be downloaded from a mainframe database system into dBASE.

The reliability of the data contained within these databases is highly variable. The data associated with sites field-checked by the USGS are considered to be fairly reliable. However, data for many of the other sites may not be comparable. Well elevation data and site locations are probably the most problematic parameters. Future database management efforts should include field verification of well information and the establishment of a uniform site identification code to be used by all databases.

C. User Agreements

It is recommended that all users of the Database Management Center sign a User Agreement. The User Agreement establishes the following:

(1) Obtained information is public and will not be used for commercial purposes.

(2) AutoCAD APWA protocol will be followed.

(3) A user fee with a one-half hour minimum fee.

(4) Quality control is the responsibility of the user.

(5) User priority schedules.

(6) The Data Management Center is not liable or responsible for data accuracy.

An example of a User Agreement is Exhibit IX-4.

5. STATE AND COUNTY LEGISLATIVE ACTION

Implementation of this Plan will require enabling legislative action at both the State and County level. Program areas where new or amended laws, regulations, and/or ordinances may be necessary are as follows:

A. State Authority

(1) The concept of Satellite System Management Agencies (SSMA) is not directly addressed in the Public Water System Coordination Act. The Program described in Section VI includes a recommendation that DSHS establish, through regulation, a state-wide procedure for certification of SSMAs. It is the intent of DSHS to first examine whether legislation is required and, if so, to submit a proposal to the 1990 State Legislature.

(2) As a companion measure to the above, the WUCC recommended that structured financial criteria be developed for SSMAs. DSHS will also examine this subject in its legal review of required statutory authority with a view to 1990 legislation.

B. County Authority

(1) Adoption of an ordinance for implementation of the Water Utility Design Standards described in Section IV.

(2) Amendment of the existing King County Code (KCC) regarding standards for approval of water comprehensive plans.

(3) Review of KCC, and appropriate action thereafter, with respect to the authority of the UTRC to process appeals as described in Section IX.

(4) Amendment of KCC as may be necessary to achieve recognition of those service area boundaries supported by signed Agreements, in Boundary Review Board and County franchise activities.

(5) Adopt procedures, by ordinance or other appropriate means, that require a signed service area Agreement as prerequisite to granting approval to a utility for service area expansion.

(6) Following DSHS determination of the elements of a state-wide SSMA program, adopt an appropriate ordinance for County implementation.

6. COORDINATED WATER SYSTEM PLAN UPDATE

In accordance with the provisions of the Public Water System Coordination Act, the CWSP must be reviewed and updated by the WUCC at a minimum of every 5 years, or sooner, if necessary. An extension of 1 year from the date the Plan is submitted to the King County Legislative Authority for review was given by the County and DSHS for the submittal of individual water system plans during the preparation of this CWSP. However, it is recommended that all individual water system plans included within the next CWSP update be submitted for review and approval at the same time as the CWSP. A uniform approval date will allow the Regional Supplement for the CWSP and the individual water system plans to be updated on the same schedule, ensuring the use of current information among all the utilities.

7. PERIODIC COMMITTEE REVIEW

The WUCC should continue as a standing committee which should meet at least semi-annually to review issues of regional significance and to review implementation issues regarding the CWSP. The Design Standards Subcommittee should meet at least annually to review the effectiveness of and any changes needed to the Minimum Design Standards.

8. ENVIRONMENTAL DOCUMENT

The State Environmental Policy Act of 1971, Chapter 43.21C RCW, requires that all water system plans prepared must be accompanied by an appropriate environmental document. An Environmental Checklist has been prepared for the South King County CWSP and its recommended activities. This Checklist is included as Exhibit IX-5.

The CWSP has been prepared to establish administrative, management, and policy procedures to respond to the needs of existing and future customers in South King County. It is intended to address regional concerns within the County which are not ordinarily included in each utility's water system plan. Examples of those regional issues are: potential shared facilities, regional sources of supply, procedures for reviewing and approving future water use activities, minimum design standards, designated water utility service areas, and water utility management policies.

The CWSP contents are referenced in the Checklist. It is anticipated that both negative and positive impacts will occur to earth, water, land use, population, public services, and utilities as a result of implementing the individual water system plans. The CWSP has been developed in accordance with the King County Comprehensive Plan, local community plans, and City land use documents to reflect local land use policies and requirements. Therefore,

implementation of this Plan and the employment of sound engineering and construction practices during the implementation of each utility's water system plan will minimize any adverse impacts.

The CWSP and Checklist also consider the use of the document for the future submittal of an application for water supply reservation. Associated impacts were considered in the Checklist. However, it is acknowledged that a final determination will be needed for approval of the GWMP and that an EIS may be required then or when the reservation application is submitted.

It is recommended before the CWSP is submitted to DSHS, a final environmental determination be made by King County. This final determination should be attached or incorporated within the CWSP Council.

EXHIBIT IX-1

STATE REGULATION RELATING TO LOCAL REVIEW OF PLAN

WAC 248-56-800 COORDINATED WATER SYSTEM PLAN - LOCAL REVIEW. (1) Prior to submission of a coordinated water system plan to the department for approval, the plan shall be reviewed by the county legislative authority(ies) in the county(ies) in which the critical water supply service area is located. County review of the coordinated water system plan shall include at least one public hearing.

(2) If no comments have been received from the county legislative authority(ies) within 60 days of receipt of the coordinated water system plan, the department may consider the plan for approval.

(3) If within 60 days of receipt of the coordinated water system plan, the county legislative authority(ies) find any segment of the plan to be inconsistent with adopted land use plans, shorelines master programs, the following shall occur:

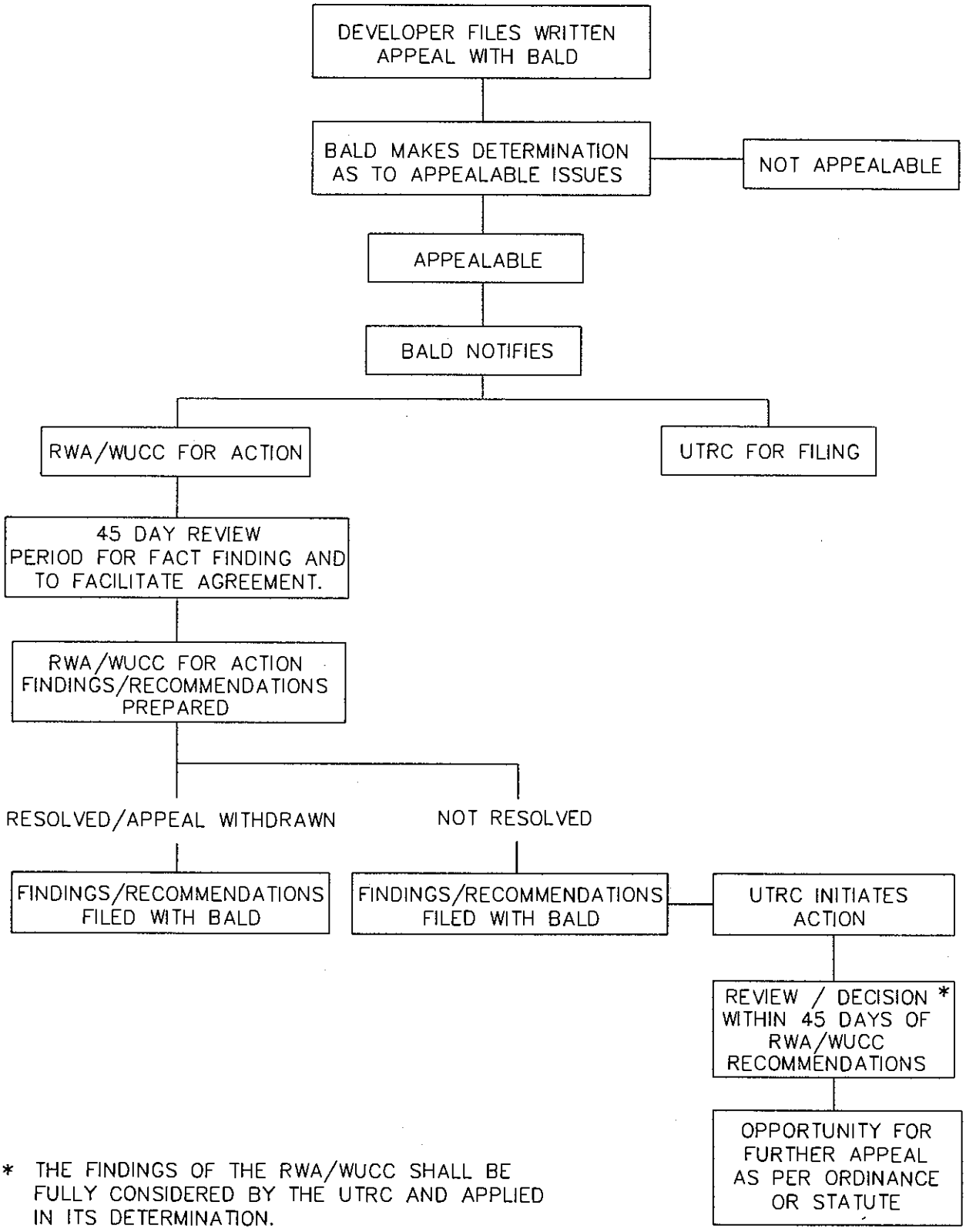
(a) The county legislative authority(ies) shall submit written description of their determination and justification supporting their determination prior to the end of the 60 day period to the department and all affected parties.

(b) The county legislative authority(ies) shall make every effort to resolve any inconsistencies within 60 days of submittal of written justification.

(c) the department may approval those portions of the coordinated water system plan found not to be inconsistent with adopted plans and policies at any time after the initial determination by the county legislative authority(ies).

(d) If after the 60-day period established for resolution of inconsistencies an inconsistency still exists, the affected parties shall each present their final recommended alternative solution to the department. The department shall then review all alternative solutions and discuss its recommendations with the county(ies) and the water utility coordinating committee. If after two years of the declaration of the critical water supply service area the inconsistencies persist, the department may deny proposals to establish or to expand any public water system facilities which affect that portion of the critical water supply service area being contested.

EXHIBIT IX–2
APPEAL PROCESS



* THE FINDINGS OF THE RWA/WUCC SHALL BE FULLY CONSIDERED BY THE UTRC AND APPLIED IN ITS DETERMINATION.

EXHIBIT IX–3
DATABASE MANAGEMENT SYSTEM

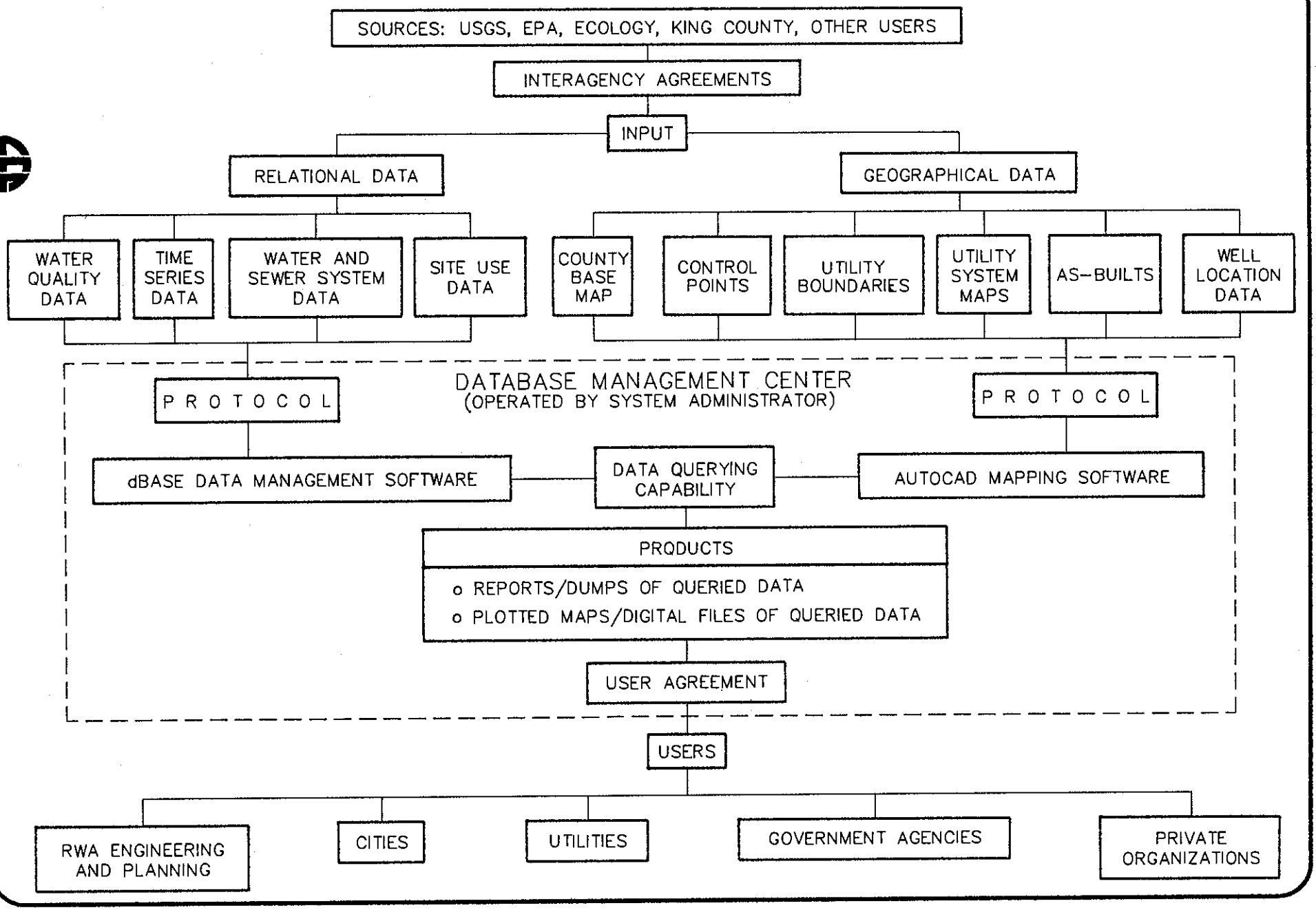


EXHIBIT IX-4

EAST KING & SOUTH KING COUNTY REGIONAL WATER ASSOCIATIONS

UTILITY DATA MANAGEMENT CENTER

USER AGREEMENT

IN CONSIDERATION of being permitted to use the joint East King County Regional Water Association/South King County Regional Water Association Utility Data Management Center ("Center"), the undersigned "User" agrees:

1. Charges. To pay the then current hourly charge for use of the Center as established by EKRWA and SKRWA, with a minimum one-half hour charge for any use.

The use time shall include time in receiving instruction or technical advice from Center personnel.

2. Scheduling. To make a reservation in advance of use of the Center. It is understood that priority in scheduling use of the Center is given to members of the sponsoring organizations, governmental bodies, and their authorized consultants.

3. Release. No warranty is made as to the reliability or accuracy of data and information obtained from the Center. User hereby releases the sponsoring organizations and their members from any and all claims or damages, including indirect or consequential damages, related to the accuracy or use of such data and information.

4. Data Use. All data and information in and provided by the Center is public information. User agrees that data or information obtained from the Center will not be sold or used for any commercial purpose without the Center's written permission.

DATED _____, 19___.

_____
Municipal or Company Name

By_____
Authorized Signature

Address: _____

_____

_____

Phone: _____

EXHIBIT IX-5
PART ELEVEN — FORMS

RCW 197-11-960 Environmental checklist.

ENVIRONMENTAL CHECKLIST

Purpose of Checklist:

The State Environmental Policy Act (SEPA), chapter 43.21C RCW, requires all governmental agencies to consider the environmental impacts of a proposal before making decisions. An environmental impact statement (EIS) must be prepared for all proposals with probable significant adverse impacts on the quality of the environment. The purpose of this checklist is to provide information to help you and the agency identify impacts from your proposal (and to reduce or avoid impacts from the proposal, if it can be done) and to help the agency decide whether an EIS is required.

Instructions for Applicants:

This environmental checklist asks you to describe some basic information about your proposal. Governmental agencies use this checklist to determine whether the environmental impacts of your proposal are significant, requiring preparation of an EIS. Answer the questions briefly, with the most precise information known, or give the best description you can.

You must answer each question accurately and carefully, to the best of your knowledge. In most cases, you should be able to answer the questions from your own observations or project plans without the need to hire experts. If you really do not know the answer, or if a question does not apply to your proposal, write "do not know" or "does not apply". Complete answers to the questions now may avoid unnecessary delays later.

Some questions ask about governmental regulations, such as zoning, shoreline, and landmark designations. Answer these questions if you can. If you have problems, the governmental agencies can assist you.

The checklist questions apply to all parts of your proposal, even if you plan to do them over a period of time or on different parcels of land. Attach any additional information that will help describe your proposal or its environmental effects. The agency to which you submit this checklist may ask you to explain your answers or provide additional information reasonably related to determining if there may be significant adverse impact.

Use of checklist for nonproject proposals:

Complete this checklist for nonproject proposals, even though questions may be answered "does not apply." IN ADDITION, complete the SUPPLEMENTAL SHEET FOR NONPROJECT ACTIONS (part D).

For nonproject actions, the references in the checklist to the words "project," "applicant," and "property or site" should be read as "proposal," "proposer," and "affected geographic area," respectively.

A. BACKGROUND

1. Name of proposed project, if applicable:
   East King County Coordinated Water System Plan

2. Name of applicant: King County Parks, Planning and Resources Department

3. Address and phone number of applicant and contact person: Mr. Richard Rodriguez
   Building and Land Development Office
   3600 - 136th Place SE, Suite A
   Bellevue, WA 98006 (206)296-6666

4. Date checklist prepared: August 15, 1989

5. Agency requesting checklist: Building and Land Development Division

6. Proposed timing or schedule (including phasing, if applicable):
   Approval of plan in 1990; update every five years thereafter.

7. Do you have any plans for future additions, expansion, or further activity related to or connected with this proposal? If yes, explain.
   Yes, participating water purveyors will update their respective comprehensive plans for consistency with this plan.

8. List any environmental information you know about that has been prepared, or will be prepared, directly related to this proposal.

None other than contained in Plan.

9. Do you know whether applications are pending for governmental approvals of other proposals directly affecting the property covered by your proposal? If yes, explain.

Not applicable.

10. List any government approvals or permits that will be needed for your proposal, if known.

a) Review by King County Council for consistency with current land use plans, shoreline master programs and/or developmental policies.

b) Approval/adoption by State Department of Health.

11. Give brief, complete description of your proposal, including the proposed uses and the size of the project and site. There are several questions later in this checklist that ask you to describe certain aspects of your proposal. You do not need to repeat those answers on this page. (Lead agencies may modify this form to include additional specific information on project description.)

Not applicable.

12. Location of the proposal. Give sufficient information for a person to understand the precise location of your proposed project, including a street address, if any, and section, township, and range, if known. If a proposal would occur over a range of area, provide the range or boundaries of the site(s). Provide a legal description, site plan, vicinity map, and topographic map, if reasonably available. While you should submit any plans required by the agency, you are not required to duplicate maps or detailed plans submitted with any permit applications related to this checklist.

Study area delineated on location diagram attached hereto.

TO BE COMPLETED BY APPLICANT

EVALUATION FOR AGENCY USE ONLY

B. ENVIRONMENTAL ELEMENTS

1. Earth

a. General description of the site (circle one): Flat, rolling, hilly, steep slopes, mountainous, other _____. Not applicable.

b. What is the steepest slope on the site (approximate percent slope)?

Not applicable.

TO BE COMPLETED BY APPLICANT

EVALUATION FOR AGENCY USE ONLY

c. What general types of soils are found on the site (for example, clay, sand, gravel, peat, muck)? If you know the classification of agricultural soils, specify them and note any prime farmland.

Not applicable.

d. Are there surface indications or history of unstable soils in the immediate vicinity? If so, describe.

Not applicable.

e. Describe the purpose, type, and approximate quantities of any filling or grading proposed. Indicate source of fill.

Not applicable.

f. Could erosion occur as a result of clearing, construction, or use? If so, generally describe.

Not applicable.

g. About what percent of the site will be covered with impervious surfaces after project construction (for example, asphalt or buildings)?

Not applicable.

h. Proposed measures to reduce or control erosion, or other impacts to the earth, if any:

Not applicable.

2. Air

a. What types of emissions to the air would result from the proposal (i.e., dust, automobile, odors, industrial wood smoke) during construction and when the project is completed? If any, generally describe and give approximate quantities if known.

Not applicable.

b. Are there any off-site sources of emissions or odor that may affect your proposal? If so, generally describe.

Not applicable.

c. Proposed measures to reduce or control emissions or other impacts to air, if any:

Not applicable.

TO BE COMPLETED BY APPLICANT

EVALUATION FOR AGENCY USE ONLY

3. Water

a. Surface:

1) Is there any surface water body on or in the immediate vicinity of the site (including year-round and seasonal streams, saltwater, lakes, ponds, wetlands)? If yes, describe type and provide names. If appropriate, state what stream or river it flows into.

Not applicable.

2) Will the project require any work over, in, or adjacent to (within 200 feet) the described waters? If yes, please describe and attach available plans.

Not applicable.

3) Estimate the amount of fill and dredge material that would be placed in or removed from surface water or wetlands and indicate the area of the site that would be affected. Indicate the source of fill material.

Not applicable.

4) Will the proposal require surface water withdrawals or diversions? Give general description, purpose, and approximate quantities if known.

Not applicable.

5) Does the proposal lie within a 100-year floodplain? If so, note location on the site plan.

Not applicable.

6) Does the proposal involve any discharges of waste materials to surface waters? If so, describe the type of waste and anticipated volume of discharge.

Not applicable.

b. Ground:

1) Will ground water be withdrawn, or will water be discharged to ground water? Give general description, purpose, and approximate quantities if known.

Not applicable.

2) Describe waste material that will be discharged into the ground from septic tanks or other sources, if any (for example: Domestic sewage; industrial, containing the following chemicals . . .; agricultural; etc.). Describe the general size of the system, the number of such systems, the number of houses to be served (if applicable), or the number of animals or humans the system(s) are expected to serve.

Not applicable.

TO BE COMPLETED BY APPLICANT

EVALUATION FOR AGENCY USE ONLY

c. Water Runoff (including storm water):

1) Describe the source of runoff (including storm water) and method of collection and disposal, if any (include quantities, if known). Where will this water flow? Will this water flow into other waters? If so, describe.

Not applicable.

2) Could waste materials enter ground or surface waters? If so, generally describe.

Not applicable.

d. Proposed measures to reduce or control surface, ground, and runoff water impacts, if any:

Not applicable.

4. Plants Not applicable.

a. Check or circle types of vegetation found on the site:
__ deciduous tree: alder, maple, aspen, other
__ evergreen tree: fir, cedar, pine, other
__ shrubs
__ grass
__ pasture
__ crop or grain
__ wet soil plants: cattail, buttercup, bullrush, skunk cabbage, other
__ water plants: water lily, eelgrass, milfoil, other
__ other types of vegetation

b. What kind and amount of vegetation will be removed or altered?

Not applicable.

c. List threatened or endangered species known to be on or near the site.

Not applicable.

d. Proposed landscaping, use of native plants, or other measures to preserve or enhance vegetation on the site, if any:

Not applicable.

5. Animals Not applicable.

a. Circle any birds and animals which have been observed on or near the site or are known to be on or near the site:

birds: hawk, heron, eagle, songbirds, other: .....
mammals: deer, bear, elk, beaver, other: .....
fish: bass, salmon, trout, herring, shellfish, other: .....

b. List any threatened or endangered species known to be on or near the site.

TO BE COMPLETED BY APPLICANT

EVALUATION FOR AGENCY USE ONLY

c. Is the site part of a migration route? If so, explain.

Not applicable.

d. Proposed measures to preserve or enhance wildlife, if any:

Not applicable.

6. Energy and Natural Resources

a. What kinds of energy (electric, natural gas, oil, wood stove, solar) will be used to meet the completed project's energy needs? Describe whether it will be used for heating, manufacturing, etc.

Not applicable.

b. Would your project affect the potential use of solar energy by adjacent properties? If so, generally describe.

Not applicable.

c. What kinds of energy conservation features are included in the plans of this proposal? List other proposed measures to reduce or control energy impacts, if any:

Not applicable.

7. Environmental Health

a. Are there any environmental health hazards, including exposure to toxic chemicals, risk of fire and explosion, spill, or hazardous waste, that could occur as a result of this proposal? If so, describe.

Not applicable.

1) Describe special emergency services that might be required.

Not applicable.

2) Proposed measures to reduce or control environmental health hazards, if any:

Not applicable.

b. Noise

1) What types of noise exist in the area which may affect your project (for example: traffic, equipment, operation, other)?

Not applicable.

2) What types and levels of noise would be created by or associated with the project on a short-term or a long-term basis (for example: traffic, construction, operation, other)? Indicate what hours noise would come from the site.

Not applicable.

TO BE COMPLETED BY APPLICANT

EVALUATION FOR AGENCY USE ONLY

3) Proposed measures to reduce or control noise impacts, if any:

Not applicable.

8. Land and Shoreline Use

a. What is the current use of the site and adjacent properties?

Multiple uses.

b. Has the site been used for agriculture? If so, describe.

Agricultural use generally exists in rural areas.

c. Describe any structures on the site.

All types.

d. Will any structures be demolished? If so, what?

Not as a part of the Plan.

e. What is the current zoning classification of the site?

Varies.

f. What is the current comprehensive plan designation of the site?

Varies.

g. If applicable, what is the current shoreline master program designation of the site?

Varies.

h. Has any part of the site been classified as an "environmentally sensitive" area? If so, specify.

Not applicable.

i. Approximately how many people would reside or work in the completed project?

Not applicable.

j. Approximately how many people would the completed project displace?

Not applicable.

k. Proposed measures to avoid or reduce displacement impacts, if any:

Not applicable.

l. Proposed measures to ensure the proposal is compatible with existing and projected land uses and plans, if any:

Plan must be consistent with existing zoning and land use plans.

TO BE COMPLETED BY APPLICANT

EVALUATION FOR AGENCY USE ONLY

9. Housing

a. Approximately how many units would be provided, if any? Indicate whether high, middle, or low-income housing. Not applicable.

b. Approximately how many units, if any, would be eliminated? Indicate whether high, middle, or low-income housing. Not applicable.

c. Proposed measures to reduce or control housing impacts, if any:

Not applicable.

10. Aesthetics

a. What is the tallest height of any proposed structure(s), not including antennas; what is the principal exterior building material(s) proposed?

Not applicable.

b. What views in the immediate vicinity would be altered or obstructed?

Not applicable.

c. Proposed measures to reduce or control aesthetic impacts, if any:

Not applicable.

11. Light and Glare

a. What type of light or glare will the proposal produce? What time of day would it mainly occur?

Not applicable.

b. Could light or glare from the finished project be a safety hazard or interfere with views?

Not applicable.

c. What existing off-site sources of light or glare may affect your proposal?

Not applicable.

d. Proposed measures to reduce or control light and glare impacts, if any:

Not applicable.

12. Recreation

a. What designated and informal recreational opportunities are in the immediate vicinity?

Not applicable.

b. Would the proposed project displace any existing recreational uses? If so, describe.

Not applicable.

TO BE COMPLETED BY APPLICANT

EVALUATION FOR AGENCY USE ONLY

c. Proposed measures to reduce or control impacts on recreation, including recreation opportunities to be provided by the project or applicant, if any:

Not applicable.

13. Historic and Cultural Preservation

a. Are there any places or objects listed on, or proposed for, national, state, or local preservation registers known to be on or next to the site? If so, generally describe.

Not applicable.

b. Generally describe any landmarks or evidence of historic, archaeological, scientific, or cultural importance known to be on or next to the site.

Not applicable.

c. Proposed measures to reduce or control impacts, if any:

Not applicable.

14. Transportation

a. Identify public streets and highways serving the site, and describe proposed access to the existing street system. Show on site plans, if any.

Not applicable.

b. Is site currently served by public transit? If not, what is the approximate distance to the nearest transit stop? Not applicable.

c. How many parking spaces would the completed project have? How many would the project eliminate? Not applicable.

d. Will the proposal require any new roads or streets, or improvements to existing roads or streets, not including driveways? If so, generally describe (indicate whether public or private).

Not applicable.

e. Will the project use (or occur in the immediate vicinity of) water, rail, or air transportation? If so, generally describe.

Not applicable.

f. How many vehicular trips per day would be generated by the completed project? If known, indicate when peak volumes would occur. Not applicable.

TO BE COMPLETED BY APPLICANT

EVALUATION FOR AGENCY USE ONLY

g. Proposed measures to reduce or control transportation impacts, if any:

Not applicable.

15. Public Services

a. Would the project result in an increased need for public services (for example: fire protection, police protection, health care, schools, other)? If so, generally describe.

Not applicable.

b. Proposed measures to reduce or control direct impacts on public services, if any.

Not applicable.

16. Utilities

a. Circle utilities currently available at the site: electricity, natural gas, water, refuse service, telephone, sanitary sewer, septic system, other. Not applicable.

b. Describe the utilities that are proposed for the project, the utility providing the service, and the general construction activities on the site or in the immediate vicinity which might be needed.

Not applicable.

C. SIGNATURE

The above answers are true and complete to the best of my knowledge. I understand that the lead agency is relying on them to make its decision.

Signature: Richard Rodrigues

Date Submitted: October 2, 1989

TO BE COMPLETED BY APPLICANT

EVALUATION FOR AGENCY USE ONLY

D. SUPPLEMENTAL SHEET FOR NONPROJECT ACTIONS

(do not use this sheet for project actions)

Because these questions are very general, it may be helpful to read them in conjunction with the list of the elements of the environment.

When answering these questions, be aware of the extent the proposal, or the types of activities likely to result from the proposal, would affect the item at a greater intensity or at a faster rate than if the proposal were not implemented. Respond briefly and in general terms.

1. How would the proposal be likely to increase discharge to water; emissions to air; production, storage, or release of toxic or hazardous substances; or production of noise?

The Plan responds to growth and related water demand. The Plan does not create the projected increase in population and attendant environmental impacts.

Proposed measures to avoid or reduce such increases are:

None - as a part of this Plan.

2. How would the proposal be likely to affect plants, animals, fish, or marine life?

The Plan has no affect on these resources. Implementation of certain aspects of the Plan may have some affect, but such actions would be subject to individual environmental review.

Proposed measures to protect or conserve plants, animals, fish, or marine life are:

None.

3. How would the proposal be likely to deplete energy or natural resources?

Same response as 2. above.

Proposed measures to protect or conserve energy and natural resources are:

The Plan proposes implementation of a water conservation program for municipal water use on a regional basis.

4. How would the proposal be likely to use or affect environmentally sensitive areas or areas designated (or eligible or under study) for governmental protection; such as parks, wilderness, wild and scenic rivers, threatened or endangered species habitat, historic or cultural sites, wetlands, floodplains, or prime farmlands?

All elements of the Plan must be found to be consistent with local land use plans, policies and development programs to be approvable. Specific actions proposed for implementation under the Plan would be subject to environmental review.

Proposed measures to protect such resources or to avoid or reduce impacts are:

None.

5. How would the proposal be likely to affect land and shoreline use, including whether it would allow or encourage land or shoreline uses incompatible with existing plans?

Same response as 4. above.

TO BE COMPLETED BY APPLICANT

EVALUATION FOR AGENCY USE ONLY

Proposed measures to avoid or reduce shoreline and land use impacts are:

None.

6. How would the proposal be likely to increase demands on transportation or public services and utilities?

Plan will provide clarity concerning water service to specific areas, thereby supporting growth planned under existing zoning and land use plans.

Proposed measures to reduce or respond to such demand(s) are:

None necessary.

7. Identify, if possible, whether the proposal may conflict with local, state, or federal laws or requirements for the protection of the environment.

No conflict expected, since Plan and all development resulting therefrom must be approved by the appropriate local and state agencies.

APPENDICES

APPENDIX A

SUPPORTING REGULATIONS

(On file with the King County Department of Parks, Planning, and Resources Building and Land Division)

APPENDIX B

SUMMARY OF DSHS PLANNING REQUIREMENTS

These guidelines are intended to serve as an outline for preparation of water system plans and to serve as partial criteria for approval of those plans by the Department of Social and Health Service's district engineer.

The following purveyors are required by various state regulations to develop a Water System Plan and/or assist in the preparation of a Coordinated Water System Plan:

1. All water systems with more than 1,000 service connections (WAC 248-54-580, State Board of Health Water Supply Regulations).

2. All water systems within the external boundaries of a Critical Water Supply Service Area (WAC 248-54-580, State Board of Health Water Supply Regulations, and WAC 248-56-700, Water System Coordination Regulations - See Footnote *).

3. All water systems within the geographical area established for reserving a future domestic water supply (WAC 173-590-070, Reservation of Public Water Supply Regulations).

If a water system plan is required by one of the above regulations, the contents of that plan will vary in detail according to the size of the public water system, consistent with the following:

1. Water System Plan - for those public water systems with over 1,000 service connections. (Page 2)

2. Abbreviated Water System Plan - for those public water systems serving between 100 and 1,000 service connections. (Page 4)

3. Water System Planning Questionnaire - for all remaining public water systems. (Page 5)

Supplementary Provisions are required in addition to the above plans for those water systems within the external boundaries of a Critical Water Supply Service Area or within the geographical area established for reserving future domestic water supply. Supplemental provisions developed under the Water System Coordination Act are expected to be more detailed, emphasizing the relationship between water systems and oriented more towards system management than supplementary provisions for reservation of future supply. Supplementary provisions for reservation should concentrate on future water needs and source development. (Pages 13 & 16)

The following chart is intended to help determine which plan contents should be followed for each of the regulations listed.

Plan Contents / Plan Requirements	Water System Plan (1000 Services)	Abbreviated Water System Plan (100 - 1000 Services)	Planning Questionnaire (Other Systems)	Supplementary Provisions For Water System Coordination Act	Supplementary Provisions For Reserving Public Water Supply
Board of Health Regulations (WAC 248-54-580)	X				
Water System Coordination Act (WAC 248-56-700)	X	X	X	X	
Reservation of Public Water Supply (WAC 173-590-070)	X	X	X		X

* Water systems in existance prior to September 21, 1977 are exempt from the planning requirement if they are:

1. Owner operated and serving less than ten customers (or one industry).
2. Non-municipally owned and have no plans for expansion (provided they meet all applicable State Board of Health regulations).

PLANNING QUESTIONNAIRE

This questionnaire is to be filled out by water purveyors which have less than 100 services and are located within a Critical Water Supply Service Area. Some small water systems may be exempted, so be sure to check with the Department of Social and Health Services before completing this questionnaire.

Part 1 - Facilities

1. Describe how your existing system works. _____

2. Has your system had any past water quality problems? If so, how have they been corrected? _____

3. a. How many existing services does your system have? _____

   b. How many services do you expect to have ten years from now? How did you arrive at that number? _____

4. Does your system have adequate water rights? If not, explain the situation. Attach a copy of your existing water rights. _____

5. What improvements will your system need in the next five years? Describe why each one will be needed. _____

5. (cont.) _____

6. a. How much will each improvement cost?

   b. How will each improvement be financed? _____

7. Attach a copy of your service area map and agreement(s).

8. a. Are you interested in sharing facilities or intertying with another water system? _____

   b. Are you interested in having another entity operate and maintain your system? _____

Part 2 - Operations Program

1. List name and phone number of person(s) responsible for your water system.

2. What are procedures for turning your system on and off, and for routine operation? _____

3. a. Who do you call when an operational problem arises? _____

3. b. How do they respond to emergencies? _____

4. List procedures for cleaning your system (tanks, mains, etc.). _____

5. a. What is your sampling frequency and procedure? _____

b. How do you respond when results of samples exceed state standards? ____

APPENDIX C

INDIVIDUAL WATER SYSTEM PLANS

(On file with the King County Department of Parks, Planning, and Resources Building and Land Division)

APPENDIX D

SERVICE AREA MAPS, AUTOCAD DATA DISKS, SERVICE AREA AGREEMENTS, AND CLASS 3 AND 4 UTILITY LOCATION MAPS

(On file with the King County Department of Parks, Planning, and Resources Building and Land Division)

APPENDIX E

SOUTH KING COUNTY MINIMUM DESIGN STANDARDS

B. City Water Systems

The minimum design standards described herein do not apply to cities insofar as service within municipal boundaries is concerned. However, it is expected that cities will adopt, or have adopted, design standards at least equal to those herein. If cities extend new water service to customers outside of the city limits, the design standards adopted by the municipality for outside city service must at least meet the minimum design standards described in this document.

C. Water System Plans and Applicable Land Use Plans

New and expanding utilities shall meet water system planning requirements using land use designations for their service area as prescribed in the King County Comprehensive Plan, Community Plan, Zoning Code, and any related interlocal agreements. Approved land use activities in the service area shall be designated by the King County Parks, Planning, and Resources Department (County). Such designations shall be identified in the utility's Water System Plan, and shall be used to establish design requirements.

The utility shall prepare a water system plan and a program of capital improvements required to provide the anticipated level of service within their designated water service area, consistent with the land use plan. When the utility is requested to provide water service, it will identify that portion of planned capital facilities as well as other installations which are necessary to provide the service requested. As growth occurs, the full level of water service will eventually be provided throughout the service area of the utility in a planned, phased program which meets County requirements and minimizes overall cost to the customers.

In areas defined as Urban by the County, the utility shall install a distribution system with a minimum pipe size of 8 inches. The installation schedule for fire hydrants and storage will be based on the designated water utilities' water system plan and the fire flow requirements established by the County Fire Marshall.

For areas defined as Transitional and Rural, the minimum pipe size shall be 6 inches, except as provided in Section 5.B(2). The installation of hydrants and storage will be based on the requirements of the County Fire Marshall.

The designated water utilities, prior to their 5-year update of their Water System Plan, shall request the County to verify the current land use designation and planning projections. Based on the projections, the utility will establish the design criteria necessary to meet the land use and

fire flow requirements. This design criteria will be used to plan for hydrants and storage to meet anticipated fire flow requirements for future development. If the County does not respond in writing within 30 days, the utility shall use the then current County Comprehensive Plan and Community Plan.

D. Conditions to Exceed Minimum Design Standards

Minimum standards represent the lowest or least level of design allowed. Water service needs, as defined by a utility's approved water system plan and sound engineering and design practices, frequently require a higher level of service than can be achieved under the minimum standards. In the following instances, design standards will be allowed to exceed the minimums.

(1) When it is necessary to adequately serve Rural Activity Centers, Rural Neighborhood Centers, Urban Activity Centers, or Urban Areas;

(2) When it is necessary to provide transmission between a water source or storage facility to a distribution system of a utility and/or a Satellite System or an intertie with another utility;

(3) When it is necessary to address existing quantity or quality problems within any area currently authorized to receive water service;

(4) When it is necessary to meet health and safety guidelines of the County's applicable fire protection ordinances or another minimum design standard.

4. STANDARDS INCORPORATED BY REFERENCE

The existing standards listed below, or as may be modified by the appropriate authorities, are hereby incorporated by reference. Priority for application of these standards is in the order listed, but the most stringent applies. Except as otherwise superceded by the County standards described herein, these standards will apply to water system design, installation, modification, and operation.

- Rules and Regulations of the State Board of Health Regarding Public Water Systems.
- Applicable County rules, regulations, ordinances, and standards.
- Standard Specifications for Road, Bridge, and Municipal Construction, as published by the Washington State Department of Transportation/ American Public Works Association (DOT/APWA), latest edition.

o Standards of the American Water Works Association.

5. MINIMUM STANDARDS

A. General Provisions

(1) Source Development

New sources must be designed to meet the Department of Ecology (Ecology), the Department of Social and Health Services (DSHS), and the Seattle-King County Department of Public Health (SKCDPH) regulations and design guideline. These include: Chapter 173-160 WAC, Minimum Standards for Construction and Maintenance of Water Wells, as administered by Ecology; Chapter 248-54 WAC, "Rules and Regulations of the State Board of Health Regarding Public Water System", as administered by DSHS; and, "King County Board of Health, Title 12" as administered by the SKCDPH.

All test and production wells must be drilled in accordance with detailed drilling and testing specifications, which have either been prepared by, or received prior approval of the designated utility, if the well is to be used for a public water supply. These specifications may not be less stringent than those identified in the references cited in the above paragraph.

(2) Water Rights

Water rights must be obtained in accordance with Ecology regulations and procedures. Copies of water rights documents, correspondence, and other records are to be maintained on file with the purveyor and in the name of the purveyor.

(3) Water Quality

Water quality must be proven to conform with DSHS criteria specified in Chapter 248-54 WAC and/or any additional requirements contained in King County Board of Health Rules and Regulations No. 9, SKCDPH.

(4) Hydrostatic Pressure Test

A hydrostatic pressure leakage test will be conducted on all newly constructed water mains, fire lines, fire hydrant leads and stubouts

in accordance with DOT/APWA Section 7-11.3(11) or AWWA C-600 specifications unless otherwise specified by the designated utility.

(5) Disinfection and Bacteriological Testing

All pipe, reservoirs, and appurtenances shall be flushed and disinfected in accordance with the standards of the DSHS, AWWA C601 and D105, or DOT/APWA Section 7-11.3(12) unless otherwise specified by the designated utility.

(6) Auxiliary Power

All source and booster pumping facilities required for primary supply in an emergency shall be equipped with auxiliary power unless a redundant power supply source is provided. Where pumping is to a storage facility which is sized to permit down time for mobilization of a portable standby power unit, pigtail outlets and a manual transfer switching device are adequate. If the pigtail outlet approach is taken, the purveyor must provide a portable power unit. Where adequate gravity standby storage has been provided, no auxiliary power is required for pumping facilities. An adequately sized engine driven pumping device is an acceptable method to meet this requirement. Adequacy of facilities will be determined by the utility through its water comprehensive plan.

(7) Utility Interties

Planning for specific locations, size, and alignment of major water lines shall consider emergency interties with adjacent water utilities.

(8) Flow Measurement

All service lines shall be installed so that each residential, commercial, and industrial structure will have a separate metered service for domestic water received from the utility. This requirement may be waived by the utility, but, at a minimum, any new service will have a box for meter drop installation. If approved by the utility, domestic water consumption may be measured by a master meter for service to a complex, under single ownership, and where water utility line subdivision is impractical. Service lines providing fire flow may be required by the utility to be equipped with a fire detection check.

All new groundwater sources shall be provided with a device for measurement of depth to water and a meter for determining flow rate and total production. Installation of these devices is also recommended for existing groundwater sources. All new sources for which water treatment is included shall be provided with flow measurement.

(9) Cross Connection Control

Where the possibility of contamination of potable water exists, water services shall be equipped with appropriate cross connection control devices in accordance with Chapter 248-54 WAC. The utility and/or the County cross connection control program shall determine the need, size, kind, and location of the device.

B. Specific Provisions

(1) Pressure Requirement

Water systems shall be designed to provide an adequate quantity of water at a positive pressure of at least 30 psi under maximum instantaneous demand (MID) flow conditions measured at any customer's water meter or at the property line if no meter exists. If fire flow is to be provided, the distribution system shall be designed to provide the required fire flow at a pressure of at least 20 psi at the fire and positive pressure shall be maintained throughout the system during MID conditions (WAC 248-54-135).

(2) Pipe Sizing and Materials

With the exceptions noted within this document, the minimum pipe diameter shall correspond with the following land use designations: Urban Areas - 8 inch diameter; Transitional Areas - 6 inch diameter; Rural Areas - 6 inch diameter. In areas where fire flow is not required under current land use and where land use designations minimize the potential future requirement for fire flow, a smaller diameter pipe may be used if hydraulically justified.

Water main size shall be adequate to deliver required fire flow and to maintain the pressure requirement defined above. All water mains shall meet applicable engineering and health standards adopted by the State of Washington or the water purveyor, including Chapters 248-54 and 248-57 WAC.

All water mains subject to King County Code 17.08, which may serve fire hydrants, shall be a minimum of 8 inches nominal diameter for dead end mains and 6 inches nominal diameter for circulating mains. Hydrant leads less than 50 feet in length may be 6 inches in diameter. In a dead end cul-de-sac, mains sized for only domestic flow may be installed from the last hydrant to remaining residences.

All pipe material for new water systems shall be constructed with "lead-free" materials. The lead content for joint compound materials (solder and flux) used for pipe installation shall be less than 0.2 percent in order to be considered "lead-free." The lead content for all installed pipe shall be less than 8 percent in order to be considered "lead-free."

(3) Isolation Valving

Valving shall be installed in a configuration which permits isolation of lines. A valve is not required for short block lines of less than 100 feet. Valves should be installed at intersections with normal maximum spacing at 500 feet in commercial, industrial, and multiple- family districts, 800 feet in residential districts, and 1/4 mile in arterial mains.

(4) Air and Air-Vacuum Relief Valves

Air or combined air-vacuum relief valves shall be installed at appropriate points of high elevation in the system. All piping shall be sloped to permit escape of any entrained air. Combination air release/air vacuum valves shall have a rated operating pressure of 300 psi.

(5) Blow-off Assembly

A blow-off assembly or fire hydrant shall be installed on all dead end runs and at designated points of low elevation to provide a way for adequate flushing of the distribution system. The blow-off assembly shall be installed in the utility right-of-way, except where a written access and construction easement is provided for the water utility. In no case shall the location be such that there is a possibility of back-siphonage into the distribution system. The blow-off assembly shall be sized to achieve a flow velocity of 2-1/2 feet per second.

(6) Storage

Storage requirements are based upon three components:

- o Equalizing Storage, required to supplement production from water sources during high demand periods,
- o Standby Storage, required as backup supply in case the largest source is out of service, and
- o Fire Storage, required in order to deliver the level of fire flow service identified in the utility's approved plan (see "Fire Flow Requirements" below) for the required duration.

As a minimum, sizing of storage facilities shall be adequate to provide for equalizing storage, plus the larger of standby or fire storage requirements. Equalizing and standby storage volumes shall be determined using "Sizing Guidelines for Public Water Supplies", DSHS. Minimum fire storage volumes shall be determined using the fire flow and duration requirements of the County Fire Marshall, the respective municipal ordinance, or the minimum design standards prescribed herein. Siting of storage facilities should consider locations which provide gravity flow. In some cases, the system hydraulics may require additional storage.

(7) General Facility Placement

All piping, pumping, source, storage, and other facilities, shall be located on public rights-of-way or dedicated utility easements. Utility easements must be a minimum of 15 feet in width, and piping shall be installed no closer than 5 feet from the easement's edge. Exceptions to this minimum easement may be approved by the operating water utility. Unrestricted access shall be provided to all public water system lines and their appurtenances and public fire hydrants that are maintained by public agencies or utilities.

New Class 2, 3, and 4 utilities in undesignated service areas should consider future interties with Class 1 systems when determining the location of their distribution network.

The location of utilities shall be in accordance with the standards and guidelines established by King County or the appropriate City criteria. Where existing utilities or storm drains are in place, new utilities shall conform to these standards as nearly as practicable

and yet be compatible with the existing installations. Where practical, there shall be at least 3 feet horizontal separation from other utilities.

(8) Pipe Cover

The depth of trenching, installation of pipes, and backfill shall be such as to give a minimum cover of 30 inches over the top of the pipe from finished grade. This standard shall apply to all transmission and distribution piping and to service piping within the right-of-way unless specifically designed for an above ground installation.

(9) Water Line and Sewer Separation Distances

Transmission and distribution water piping shall be separated at least 10 feet horizontally from existing wastewater gravity or force mains. The bottom of the water main shall be 18 inches above the top of the sewer. Where local conditions prevent such horizontal and/or vertical separation, closer spacing is permissible where design and construction meet the special requirements of Section 2.4 of Ecology's Criteria for Sewage Works Design, as revised October 1985.

Separation distances between water piping and any portion of an on-site sewage system shall meet the requirements of the SKCBH Rules and Regulations.

(10) Fire Hydrants

Fire hydrants within cities shall adhere to the specific design criteria and standards utilized by the City Fire Department. Fire hydrants within the unincorporated areas of the County shall comply with the minimum design criteria set forth in King County Code 17.08. (King County is encouraged to address standardization of pipe threads in future revisions of this Code.)

(11) Fire Hydrant Location Installation Criteria

The location of fire hydrants within cities shall be located and/or installed as specified by the design standards of the city. Fire hydrants within the unincorporated areas of the County shall comply with the minimum location/installation criteria set forth in the King County Code 17.08. In all circumstances, these standards shall not be less stringent than the placement requirements prescribed by WAC 248-57-900.

(12) Fire Flow Requirements

New facilities installed by a water utility shall be designed to provide a level of service assigned to designated land uses within the County. The actual fire flow to be provided at a proposed development will be determined by the County Fire Marshall or City Fire Department Chief.

The minimum pipe size will be based on these standards. The location of hydrants and fire flow storage requirements will be based on the designated level of service identified during the water system planning process or the rated flow and duration for public water supply for fire protection, whichever is greater. The Fire Marshall shall consider the availability of water service based upon a phased improvement plan within the utility's water system plan and shall specify the fire flow requirements in conjunction with the utility, confirming the availability of water service. All water systems providing fire flow should be designed to deliver water supply to the services which require fire flow with a minimum rated flow of 1,000 gpm. The Fire Marshall will determine the duration required for fire protection.

(13) Maintenance of Fire Protection Facilities

A written operational agreement which identifies responsibilities for maintenance and testing of fire protection facilities shall be negotiated between the fire department or district and the water utility.

6. WAIVER PROCESS

A waiver process exists for circumstances where the minimum design standards create undue hardship. Outside designated service areas, a waiver may be obtained through the Appeals Process described in Section IX. In this instance, a waiver can only be granted to Class 4 systems located in rural land use areas where fire flows are not required.

Within designated service areas, the designated purveyor has the sole authority to allow the installation of facilities for remote systems which conform with DSHS standards but are less stringent than the South King County Minimum Design Standards. In this instance, lesser standards can only be granted to new systems with four or fewer service connections and where fire flow is not required. The acceptance of lesser standards should be noted on the Certificate of Water Availability by the designated utility and in its service area contract with the applicant. It is anticipated that this waiver will be utilized primarily

when the proximity of a smaller system will benefit from larger, nearby facilities planned for future installation by the designated utility.

7. STANDARDS REVIEW SUBCOMMITTEE

A Standards Review Subcommittee shall be established by the Water Utility Coordinating Committee (WUCC) and shall convene at least annually to review these standards and their implementation. The Subcommittee shall seek input from the King County Fire Marshall, the City fire departments, and King County fire protection districts in matters related to fire protection standards. Recommendations of the Standards Review Committee shall be submitted to the WUCC and, if revisions are approved, they shall be forwarded to the County Council for adoption.

8. SEVERABILITY

If any provision of these standards or their application is found to be invalid, the remainder of the standards and their implementation are not affected.

APPENDIX F

EXAMPLE WATER SERVICE AGREEMENT

APPENDIX F

WATER SERVICE AGREEMENT

It is recognized that a number of instances may arise early in the implementation of the Coordinated Water System Plan (CWSP) where relatively small developments may be proposed within a utility's designated service area but which are remote to the existing water supply system. It may not be economically feasible for the utility to provide service by direct connection, ownership, and/or operation at that time. However, in the long-term, the utility does propose to assume full responsibility for water service to the area in question.

In these instances, a number of options exist for the utility and developer to enter into an agreement for providing mutually acceptable service. Conditions of such an agreement will vary on a case-by-case basis.

The Water Service Agreement document, attached hereto, is recommended as the general form of a legal instrument to achieve an understanding between parties in those situations described above. The Agreement is generally intended to accomplish the following objectives:

1. Establish relationships in new developments with two or more services where the designated utility wishes to retain its service area.

2. If a new, remote system is installed and the designated utility wants to retain the service area, the designated utility shall:

    - Enter into a water service agreement with the developer.

    - Be responsible for ensuring the collection of water quality samples and submittal of reports.

    - Provide other O&M duties and services as specified in the agreement.

    - Be reimbursed for all services at a "reasonable" rate.

3. All costs for capital improvements and correcting water quality problems are the responsibility of the developer and/or system customers.

4. Provide for eventual connection of the development to the water system of the designated utility.

5. Annexation, ULID formation, and "non-opposition" clauses are agreement considerations.

6. For new subdivisions of four lots or less, where the designated utility wants to retain the service area, interim water piping facilities smaller than the utility standards may be allowed by the designated utility when:

   - The designated utility has planned for the eventual direct connection of the development.

   - Fire protection requirements, if any, can be met during the interim.

7. If the new subdivision of four lots or less is within the designated utility's service area, but a water service agreement is not executed, the new development must meet the CWSP minimum design standards.

WATER SERVICE AGREEMENT

IT IS AGREED by and between (name of utility), hereinafter referred to as UTILITY, and (name of developer), hereinafter referred to as OWNER, to the following:

1. Parties. The UTILITY is the designated water purveyor established in accordance with the South King County Coordinated Water System Plan with responsibilities for water service to the area being developed by the OWNER. The OWNER is the owner of certain real property as described in Addendum A, attached hereto and incorporated herein by this reference to this Agreement.

2. Objective. The objective of this Agreement is to establish the service responsibilities of the UTILITY and OWNER in order to meet all applicable local, State, and federal requirements; and to provide for the planned connection of small remote water systems to the UTILITY, whenever and wherever possible.

3. Ownership/Operation Services. The UTILITY and the OWNER have reviewed a range of services described below which are offered by the UTILITY. The OWNER has selected the preferred level of services as hereby indicated below:

☐ A. Ownership and Operation. Ownership and operational responsibilities of the water system facility serving the property described in Addendum A is hereby transferred to the UTILITY. Other major conditions of service are specified in Addendum B.

☐ B. Contract Operation. The Ownership of the system is retained by the OWNER with operational responsibilities provided by UTILITY. Other major conditions of service are specified in Addendum B.

☐ C. Water Quality Monitoring. Ownership of the system is retained by the OWNER and the UTILITY will ensure that required water quality monitoring is performed by (utility/contractor/owner). All costs for the collection, submittal, and testing of water quality results will be borne by the OWNER. OWNER retains operational responsibility. Other major conditions of service are specified in Addendum B.

4. Rates and Charges.

A. Capital Improvements Charge. The OWNER will be responsible for financing all capital improvements and those facilities identified on

Addendum B. Addendum A represents the current DSHS/County/Utility approved plans and specifications of the OWNER's water system and a description of the real property.

B. Renewal and Replacement Charge. The OWNER will be responsible for financing all major repairs or system upgrades necessary to comply with regulatory requirements or customers' service needs, except as provided in Addendum B.

C. Operation and Maintenance Charge. A monthly user charge will be assessed against all properties for which water service is available as shown initially in Addendum A. A monthly ready-to-serve charge will be assessed to finance the base operating cost. A water use or "commodity" charge will be assessed based on the actual water use to finance operating costs associated with daily system operation. The Operation and Maintenance Charge will be identified in Addendum B.

D. Reserve Account. The OWNER and UTILITY shall establish a reserve account or security deposit against payment for services and to ensure the availability of funds necessary for renewal or replacement of facilities. The monthly renewal and replacement charge shall be adjusted as required to maintain a minimum balance as identified in Addendum B.

5. Delinquent Payments/Liens. If at any time the rates and charges are not paid in full within 30 days of receipt, the UTILITY may, in its sole discretion, file a lien or liens against all of the properties served by the remote/satellite system or against the property of those customers who have not paid their monthly charges in full. Said charges are agreed to be statutory rates and charges for water supplies, and the lien or liens may be foreclosed in the manner provided by statute.

If, in the future, the utility's system is extended to serve the remote/satellite system area, then the balance of the account shall be applied to any amount then owed the utility, and the balance shall be divided and paid equally to all the then owners.

6. Covenant Running with the Property. It is agreed that this Agreement is a covenant running with the property described in Section 1 of this Agreement and any other properties receiving water in the future all such property, their heirs, and successors.

7. Term and Duration. This Agreement shall remain in full force and effect until the utility system is extended to provide water service to the service area defined in Section 1 of this Agreement in lieu of the provision of water service through the satellite system. Neither party may terminate this Agreement except as specifically provided for in Addendum B.

Signed this _____ day of _____, 1989.

_____ _____

Utility Date

_____ _____

Owner Date

ADDENDUM A

COPY OF LEGAL DESCRIPTION AND PLANS AND SPECIFICATIONS FOR REMOTE/SATELLITE SYSTEM

ADDENDUM B

WATER SERVICE AGREEMENT

SERVICE AREA	Utility	Owner
(See Addendum A - Legal Description and DSHS/COUNTY APPROVED PLANS AND SPECIFICATIONS		
OWNERSHIP	(1) See Footnote	

- o Existing System
- o Future Options
  - Transfer to UTILITY with conditions specified
  - Remain independent & agree to no protest provision for ULID and Annexation
  - Remain independent system & be fully responsible (subject to Utility Agreement)

OPERATION RESPONSIBILITY (1) See Footnote

- o Water quality monitoring
- o Administration, reporting, billing
- o Routine operation
- o System improvement/repairs
- o Emergency repair
- o Other (specify)

FINANCIAL RESPONSIBILITY (1) See Footnote

Capital Improvements Cost

- o Initial
- o Expansion
- o System Intertie

Renewal and Replacement Cost

- o System upgrade
- o System replacement
- o Reserve fund

Operation and Maintenance Cost	Utility	Owner
o Operation		
o Maintenance		
o Monitoring/Reporting		
o Customer Services		
o Emergency		

RATES AND CHARGES FOR THE PERIOD FROM TO .

o Capital charge	$_____
o Renewal and replacement charge	$_____
o Operation and maintenance	
- Base Charge	$_____
- Commodity Charge	$_____

LEGAL AND RESPONSIBILITY

- o Regulatory Compliance
- o Utility Permits/Easements
- o Rates/Charges/Collection

Footnote:

(1) Responsibility for each activity shall be assigned to either the UTILITY or the OWNER. The actual Agreement shall expand on each item to clearly assign responsibility.

APPENDIX G

POPULATION AND DEMAND CALCULATIONS

TABLE G-1

SOUTH KING COUNTY CWSP AREA
TOTAL HOUSEHOLDS

FAZ NO.	% IN STUDY AREA (1)	YEAR 1970	1980	1985 (2)	1990	1995 (2)	2000	2010 (2)	2020	STRAIGHT LINE (3): 2030	2040
3010	100%	1,841	6,067	8,108	10,149	12,316	14,483	18,000	21,516	25,033	28,549
3020	100%	3,222	5,220	6,151	7,081	8,004	8,926	10,623	12,320	14,017	15,714
3030	100%	3,418	5,425	6,586	7,746	9,038	10,329	12,892	15,454	18,017	20,579
3040	100%	4,946	8,915	10,875	12,835	14,226	15,616	18,386	21,155	23,925	26,694
3110	100%	841	1,232	1,596	1,959	2,406	2,852	3,716	4,579	5,443	6,306
3120	100%	3,816	5,593	6,395	7,197	8,102	9,007	11,038	13,068	15,099	17,129
3130	100%	3,457	4,795	5,612	6,429	7,278	8,126	9,574	11,022	12,470	13,918
3200	100%	2,870	4,398	4,955	5,512	6,167	6,821	7,799	8,776	9,754	10,731
3310	80%	1,009	1,818	2,276	2,734	3,224	3,715	5,140	6,566	7,991	9,416
3320	70%	719	1,993	2,819	3,646	4,346	5,047	6,952	8,857	10,762	12,667
3411	5%	253	437	543	650	792	935	1,281	1,628	1,974	2,321
3420	100%	3,447	6,733	8,283	9,832	12,116	14,399	20,604	26,809	33,014	39,219
3500	95%	4,945	6,795	9,063	11,331	12,532	13,734	15,412	17,091	18,769	20,447
3600	100%	2,590	3,710	4,350	4,989	6,044	7,099	9,104	11,109	13,114	15,119
3700	80%	9,482	11,838	12,918	13,998	14,934	15,870	17,098	18,327	19,556	20,785
3810	5%	596	666	723	780	803	826	863	899	936	972
3900	20%	243	361	409	458	519	580	686	791	897	1,002
4110	5%	144	211	258	304	333	362	415	469	522	575
6900 (4)	33%	331	476	587	697	840	982	1,360	1,738	2,115	2,493
TOTAL:		48,169	76,683	92,504	108,326	124,017	139,709	170,941	202,173	233,404	264,636

(1) Corresponds to Coordinated Water System Plan Study Area boundaries. FAZ 6900 ajusted to include about 1/3 of FAZ households within the study area.
(2) Linearly extrapolated.
(3) Straight line projection based on 2000 to 2020 PSCOG's projection.

SOURCE: Adapted from the Puget Sound Council of Governments June 1988 Population and Employment Forecasts

TABLE G-2

SOUTH KING COUNTY
FORECAST AND ANALYSIS ZONES
AVERAGE HOUSEHOLD SIZE

FAZ NO.	YEAR									
	1970	1980	1985 (1):	1990	1995 (1):	2000	2010 (1):	2020	2030 (2):	2040 (2):
3010	4.22	3.07	2.91	2.82	2.74	2.69	2.56	2.48	2.48	2.48
3020	3.63	2.65	2.53	2.45	2.39	2.34	2.24	2.17	2.17	2.17
3030	4.15	3.22	3.07	2.96	2.88	2.82	2.68	2.59	2.59	2.59
3040	3.82	2.82	2.60	2.45	2.40	2.35	2.25	2.18	2.18	2.18
3110	3.50	2.84	2.71	2.62	2.55	2.50	2.39	2.31	2.31	2.31
3120	3.21	2.58	2.47	2.39	2.33	2.29	2.19	2.12	2.12	2.12
3130	2.92	2.47	2.36	2.29	2.23	2.19	2.10	2.04	2.04	2.04
3200	3.22	2.92	2.79	2.69	2.62	2.57	2.46	2.37	2.37	2.37
3310	3.42	3.02	2.90	2.83	2.75	2.70	2.56	2.48	2.48	2.48
3320	3.61	3.27	3.13	3.05	2.97	2.90	2.75	2.67	2.67	2.67
3411	3.63	3.12	2.96	2.86	2.78	2.72	2.58	2.50	2.50	2.50
3420	3.81	3.27	3.11	3.00	2.91	2.86	2.70	2.62	2.62	2.62
3500	2.80	2.65	2.47	2.37	2.31	2.27	2.18	2.10	2.10	2.10
3600	4.05	2.58	2.47	2.39	2.33	2.29	2.18	2.12	2.12	2.12
3700	3.30	2.56	2.46	2.38	2.33	2.28	2.20	2.13	2.13	2.13
3810	3.23	2.60	2.49	2.41	2.35	2.31	2.22	2.14	2.14	2.14
3900	2.61	1.94	1.88	1.82	1.79	1.76	1.70	1.65	1.65	1.65
4110	3.45	2.62	2.50	2.42	2.36	2.32	2.22	2.15	2.15	2.15
6900	3.26	3.06	2.97	2.90	2.81	2.75	2.63	2.56	2.56	2.56

(1) Linearly extrapolated.
(2) After 2020 average household size assumed to be constant.

SOURCE: Adapted from the Puget Sound Council of Governments June 1988 Population and Employment Forecasts

TABLE G-3

SOUTH KING COUNTY CWSP STUDY AREA
POPULATION PROJECTION (1)

FAZ NO.	% IN STUDY AREA (2)	1970	1980	1985 (3)	1990	1995 (3)	YEAR 2000	2010 (3)	2020	STRAIGHT LINE 2030 (4)	2040(4)
3010	100%	7,773	18,598	23,609	28,620	33,784	38,948	46,111	53,273	61,980	70,687
3020	100%	11,692	13,827	15,578	17,329	19,116	20,902	23,810	26,717	30,397	34,077
3030	100%	14,184	17,470	20,187	22,904	26,005	29,106	34,566	40,026	46,663	53,300
3040	100%	18,874	25,118	28,311	31,504	34,106	36,707	41,383	46,059	52,089	58,119
3110	100%	2,946	3,502	4,319	5,135	6,138	7,141	8,863	10,585	12,581	14,577
3120	100%	12,258	14,442	15,824	17,205	18,907	20,608	24,158	27,707	32,012	36,317
3130	100%	10,080	11,838	13,268	14,698	16,253	17,808	20,129	22,449	25,398	28,347
3200	100%	9,248	12,843	13,838	14,833	16,182	17,531	19,176	20,821	23,140	25,459
3310	80%	3,452	5,486	6,606	7,725	8,869	10,013	13,151	16,290	19,826	23,362
3320	70%	2,595	6,515	8,818	11,121	12,890	14,659	19,139	23,619	28,700	33,780
3411	5%	918	1,362	1,610	1,858	2,202	2,546	3,310	4,074	4,941	5,808
3420	100%	13,147	21,997	25,737	29,476	35,298	41,119	55,711	70,302	86,574	102,845
3500	95%	13,832	17,980	22,404	26,829	28,978	31,128	33,525	35,921	39,449	42,976
3600	100%	10,501	9,577	10,750	11,922	14,077	16,232	19,885	23,538	27,786	32,034
3700	80%	31,254	30,332	31,804	33,276	34,752	36,227	37,612	38,996	41,611	44,225
3810	5%	1,926	1,729	1,802	1,876	1,890	1,905	1,916	1,927	2,006	2,084
3900	20%	635	701	768	834	927	1,019	1,163	1,306	1,480	1,655
4110	5%	499	553	645	737	787	838	922	1,005	1,120	1,234
6900	33%	1,080	1,459	1,740	2,021	2,362	2,702	3,576	4,450	5,417	6,384
TOTAL:		166,893	215,328	247,615	279,903	313,521	347,139	408,102	469,066	543,168	617,270

(1) Based on the number of households estimated in Table G-1 and household size shown in Table G-2 in Appendix G.
(2) Corresponds to Coordinated Water System Plan Study Area boundaries. FAZ 6900 adjusted to include about 1/3 of FAZ population living within the study area.
(3) Linearly extrapolated between forecasted figures from PSCOG.
(4) Straight-line projection from 2020.

SOURCE: Adapted from the Puget Sound Council of Governments June 1988 Population and Employment Forecasts

TABLE G-4

SOUTH KING COUNTY CWSP WATER USE PROJECTIONS
SCENARIO 1 - EXISTING CONDITION (1)
AVERAGE DAY DEMAND (MGD)

FAZ NO.	GPCD (2)	YEAR 1970	1980	1985	1990	1995	2000	2010	2020	STRAIGHT LINE 2030	2040
3010	140	1.09	2.60	3.31	4.01	4.73	5.45	6.46	7.46	8.68	9.90
3020	180	2.10	2.49	2.80	3.12	3.44	3.76	4.29	4.81	5.47	6.13
3030	140	1.99	2.45	2.83	3.21	3.64	4.07	4.84	5.60	6.53	7.46
3040	140	2.64	3.52	3.96	4.41	4.77	5.14	5.79	6.45	7.29	8.14
3110	140	0.41	0.49	0.60	0.72	0.86	1.00	1.24	1.48	1.76	2.04
3120	140	1.72	2.02	2.22	2.41	2.65	2.89	3.38	3.88	4.48	5.08
3130	180	1.81	2.13	2.39	2.65	2.93	3.21	3.62	4.04	4.57	5.10
3200	120	1.11	1.54	1.66	1.78	1.94	2.10	2.30	2.50	2.78	3.06
3310	120	0.41	0.66	0.79	0.93	1.06	1.20	1.58	1.95	2.38	2.80
3320	120	0.31	0.78	1.06	1.33	1.55	1.76	2.30	2.83	3.44	4.05
3411	140	0.13	0.19	0.23	0.26	0.31	0.36	0.46	0.57	0.69	0.81
3420	140	1.84	3.08	3.60	4.13	4.94	5.76	7.80	9.84	12.12	14.40
3500	180	2.49	3.24	4.03	4.83	5.22	5.60	6.03	6.47	7.10	7.74
3600	180	1.89	1.72	1.93	2.15	2.53	2.92	3.58	4.24	5.00	5.77
3700	140	4.38	4.25	4.45	4.66	4.87	5.07	5.27	5.46	5.83	6.19
3810	140	0.27	0.24	0.25	0.26	0.26	0.27	0.27	0.27	0.28	0.29
3900	180	0.11	0.13	0.14	0.15	0.17	0.18	0.21	0.24	0.27	0.30
4110	180	0.09	0.10	0.12	0.13	0.14	0.15	0.17	0.18	0.20	0.22
6900	120	0.13	0.18	0.21	0.24	0.28	0.32	0.43	0.53	0.65	0.77
TOTAL:		24.93	31.80	36.58	41.37	46.29	51.22	60.01	68.80	79.53	90.25

PEAK DAY DEMAND (MGD)

FAZ NO.	PEAK/AVG FACTOR(3)	YEAR 1970	1980	1985	1990	1995	2000	2010	2020	STRAIGHT LINE 2030	2040
3010	2.4	2.61	6.25	7.93	9.62	11.35	13.09	15.49	17.90	20.83	23.75
3020	2.2	4.63	5.48	6.17	6.86	7.57	8.28	9.43	10.58	12.04	13.49
3030	2.4	4.77	5.87	6.78	7.70	8.74	9.78	11.61	13.45	15.68	17.91
3040	2.4	6.34	8.44	9.51	10.59	11.46	12.33	13.90	15.48	17.50	19.53
3110	2.4	0.99	1.18	1.45	1.73	2.06	2.40	2.98	3.56	4.23	4.90
3120	2.4	4.12	4.85	5.32	5.78	6.35	6.92	8.12	9.31	10.76	12.20
3130	2.2	3.99	4.69	5.25	5.82	6.44	7.05	7.97	8.89	10.06	11.23
3200	2.8	3.11	4.32	4.65	4.98	5.44	5.89	6.44	7.00	7.78	8.55
3310	2.8	1.16	1.84	2.22	2.60	2.98	3.36	4.42	5.47	6.66	7.85
3320	2.8	0.87	2.19	2.96	3.74	4.33	4.93	6.43	7.94	9.64	11.35
3411	2.4	0.31	0.46	0.54	0.62	0.74	0.86	1.11	1.37	1.66	1.95
3420	2.4	4.42	7.39	8.65	9.90	11.86	13.82	18.72	23.62	29.09	34.56
3500	2.2	5.48	7.12	8.87	10.62	11.48	12.33	13.28	14.22	15.62	17.02
3600	2.2	4.16	3.79	4.26	4.72	5.57	6.43	7.87	9.32	11.00	12.69
3700	2.4	10.50	10.19	10.69	11.18	11.68	12.17	12.64	13.10	13.98	14.86
3810	2.4	0.65	0.58	0.61	0.63	0.64	0.64	0.64	0.65	0.67	0.70
3900	2.2	0.25	0.28	0.30	0.33	0.37	0.40	0.46	0.52	0.59	0.66
4110	2.2	0.20	0.22	0.26	0.29	0.31	0.33	0.37	0.40	0.44	0.49
6900	2.8	0.36	0.49	0.58	0.68	0.79	0.91	1.20	1.50	1.82	2.14
TOTAL:		58.91	75.62	87.00	98.39	110.15	121.91	143.09	164.26	190.04	215.82

(1) Projected demand assumed to be consistent with existing conditions of similar water utilities within South King County.

(2) Assumes 180, 140 and 120 gallons per capita per day (gpcd) for existing conditions for urban, transitional and rural areas, respectively. These numbers are consistent with water utilities in South King County of similar development.

(3) Assumes peak to average day factors of 2.2, 2.4, and 2.8 for urban, transitional and rural areas, respectively. These numbers are consistent with water utilities in South King County of similar development.

TABLE G-5

SOUTH KING COUNTY CWSP WATER USE PROJECTIONS
SCENARIO 2 - MULTI-FAMILY INCREASE (1)
AVERAGE DAY DEMAND (MGD)

FAZ NO.	GPCD (2)	YEAR 1970	1980	1985	1990	1995	2000	2010	2020	STRAIGHT LINE 2030	2040
3010	140	1.09	2.60	3.31	4.01	4.56	5.07	6.00	6.94	8.07	9.20
3020	180	2.10	2.49	2.80	3.12	3.39	3.65	4.16	4.66	5.31	5.95
3030	140	1.99	2.45	2.83	3.21	3.51	3.79	4.50	5.21	6.08	6.94
3040	140	2.64	3.52	3.96	4.41	4.61	4.78	5.39	6.00	6.78	7.57
3110	140	0.41	0.49	0.60	0.72	0.83	0.93	1.15	1.38	1.64	1.90
3120	140	1.72	2.02	2.22	2.41	2.55	2.68	3.15	3.61	4.17	4.73
3130	180	1.81	2.13	2.39	2.65	2.88	3.11	3.51	3.92	4.43	4.95
3200	120	1.11	1.54	1.66	1.78	1.94	2.10	2.30	2.50	2.78	3.06
3310	120	0.41	0.66	0.79	0.93	1.06	1.20	1.58	1.95	2.38	2.80
3320	120	0.31	0.78	1.06	1.33	1.55	1.76	2.30	2.83	3.44	4.05
3411	140	0.13	0.19	0.23	0.26	0.30	0.33	0.43	0.53	0.64	0.76
3420	140	1.84	3.08	3.60	4.13	4.77	5.35	7.25	9.15	11.27	13.39
3500	180	2.49	3.24	4.03	4.83	5.14	5.43	5.85	6.27	6.89	7.50
3600	180	1.89	1.72	1.93	2.15	2.50	2.83	3.47	4.11	4.85	5.59
3700	140	4.38	4.25	4.45	4.66	4.69	4.72	4.90	5.08	5.42	5.76
3810	140	0.27	0.24	0.25	0.26	0.26	0.25	0.25	0.25	0.26	0.27
3900	180	0.11	0.13	0.14	0.15	0.16	0.18	0.20	0.23	0.26	0.29
4110	180	0.09	0.10	0.12	0.13	0.14	0.15	0.16	0.18	0.20	0.22
6900	120	0.13	0.18	0.21	0.24	0.28	0.32	0.43	0.53	0.65	0.77
TOTAL:		24.93	31.80	36.58	41.37	45.13	48.64	56.99	65.33	75.51	85.69

PEAK DAY DEMAND (MGD)

FAZ NO.	PEAK/AVG FACTOR (3)	YEAR 1970	1980	1985	1990	1995	2000	2010	2020	STRAIGHT LINE 2030	2040
3010	2.4	2.61	6.25	7.93	9.62	10.95	12.17	14.41	16.65	19.37	22.09
3020	2.2	4.63	5.48	6.17	6.86	7.46	8.03	9.15	10.26	11.68	13.09
3030	2.4	4.77	5.87	6.78	7.70	8.43	9.10	10.80	12.51	14.58	16.66
3040	2.4	6.34	8.44	9.51	10.59	11.06	11.47	12.93	14.39	16.28	18.16
3110	2.4	0.99	1.18	1.45	1.73	1.99	2.23	2.77	3.31	3.93	4.56
3120	2.4	4.12	4.85	5.32	5.78	6.13	6.44	7.55	8.66	10.00	11.35
3130	2.2	3.99	4.69	5.25	5.82	6.34	6.84	7.73	8.62	9.76	10.89
3200	2.8	3.11	4.32	4.65	4.98	5.44	5.89	6.44	7.00	7.78	8.55
3310	2.8	1.16	1.84	2.22	2.60	2.98	3.36	4.42	5.47	6.66	7.85
3320	2.8	0.87	2.19	2.96	3.74	4.33	4.93	6.43	7.94	9.64	11.35
3411	2.4	0.31	0.46	0.54	0.62	0.71	0.80	1.03	1.27	1.54	1.81
3420	2.4	4.42	7.39	8.65	9.90	11.44	12.85	17.41	21.97	27.05	32.14
3500	2.2	5.48	7.12	8.87	10.62	11.30	11.96	12.88	13.80	15.15	16.51
3600	2.2	4.16	3.79	4.26	4.72	5.49	6.24	7.64	9.04	10.67	12.31
3700	2.4	10.50	10.19	10.69	11.18	11.27	11.32	11.75	12.19	13.00	13.82
3810	2.4	0.65	0.58	0.61	0.63	0.61	0.60	0.60	0.60	0.63	0.65
3900	2.2	0.25	0.28	0.30	0.33	0.36	0.39	0.45	0.50	0.57	0.64
4110	2.2	0.20	0.22	0.26	0.29	0.31	0.32	0.35	0.39	0.43	0.47
6900	2.8	0.36	0.49	0.58	0.68	0.79	0.91	1.20	1.50	1.82	2.14
TOTAL:		58.91	75.62	87.00	98.39	107.40	115.83	135.94	156.05	180.54	205.03

(1) Assumes increase in multi-family units in both the urban and transitional areas resulting in gradual reduction in per capita water consumption of 1.5% in the urban area and 3.5% in the transitional area for the year 1995 up to 3% and 7%, respectively for the year 2000 and thereafter. This reduction ultimately results in average gallons per capita per day (gpcd) of about 175, 130 and 108, respectively for urban, transitional and rural areas after 2000.

(2) Assumes 180, 140 and 120 gallons per capita per day (gpcd) for existing conditions for urban, transitional and rural areas, respectively. These numbers are consistent with water utilities in South King County of similar development.

(3) Assumes peak to average day factors of 2.2, 2.4, and 2.8 for urban, transitional and rural areas, respectively. These numbers are consistent with water utilities in South King County of similar development.

TABLE G-6

SOUTH KING COUNTY CWSP WATER USE PROJECTIONS
SCENARIO 3 - WITH CONSERVATION (1)
AVERAGE DAY DEMAND (MGD)

FAZ NO.	GPCD (2)	YEAR 1970	1980	1985	1990	1995	2000	2010	2020	STRAIGHT LINE 2030	2040
3010	140	1.09	2.60	3.31	4.01	4.49	4.91	5.81	6.71	7.81	8.91
3020	180	2.10	2.49	2.80	3.12	3.27	3.39	3.86	4.33	4.92	5.52
3030	140	1.99	2.45	2.83	3.21	3.46	3.67	4.36	5.04	5.88	6.72
3040	140	2.64	3.52	3.96	4.41	4.54	4.63	5.21	5.80	6.56	7.32
3110	140	0.41	0.49	0.60	0.72	0.82	0.90	1.12	1.33	1.59	1.84
3120	140	1.72	2.02	2.22	2.41	2.51	2.60	3.04	3.49	4.03	4.58
3130	180	1.81	2.13	2.39	2.65	2.78	2.88	3.26	3.64	4.11	4.59
3200	120	1.11	1.54	1.66	1.78	1.84	1.89	2.07	2.25	2.50	2.75
3310	120	0.41	0.66	0.79	0.93	1.01	1.08	1.42	1.76	2.14	2.52
3320	120	0.31	0.78	1.06	1.33	1.47	1.58	2.07	2.55	3.10	3.65
3411	140	0.13	0.19	0.23	0.26	0.29	0.32	0.42	0.51	0.62	0.73
3420	140	1.84	3.08	3.60	4.13	4.69	5.18	7.02	8.86	10.91	12.96
3500	180	2.49	3.24	4.03	4.83	4.96	5.04	5.43	5.82	6.39	6.96
3600	180	1.89	1.72	1.93	2.15	2.41	2.63	3.22	3.81	4.50	5.19
3700	140	4.38	4.25	4.45	4.66	4.62	4.56	4.74	4.91	5.24	5.57
3810	140	0.27	0.24	0.25	0.26	0.25	0.24	0.24	0.24	0.25	0.26
3900	180	0.11	0.13	0.14	0.15	0.16	0.17	0.19	0.21	0.24	0.27
4110	180	0.09	0.10	0.12	0.13	0.13	0.14	0.15	0.16	0.18	0.20
6900	120	0.13	0.18	0.21	0.24	0.27	0.29	0.39	0.48	0.59	0.69
TOTAL:		24.93	31.80	36.58	41.37	43.98	46.10	54.01	61.92	71.57	81.23

PEAK DAY DEMAND (MGD)

FAZ NO.	PEAK/AVG FACTOR (3)	YEAR 1970	1980	1985	1990	1995	2000	2010	2020	STRAIGHT LINE 2030	2040
3010	2.4	2.61	6.25	7.93	9.62	10.78	11.78	13.94	16.11	18.74	21.38
3020	2.2	4.63	5.48	6.17	6.86	7.19	7.45	8.49	9.52	10.83	12.15
3030	2.4	4.77	5.87	6.78	7.70	8.30	8.80	10.45	12.10	14.11	16.12
3040	2.4	6.34	8.44	9.51	10.59	10.89	11.10	12.51	13.93	15.75	17.58
3110	2.4	0.99	1.18	1.45	1.73	1.96	2.16	2.68	3.20	3.80	4.41
3120	2.4	4.12	4.85	5.32	5.78	6.03	6.23	7.31	8.38	9.68	10.98
3130	2.2	3.99	4.69	5.25	5.82	6.11	6.35	7.17	8.00	9.05	10.10
3200	2.8	3.11	4.32	4.65	4.98	5.17	5.30	5.80	6.30	7.00	7.70
3310	2.8	1.16	1.84	2.22	2.60	2.83	3.03	3.98	4.93	6.00	7.06
3320	2.8	0.87	2.19	2.96	3.74	4.11	4.43	5.79	7.14	8.68	10.22
3411	2.4	0.31	0.46	0.54	0.62	0.70	0.77	1.00	1.23	1.49	1.76
3420	2.4	4.42	7.39	8.65	9.90	11.27	12.43	16.85	21.26	26.18	31.10
3500	2.2	5.48	7.12	8.87	10.62	10.90	11.09	11.95	12.80	14.06	15.32
3600	2.2	4.16	3.79	4.26	4.72	5.30	5.79	7.09	8.39	9.90	11.42
3700	2.4	10.50	10.19	10.69	11.18	11.09	10.96	11.37	11.79	12.58	13.37
3810	2.4	0.65	0.58	0.61	0.63	0.60	0.58	0.58	0.58	0.61	0.63
3900	2.2	0.25	0.28	0.30	0.33	0.35	0.36	0.41	0.47	0.53	0.59
4110	2.2	0.20	0.22	0.26	0.29	0.30	0.30	0.33	0.36	0.40	0.44
6900	2.8	0.36	0.49	0.58	0.68	0.75	0.82	1.08	1.35	1.64	1.93
TOTAL:		58.91	75.62	87.00	98.39	104.64	109.72	128.78	147.84	171.04	194.24

(1) Assumes conservation savings in gallons per capita per day (gpcd) of 5% in 1995 up to 10% in 2000 and thereafter for all urban, transitional and rural customers. This reduction utlimately results in average gallons per capita per day (gpcd) of 162, 126 and 108, respectively for urban, transitional and rural areas after the year 2000.

(2) Assumes 180, 140 and 120 gallons per capita per day (gpcd) for existing conditions for urban, transitional and rural areas, respectively. These numbers are consistent with water utilities in South King County of similar development.

(3) Assumes peak to average day factors of 2.2, 2.4, and 2.8 for urban, transitional and rural areas, respectively. These numbers are consistent with water utilities in South King County of similar development.

TABLE G-7

SOUTH KING COUNTY CWSP WATER USE PROJECTIONS
SCENARIO 4 - CONSERVATION (1) & MULTI-FAMILY INCREASE (2)
AVERAGE DAY DEMAND (MGD)

FAZ NO.	GPCD (3)	YEAR 1970	1980	1985	1990	1995	2000	2010	2020	STRAIGHT LINE 2030	2040
3010	140	1.09	2.60	3.31	4.01	4.33	4.53	5.36	6.19	7.20	8.21
3020	180	2.10	2.49	2.80	3.12	3.22	3.27	3.73	4.18	4.76	5.34
3030	140	1.99	2.45	2.83	3.21	3.33	3.38	4.02	4.65	5.42	6.19
3040	140	2.64	3.52	3.96	4.41	4.37	4.27	4.81	5.35	6.05	6.75
3110	140	0.41	0.49	0.60	0.72	0.79	0.83	1.03	1.23	1.46	1.69
3120	140	1.72	2.02	2.22	2.41	2.42	2.39	2.81	3.22	3.72	4.22
3130	180	1.81	2.13	2.39	2.65	2.74	2.79	3.15	3.52	3.98	4.44
3200	120	1.11	1.54	1.66	1.78	1.84	1.89	2.07	2.25	2.50	2.75
3310	120	0.41	0.66	0.79	0.93	1.01	1.08	1.42	1.76	2.14	2.52
3320	120	0.31	0.78	1.06	1.33	1.47	1.58	2.07	2.55	3.10	3.65
3411	140	0.13	0.19	0.23	0.26	0.28	0.30	0.38	0.47	0.57	0.67
3420	140	1.84	3.08	3.60	4.13	4.52	4.78	6.47	8.17	10.06	11.95
3500	180	2.49	3.24	4.03	4.83	4.88	4.87	5.25	5.63	6.18	6.73
3600	180	1.89	1.72	1.93	2.15	2.37	2.54	3.11	3.69	4.35	5.02
3700	140	4.38	4.25	4.45	4.66	4.45	4.21	4.37	4.53	4.84	5.14
3810	140	0.27	0.24	0.25	0.26	0.24	0.22	0.22	0.22	0.23	0.24
3900	180	0.11	0.13	0.14	0.15	0.16	0.16	0.18	0.20	0.23	0.26
4110	180	0.09	0.10	0.12	0.13	0.13	0.13	0.14	0.16	0.18	0.19
6900	120	0.13	0.18	0.21	0.24	0.27	0.29	0.39	0.48	0.59	0.69
TOTAL:		24.93	31.80	36.58	41.37	42.82	43.52	50.99	58.45	67.56	76.67

PEAK DAY DEMAND (MGD)

FAZ NO.	PEAK/AVG FACTOR (4)	YEAR 1970	1980	1985	1990	1995	2000	2010	2020	STRAIGHT LINE 2030	2040
3010	2.4	2.61	6.25	7.93	9.62	10.39	10.86	12.86	14.86	17.28	19.71
3020	2.2	4.63	5.48	6.17	6.86	7.08	7.20	8.20	9.20	10.47	11.74
3030	2.4	4.77	5.87	6.78	7.70	7.99	8.12	9.64	11.16	13.01	14.86
3040	2.4	6.34	8.44	9.51	10.59	10.49	10.24	11.54	12.84	14.53	16.21
3110	2.4	0.99	1.18	1.45	1.73	1.89	1.99	2.47	2.95	3.51	4.07
3120	2.4	4.12	4.85	5.32	5.78	5.81	5.75	6.74	7.73	8.93	10.13
3130	2.2	3.99	4.69	5.25	5.82	6.02	6.14	6.93	7.73	8.75	9.77
3200	2.8	3.11	4.32	4.65	4.98	5.17	5.30	5.80	6.30	7.00	7.70
3310	2.8	1.16	1.84	2.22	2.60	2.83	3.03	3.98	4.93	6.00	7.06
3320	2.8	0.87	2.19	2.96	3.74	4.11	4.43	5.79	7.14	8.68	10.22
3411	2.4	0.31	0.46	0.54	0.62	0.68	0.71	0.92	1.14	1.38	1.62
3420	2.4	4.42	7.39	8.65	9.90	10.85	11.47	15.54	19.61	24.14	28.68
3500	2.2	5.48	7.12	8.87	10.62	10.73	10.72	11.55	12.38	13.59	14.81
3600	2.2	4.16	3.79	4.26	4.72	5.21	5.59	6.85	8.11	9.57	11.04
3700	2.4	10.50	10.19	10.69	11.18	10.68	10.10	10.49	10.88	11.60	12.33
3810	2.4	0.65	0.58	0.61	0.63	0.58	0.53	0.53	0.54	0.56	0.58
3900	2.2	0.25	0.28	0.30	0.33	0.34	0.35	0.40	0.45	0.51	0.57
4110	2.2	0.20	0.22	0.26	0.29	0.29	0.29	0.32	0.35	0.39	0.43
6900	2.8	0.36	0.49	0.58	0.68	0.75	0.82	1.08	1.35	1.64	1.93
TOTAL:		58.91	75.62	87.00	98.39	101.90	103.64	121.63	139.63	161.54	183.45

(1) Assumes conservation savings in gallons per capita per day (gpcd) of 5% in 1995 up to 10% in 2000 and thereafter for all urban, transitional and rural customers. This reduction utlimately results in average gallons per capita per day (gpcd) of 162, 126 and 108, respectively for urban, transitional and rural areas after the year 2000.

(2) Assumes increase in multi-family units in both the urban and transitional areas resulting in gradual reduction in per capita water consumption of 1.5% in the urban area and 3.5% in the transitional area for the year 1995 up to 3% and 7%, respectively for the year 2000 and thereafter. This reduction ultimately results in average gallons per capita per day (gpcd) of about 175, 130 and 108, respectively for urban, transitional and rural areas after 2000.

(3) Assumes 180, 140 and 120 gallons per capita per day (gpcd) for existing conditions for urban, transitional and rural areas, respectively. These numbers are consistent with water utilities in South King County of similar development.

(4) Assumes peak to average day factors of 2.2, 2.4, and 2.8 for urban, transitional and rural areas, respectively. These numbers are consistent with water utilities in South King County of similar development.
respectively. These numbers are consistent with water utilities in South King County of similar development.

TABLE G-8

SOUTH KING COUNTY CWSP STUDY AREA
EXISTING INSTALLED SOURCE CAPACITY

PUBLIC WATER SYSTEM SIZE	NO. OF WATER SYSTEMS	INSTALLED CAPACITY GPM	MGD	(1)
CLASS 1 (100 or more connections or more than 1000 transient people)	16	85,194	122.7	(2)
CLASS 2 (10-99 connections or transient 300 to 999 on any one day)	42	2,161	3.1	(3)
CLASS 3 (transient population of 25 to 299 on any one day)	(4)	1,389	2.0	(3)
CLASS 4 (2-9 connections or transient less than 25)	(4)	3,472	5.0	(3)
	623	92,217	132.8	

(1) Estimated from individual data requests, DSHS files, DOE material, Water Resource Facility forms, and phone conversations.

(2) Seattle's available supply to Water District No. 75 of 22.5 MGD is included above.

(3) Estimated. Incomplete records for Water System Class's 2, 3 and 4.

(4) Combined total of Class 3 and 4 is about 565 water systems.

TABLE G-9

SOUTH KING COUNTY CWSP STUDY AREA
SUMMARY OF PROJECTED SOURCE REQUIREMENTS
(MGD)

	YEAR						STRAIGHT LINE	
	1985	1990	1995	2000	2010	2020	2030	2040
SCENARIO 1 - EXISTING CONDITION (1)								
Projected Peak Day Demand	87.0	98.4	110.2	121.9	143.1	164.3	190.0	215.8
Existing Source Capacity (2)	132.8	132.8	132.8	132.8	132.8	132.8	132.8	132.8
Cumulative Source Deficiency	(45.8)	(34.4)	(22.6)	(10.9)	10.3	31.5	57.3	83.0
SCENARIO 2 - MULTI-FAMILY INCREASE (3)								
Projected Peak Day Demand	87.0	98.4	107.4	115.8	135.9	156.1	180.5	205.0
Existing Source Capacity (2)	132.8	132.8	132.8	132.8	132.8	132.8	132.8	132.8
Cumulative Source Deficiency	(45.8)	(34.4)	(25.4)	(17.0)	3.2	23.3	47.8	72.3
SCENARIO 3 - WITH CONSERVATION (4)								
Projected Peak Day Demand	87.0	98.4	104.6	109.7	128.8	147.8	171.0	194.2
Existing Source Capacity (2)	132.8	132.8	132.8	132.8	132.8	132.8	132.8	132.8
Cumulative Source Deficiency	(45.8)	(34.4)	(28.1)	(23.1)	(4.0)	15.1	38.3	61.5
SCENARIO 4 - WITH CONSERVATION & MULTI-FAMILY INCREASE (5)								
Projected Peak Day Demand	87.0	98.4	101.9	103.6	121.6	139.6	161.5	183.4
Existing Source Capacity (2)	132.8	132.8	132.8	132.8	132.8	132.8	132.8	132.8
Cumulative Source Deficiency	(45.8)	(34.4)	(30.9)	(29.1)	(11.1)	6.8	28.8	50.7

Footnotes:

(1) Assumes on the average 180, 140 and 120 gallons per capita per day (gpcd) and peak to average day factors of 2.2, 2.4, and 2.8 for urban, transitional and rural areas, respectively.

(2) Estimated from individual data requests, DSHS files, DOE material and Water Resource Facility forms. Seattle's available supply to King County Water District No. 75 of 22.5 MGD has been included.

(3) Assumes increase in multi-family units in both urban and transitional areas resulting in gradual reduction in per capita water use of 1.5% and 3% in 1995, and 3.5% and 7% in 2000 and thereafter for urban and transitional areas, respectively.

(4) Assumes water conservation savings of 5% by 1995, and 10% by 2000 and thereafter for all areas.

(5) Combination of (3) and (4).

APPENDIX H

QUESTIONNAIRE COMPLETED CLASS 1 AND 2

(On file with the King County Department of Parks, Planning, and Resources Building and Land Division)

APPENDIX I

REGIONAL UTILITY POPULATION, DEMAND, AND CAPACITY ANALYSIS

APPENDIX I

REGIONAL UTILITY POPULATION, DEMAND, AND CAPACITY ANALYSIS

1. DESCRIPTION OF ANALYSIS

The accompanying tables and graphs at the end of this Appendix depict the present and forecasted water demand and supply balance for the six major utilities, excluding supply from Pipeline No. 5. In addition, information for the individual utilities has been aggregated into summary tables, Tables VII-5a, b, c, and d under similar scenarios described in the Regional Utilities sub-section of the Regional Water Supply Section VII(i.e., existing condition, multi-family increase, water conservation, and combination of water conservation and multi-family increase). These tables show new capacity that has been identified at the present time, the gradual disappearance of surplus supply, and the advent of deficits. They also summarize population and demands for the six water systems. These tables were developed based on the following assumptions:

A. The population figures for the individual utilities were taken from their individual water system plans through 2000. June, 1988 Forecast mid-range population projection was used for population projections between 2000 and 2020. Puget Sound Council of Governments (PSCOG) has alternative high and low region-wide population forecasts that would yield different results. But, the high and low region-wide forecasts have not been allocated to sub-areas, and the corresponding demand scenarios have not been developed. After 2020, a straight-line projecting using PSCOG data was used to 2040.

B. The demand estimates are population-driven. In other words, total municipal demand has not been estimated by economic sector, but estimated only as a function of population growth. No direct account has been taken of such water demand impacts as the closure or construction of large uses such as pulp mills or waste incinerators and/or substantial reduction of water use by re-use.

C. There are other substantial water supplies not included in the analysis. It is an assumption that Enumclaw will stand on its own and not share in Tacoma Pipeline No. 5. Others --Black Diamond, Algona, Pacific -- have options for meeting their foreseeable demands that do not involve a regional supply. Still others are wholesale purchasers of water from utilities included in the present analysis. It is presumed they will remain so.

D. To reflect the fact that there may be some sharing of resources within the region, we assumed that half the available region-wide surplus in any given year is free to move about to satisfy projected deficiencies. There are some obvious limits to this process; head requirements, transmission capacity, distance, etc. The 50% figure is subjective; clearly some of the water can move around, but not all of it.

E. Regional water conservation has been forecast. The potential of conservation savings is estimated to range from 5% in 1995 to 10% in 2000 and thereafter. It is not precisely known at this point how water conservation would affect average to peak demand ratios; utility revenues; geographic distribution of demand; and distribution of demand by sector. Some of the factors that may affect demand are demand deflection due to the revenue requirements to cover large capacity expansions; volume-based sewer rates; employment growth; and family income.

F. A forecasted relative increase in multi-family units for urban and transitional areas of South King County has been assumed to result in a water savings of 1.5% and 3% in 1995 and 3.5% and 7% in 2000 for the urban and transitional areas, respectively.

G. Also included in analysis, was an evaluation of potential combined water savings, with water conservation for the entire area and increase in multi-family units for the transitional and urban areas of 6.5% and 8% in 1995 and 13.5% and 17% in 2000 and thereafter for urbanized and transitional areas, respectively. Only water conservation of 5% in 1995 and 10% in 2000 is assumed for rural areas of South King County.

2. SUMMARY OF REGIONAL UTILITIES ANALYSIS

The following is a narrative description of the six utilities forming the South King County Regional Water Association (SKRWA). These utilities are: City of Auburn, Covington Water District, Federal Way Water and Sewer District, City of Kent, King County Water District No. 75, and King County Water District No. 111. Included in the description are the population and demand assumptions and a discussion of potential sources of supply.

A. City of Auburn (Auburn) (See Tables I-1a through I-1d)

Information on the water supply situation of Auburn is based on Auburn's 1983 Comprehensive Water System Plan, done by Poole Engineering, Inc. Supplemental information has been gathered from the members of the Public Works Department staff, who are undertaking a revision of the Comprehensive Water System Plan.

There is a diversity of settlement in Auburn. Due to this, the separate identities of the different service area populations have been maintained. The Valley service area has the largest share of the population and also the bulk of the commercial and industrial water use. Population estimates were available only for 1980, 1990, and 2000; the estimates for the other intervals during the planning horizon were arrived at by the use of straight-line projection on the years that were furnished by Auburn. Auburn, itself, looked at a range of estimates and settled on the higher growth rates among the range of reasons for planning conservatism. Use of this population estimating approach results in more than a two-fold increase in Auburn's population by the end of the planning horizon, in 2040.

As to sources of supply, Auburn's current capacity of 17.6 MGD in 1988 appears to be sufficient until 2000. Nonetheless, Auburn intends to add a number of wells. These wells are Lakeland Hills Well in 1990, Well No. 8 in 1995, Well No. 6 in 2000, and Well No. 7 in 2010. The combined capacity of these well services is anticipated to be approximately 10 MGD. A study of Auburn's groundwater in 1983 concluded that the aquifer under Auburn and in the Green River flood plain was capable of 40-60 MGD yield. This desirable situation gives rise to the suggestion that Auburn could in fact feed water into Pipeline No. 5, as an alternate source. This is assuming the Pipeline is to be built in its presently proposed location. This would allow the use of the Pipeline during times when diversions from the Green River are not possible because of water quality or runoff considerations.

Presently, Cold Creek Springs is a major source for Auburn. Although Auburn has water rights for 23 MGD on the Springs, there is no more than 6-8 MGD yield. Auburn anticipates the continued use of the Springs, notwithstanding discussions with the Muckleshoot Tribe over eventual use of the Springs for hatchery purposes. Use by the Muckleshoot Hatchery would be complimentary to Auburn's use in the sense that they need water at different times of year.

West Hill Spring lies on the high ground to the west of Auburn and the Valley. At one time the yield was approximately 0.65 MGD. In recent years, the yield has dropped off to approximately 0.5 MGD. The water is good quality and is the cheapest source for Auburn. Auburn has no control over the recharge area, which lies in Federal Way Water and Sewer (FWWS). With the development of the Plateau, storm sewers are intercepting the runoff. For these reasons, Auburn regards the future of this spring as uncertain.

The wells in the Valley show very steep gradients with respect to water quality. Several wells have shown high iron and manganese. These wells would, presumably, be blended or treated in order to serve as a municipal water supply. Some samples have tested as high as 2 to 5 times the secondary drinking water standard.

Auburn has expressed an interest in acquisition of a share of the flow Pipeline No. 5. Auburn's interest arises from the possibility of blending to achieve water quality criteria where the wells are high in iron and manganese and also from the possibility of serving the Lea Hills area by gravity instead of pumping water from the lower pressure zone in the Valley. Although Public Works Department representatives have talked about 2 MGD as a conceptual amount which Auburn might potentially purchase, Auburn is not a signatory to the SKRWA contract which allocates the 15 MGD from Pipeline No. 5 among the SKRWA utilities. The desirability of Auburn's participation in Pipeline No. 5 rests on the assumption that Pipeline water would be cheaper than the electrical costs entailed in pumping well water from the valley. The desirability of the Pipeline may also be governed, to some extent, by the cost of new storage capacity. Auburn could potentially acquire a new source, in the form of Pipeline No. 5, to meet its peak demands rather than building new distribution reservoirs.

B. Federal Way Water and Sewer District (FWWS) (See Tables I-2a through I-2d)

The FWWS population is anticipated to more than double during the 50-year planning horizon. FWWS has 19 wells in service, though it cannot use them all simultaneously due to drawdown, interference, and yield limitations. FWWS has energetic programs of water conservation and development of new groundwater, including an as yet unexplored deep aquifer. FWWS is also evaluating the possibilities for water importation into the District. These would include transmission interties with KCWD #75 to the north, or the City of Tacoma to the south. FWWS would be an early beneficiary of the construction of Pipeline No. 5, because the proposed location transects FWWS and the FWWS contractual share of the Pipeline's capacity, which is 4.62 MGD, would supply approximately 10 years of growth at the rate anticipated for FWWS. In addition to FWWS's 4.62 MGD allocation, FWWS has agreed to take any surplus from KCWD #111 on a year-to-year basis. FWWS's allocation out of Pipeline No. 5 may eventually turn out to be larger than the 4.62 MGD contractual commitment.

If Pipeline No. 5 is substantially delayed or does not get built, FWWS will have a proportionately greater reliance on local groundwater, demand management, purchase from Seattle through a KCWD #75 intertie, or a possible purchase from the City of Auburn. If Pipeline No. 5 were delayed rather than postponed indefinitely, it could be built out of sequence, with the segment between FWWS and Auburn being one of the earlier segments to be completed.

C. City of Kent (Kent) (See Tables I-3a through I-3d)

The source of information for the analysis of the Kent system is the Kent water system plan, which has been prepared by its Department of Public Works. The Plan relies on previous estimates of population, which were prepared by a consultant for a local transportation study. The population projections that resulted from this process were higher than those derived by PSCOG approach for the same area. The discrepancy is approximately 25 percent in the year 2000.

Kent has substantial commercial and industrial water demands, which vary under different estimates from about 1.5 MGD to upwards of 4.6 MGD. Planning for industrial water demands is a substantial feature of the Kent municipal system, and warrants further detailed investigation. This is true from the point of view of managing peak demands and estimating the potential for water conservation. In the absence of better information about the dynamics of water demand in Kent, historical water use trends have been used to estimate system average demands beyond 1987. This amounts to an assumption that conditions will not deviate from the present tendency for water consumption to increase; an assumption which may not be warranted. Further, the system peak demand is based on utility operating experience. This has been shown to have steadily increased due to an increase in water demand by the industrial sector. The additional water consumption reflected in these figures would allow substantial increase in industrial water consumption. The resulting peak day figures of 351 to 388 gpcd are comparable with the figure of 396 gpcd assumed in the PSCOG approach to estimating peak water demand for the urbanized areas of South King County.

Kent's planned capacity expansion include a number of wells, an intertie with Pipeline No. 5, construction of a surface storage impoundment, and possible development of the Auburn well field. The well construction program is relatively straightforward. Pipeline No. 5 could be used to offset the peak deficits in 1995 and 2000. The construction of the surface impoundment proposed in 2006 which could be supplied by the springs, Pipeline No. 5 or from groundwater in the Green River Valley. The reservoir would be able to meet peak demands, but presumably would

have to be built on the basis of a careful analysis of peak versus average demand relationships at the time of construction. The Auburn well field could supply as much as 10 MGD and would provide a good backup supply in the event that Pipeline No. 5 is not built. Disadvantages of the Auburn well field are that the water appears to be high in manganese, there may be complications arising from the fact that the well may influence surface flows in the Green River, and utilization of the well field may require that approximately 375 feet of head be overcome with pumping installations. Kent has not filed for permit applications for the Auburn well field, though it currently owns easements on the assumed location. The sequence of developing the well field will depend on the outcome of Pipeline No. 5 development.

The location of the proposed impoundment would be near the intersection of SE 304th Street and 124th Avenue SE, in a location that would be bisected by the proposed alignment for Pipeline No. 5. The surface elevation would be approximately 400 feet, the storage capacity would be approximately 3,200 acre-feet, and the depth would be approximately 50 feet.

D. King County Water District No. 75 (KCWD #75) (See Tables VII-4a through VII-4d)

KCWD #75 occupies a unique location in the SKRWA. It lies to the west and north of the other utilities, and is situated so that it is not able to benefit directly from the construction of Tacoma's Pipeline No. 5 from the Green River. However, there is the possibility of wheeling water through Federal Way or Kent to KCWD #75.

KCWD #75's primary supply is through contractual arrangements with the Seattle Water Department (SWD), for 20 MGD of the Cedar River. Currently, the most KCWD #75 uses of this supply is approximately 15 MGD. The transmission main is hydraulically capable of supplying 22.5 MGD, which is the reported peak capacity available from Seattle in the Water System Plan. This amount has been included in the present analysis.

Because the contractual arrangements entail a substantially higher price for the water than KCWD #75 has been paying under its "old water base" allocation, KCWD #75 wishes to defer the use of the 20 MGD allocation as long as possible.

Groundwater is likely to play a significant role in KCWD #75's future. In 1983, KCWD #75 drilled two wells which did not meet early expectations of yield, but have been developed at a capacity of about 6.34 MGD. However, because of drawdown, these wells are operationally limited to

approximately 3.25 MGD. In addition, KCWD #75 is likely to be a participant in the development of the nearby Highline Wellfield, though its share of costs and water allocation has not been determined.

E. Covington Water District (Covington) (See Tables VII-5a through VII-5d)

Covington is geographically the largest and most sparsely settled of the six SKRWA utilities. The Covington population has been projected to increase from approximately 22,400 to over 95,000 in the 50-year planning horizon.

Covington also has an energetic well construction program. Covington has extensive areas of groundwater production, but has expressed a concern about the shallowness and susceptibility to contamination of its aquifer recharge area. There have been discussions between Covington and Black Diamond regarding the possible purchase of excess capacity from Black Diamond. Water supply deficits for Covington will not materialize until the middle of the planning horizon, provided Pipeline No. 5 is constructed. In addition, there are some complications over the Black Diamond water right situation. Consequently, Covington maintains an active interest in Black Diamond water though it is not ready to make a commitment now. If Pipeline No. 5 is built in the mid-1990s, Covington would maintain a surplus with respect to average demands almost until the end of the planning horizon. They would be surplus with respect to peak demands until approximately 2000, when they will need to consider additional sources of supply.

F. King County Water District No. 111 (KCWD #111) (See Tables VII-6a through VII-6d)

KCWD #111 is strategically situated in the middle of the SKRWA utilities and close to the proposed location of Pipeline No. 5 and the intertie with SWD. KCWD #111 is relatively small from the point of view of both land area and population. Its supply deficits are relatively modest until late in the planning horizon. KCWD #111 has requested an allocation of 2.3 MGD from Pipeline No. 5. They have also expressed the concern that the cost of Pipeline No. 5 water will put KCWD #111's customers under a substantial burden. The 2.3 MGD allocation from Pipeline No. 5 is about the same size as KCWD #111's present peak day demands. However, it would meet the District's projected deficit through about 2005. The groundwater potential in the areas has not been fully evaluated.

TABLE I-1a

CITY OF AUBURN
WITHOUT PIPELINE NO. 5
EXISTING CONDITION (1)

Year	1980	1985	1990	1995	2000	2010	2020	2030	2040
Service population (2):									
Valley	22,168	24,560	27,138	28,976	31,000	35,600	40,017	44,433	48,849
Lea Hills	2,453	3,163	3,870	4,586	5,300	6,721	8,145	9,567	10,992
Academy	3,910	4,587	5,270	5,932	6,600	7,950	9,295	10,300	11,985
Total	28,531	32,310	36,278	39,494	42,900	50,271	57,457	64,300	71,826
DEMAND									
Ann. Avg. gpcd (3)									
Valley	198	210	210	210	210	210	210	210	210
Lea Hills	77	77	100	100	100	100	100	100	100
Academy	100	100	120	120	120	120	120	120	120
Peak gpcd									
Valley	495	525	525	525	525	525	525	525	525
Lea Hills	193	193	250	250	250	250	250	250	250
Academy	250	250	300	300	300	300	300	300	300
Peak/Avg. ratio (4)	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5
Unaccounted-for %									
System avg. demand (mgd)(5)	5.0	5.9	6.7	7.3	7.8	9.1	10.3	11.5	12.8
System peak demand (mgd)(6)	12.4	14.6	16.8	18.1	19.6	22.8	25.8	28.8	32.0
SOURCES				Well (9)					
Description	(7)	(8)	Well (9)	PL#5 (10)	Well (9)	Well (9)			
Capacity (mgd)	14.4	23.2	24.2	28.2	31.2	33.2	33.2	33.2	33.2
Water rights		27.4							
BALANCE: SURPLUS OR (DEFICIT)									
Average (mgd)	9.4	17.3	17.5	20.9	23.4	24.1	22.9	21.7	20.4
Peak (mgd)	2.0	8.6	7.4	10.1	11.6	10.4	7.4	4.4	1.2

NOTES:
(1) As decribed in 1983 Comprehensive Water System Plan.
(2) Values taken from Comprehensive Plan, pp. V-3; VI-4; VII-2. Intermediate values derived by linear extrapolation. There is no general agreement on population forecasts. The highest estimates from the Plan have been used.
(3) Initial figures from Plan, p. V-7; VI-8. Academy and Lea Hills shown in Plan to increase in 1990 to 120 and 110 gpcd, respectively.
(4) Peaking factor from Plan, p. VI-9.
(5) Derived by multiplying estimated population by per capita consumption rates.
(6) Derived by multiplying avg. demands by peak/avg. ratio.
(7) 2 wells, and 2 springs peak day, Figure IV-1 in Comprehensive Water System Plan.
(8) 6 wells, and 2 springs combined capacity of 23.2 mgd.
(9) CIP sequence:
1990 - Lakeland Hills Well, 1 mgd; 1995 - Well #8, 4 mgd; 2000 - Well #6, 3 mgd; and 2010 - Well #7, 2 mgd.
(10) Auburn has discussed purchase of an unquantified share of PL #5 in order to serve Lea Hill by gravity, also to enable blending with groundwater for quality objectives (p. IV-22). No supply from PL#5. Auburn could also act as a regional source by feeding pipeline #5 with groundwater.

Sources of information: Comprehensive Water System Plan, June 1983 (Pool Engineering, Inc.); letter 2/6/87, Currie to Wubbena; Currie, personal communication.

TABLE I-1b

CITY OF AUBURN
WITHOUT PIPELINE NO. 5
WITH AN INCREASE IN MULTI-FAMILY UNITS (1)

Year	1980	1985	1990	1995	2000	2010	2020	2030	2040
Service population (2):									
Valley	22,168	24,560	27,138	28,976	31,000	35,600	40,017	44,433	48,849
Lea Hills	2,453	3,163	3,870	4,586	5,300	6,721	8,145	9,567	10,992
Academy	3,910	4,587	5,270	5,932	6,600	7,950	9,295	10,300	11,985
Total	28,531	32,310	36,278	39,494	42,900	50,271	57,457	64,300	71,826
DEMAND									
Ann. Avg. gpcd (3)									
Valley	198	210	210	207	204	204	204	204	204
Lea Hills	77	77	100	97	93	93	93	93	93
Academy	100	100	120	116	112	112	112	112	112
Peak gpcd									
Valley	495	525	525	517	509	509	509	509	509
Lea Hills	193	193	250	243	233	233	233	233	233
Academy	250	250	300	291	279	279	279	279	279
Peak/Avg. ratio (4)	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5
Unaccounted-for %									
System avg. demand (mgd)(5)	5.0	5.9	6.7	7.1	7.5	8.8	9.9	11.1	12.3
System peak demand (mgd)(6)	12.4	14.6	16.8	17.8	18.9	21.9	24.9	27.7	30.8
SOURCES				Well (9)					
Description	(7)	(8)	Well (9)	PL#5 (10)	Well (9)	Well (9)			
Capacity (mgd)	14.4	23.2	24.2	28.2	31.2	33.2	33.2	33.2	33.2
Water rights		27.4							
BALANCE: SURPLUS OR (DEFICIT)									
Average (mgd)	9.4	17.3	17.5	21.1	23.7	24.4	23.3	22.1	20.9
Peak (mgd)	2.0	8.6	7.4	10.4	12.3	11.3	8.3	5.5	2.4

NOTES:
(1) Assumes water savings of 1.5% in 1995, and 3.5% in 2000 and thereafter for urbanized Valley, and savings of 3% in 1990, and 7% in 2000 and thereafter for Lea Hills and Academy (both transitional areas).
(2) Values taken from Comprehensive Plan, pp. V-3; VI-4; VII-2. Intermediate values derived by linear extrapolation. There is no general agreement on population forecasts. The highest estimates from the Plan have been used.
(3) Initial figures from Plan, p. V-7; VI-8. Academy and Lea Hills shown in Plan to increase in 1990 to 120 and 110 gpcd, respectively.
(4) Peaking factor from Plan, pp. VI-9.
(5) Derived by multiplying estimated population by per capita consumption rates.
(6) Derived by multiplying avg. demands by peak/avg. ratio.
(7) 2 wells, and 2 springs peak day, Figure IV-1 in Comprehensive Water System Plan.
(8) 6 wells, and 2 springs combined capacity of 23.2 mgd.
(9) CIP sequence:
1990 - Lakeland Hills Well, 1 mgd; 1995 - Well #8, 4 mgd; 2000 - Well #6, 3 mgd; and 2010 - Well #7, 2 mgd.
(10) Auburn has discussed purchase of an unquantified share of PL #5 in order to serve Lea Hill by gravity, also to enable blending with groundwater for quality objectives (p. IV-22). No supply from PL#5. Auburn could also act as a regional source by feeding pipeline #5 with groundwater.

Sources of information: Comprehensive Water System Plan, June 1983 (Pool Engineering, Inc.); letter 2/6/87, Currie to Wubbena; Currie, personal communication.

TABLE I-1c

CITY OF AUBURN
WITHOUT PIPELINE NO. 5
WITH WATER CONSERVATION (1)

Year	1980	1985	1990	1995	2000	2010	2020	2030	2040
Service population (2):									
Valley	22,168	24,560	27,138	28,976	31,000	35,600	40,017	44,433	48,849
Lea Hills	2,453	3,163	3,870	4,586	5,300	6,721	8,145	9,567	10,992
Academy	3,910	4,587	5,270	5,932	6,600	7,950	9,295	10,300	11,985
Total	28,531	32,310	36,278	39,494	42,900	50,271	57,457	64,300	71,826
DEMAND									
Ann. Avg. gpcd (3)									
Valley	198	210	210	200	189	189	189	189	189
Lea Hills	77	77	100	95	90	90	90	90	90
Academy	100	100	120	114	108	108	108	108	108
Peak gpcd									
Valley	495	525	525	499	473	473	473	473	473
Lea Hills	193	193	250	238	225	225	225	225	225
Academy	250	250	300	285	270	270	270	270	270
Peak/Avg. ratio (4)	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5
Unaccounted-for %									
System avg. demand (mgd)(5)	5.0	5.9	6.7	6.9	7.0	8.2	9.3	10.4	11.5
System peak demand (mgd)(6)	12.4	14.6	16.8	17.2	17.6	20.5	23.3	25.9	28.8
SOURCES				Well (9)					
Description	(7)	(8)	Well (9)	PL#5 (10)	Well (9)	Well (9)			
Capacity (mgd)	14.4	23.2	24.2	28.2	31.2	33.2	33.2	33.2	33.2
Water rights		27.4							
BALANCE: SURPLUS OR (DEFICIT)									
Average (mgd)	9.4	17.3	17.5	21.3	24.2	25.0	23.9	22.8	21.7
Peak (mgd)	2.0	8.6	7.4	11.0	13.6	12.7	9.9	7.3	4.4

NOTES:
(1) Assumes water savings of 5% in 1995, and 10% in 2000 and thereafter.
(2) Values taken from Comprehensive Plan, pp. V-3; VI-4; VII-2. Intermediate values derived by linear extrapolation. There is no general agreement on population forecasts. The highest estimates from the Plan have been used.
(3) Initial figures from Plan, p. V-7; VI-8. Academy and Lea Hills shown in Plan to increase in 1990 to 120 and 110 gpcd, respectively.
(4) Peaking factor from Plan, pp. VI-9.
(5) Derived by multiplying estimated population by per capita consumption rates.
(6) Derived by multiplying avg. demands by peak/avg. ratio.
(7) 2 wells, and 2 springs peak day, Figure IV-1 in Comprehensive Water System Plan.
(8) 6 wells, and 2 springs combined capacity of 23.2 mgd.
(9) CIP sequence:
1990 - Lakeland Hills Well, 1 mgd; 1995 - Well #8, 4 mgd; 2000 - Well #6, 3 mgd; and 2010 - Well #7, 2 mgd.
(10) Auburn has discussed purchase of an unquantified share of PL #5 in order to serve Lea Hill by gravity, also to enable blending with groundwater for quality objectives (p. IV-22). No supply from PL#5. Auburn could also act as a regional source by feeding pipeline #5 with groundwater.

Sources of information: Comprehensive Water System Plan, June 1983 (Pool Engineering, Inc.); letter 2/6/87, Currie to Wubbena; Currie, personal communication.

TABLE I-1d

CITY OF AUBURN
WITHOUT PIPELINE NO. 5
WITH CONSERVATION AND INCREASE IN MULTI-FAMILY UNITS (1)

Year	1980	1985	1990	1995	2000	2010	2020	2030	2040
Service population (2):									
Valley	22,168	24,560	27,138	28,976	31,000	35,600	40,017	44,433	48,849
Lea Hills	2,453	3,163	3,870	4,586	5,300	6,721	8,145	9,567	10,992
Academy	3,910	4,587	5,270	5,932	6,600	7,950	9,295	10,300	11,985
Total	28,531	32,310	36,278	39,494	42,900	50,271	57,457	64,300	71,826
DEMAND									
Ann. Avg. gpcd (3)									
Valley	198	210	210	196	182	182	182	182	182
Lea Hills	77	77	100	92	83	83	83	83	83
Academy	100	100	120	110	100	100	100	100	100
Peak gpcd									
Valley	495	525	525	491	454	454	454	454	454
Lea Hills	193	193	250	230	208	208	208	208	208
Academy	250	250	300	276	249	249	249	249	249
Peak/Avg. ratio (4)	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5
Unaccounted-for %									
System avg. demand (mgd)(5)	5.0	5.9	6.7	6.8	6.7	7.8	8.9	9.9	11.0
System peak demand (mgd)(6)	12.4	14.6	16.8	16.9	16.8	19.5	22.2	24.7	27.4
SOURCES				Well (9)					
Description	(7)	(8)	Well (9)	PL#5 (10)	Well (9)	Well (9)			
Capacity (mgd)	14.4	23.2	24.2	28.2	31.2	33.2	33.2	33.2	33.2
Water rights		27.4							
BALANCE: SURPLUS OR (DEFICIT)									
Average (mgd)	9.4	17.3	17.5	21.4	24.5	25.4	24.3	23.3	22.2
Peak (mgd)	2.0	8.6	7.4	11.3	14.4	13.7	11.0	8.5	5.8

NOTES:
(1) Assumes combined water savings of 6.5% in 1995, and 13.5% in 2000 and thereafter for urbanized Valley, and savings of 8% in 1990, and 17% in 2000 and thereafter for Lea Hills and Academy (both transitional areas).
(2) Values taken from Comprehensive Plan, pp. V-3; VI-4; VII-2. Intermediate values derived by linear extrapolation. There is no general agreement on population forecasts. The highest estimates from the Plan have been used.
(3) Initial figures from Plan, p. V-7; VI-8. Academy and Lea Hills shown in Plan to increase in 1990 to 120 and 110 gpcd, respectively.
(4) Peaking factor from Plan, pp. VI-9.
(5) Derived by multiplying estimated population by per capita consumption rates.
(6) Derived by multiplying avg. demands by peak/avg. ratio.
(7) 2 wells, and 2 springs peak day, Figure IV-1 in Comprehensive Water System Plan.
(8) 6 wells, and 2 springs combined capacity of 23.2 mgd.
(9) CIP sequence:
1990 - Lakeland Hills Well, 1 mgd; 1995 - Well #8, 4 mgd; 2000 - Well #6, 3 mgd; and 2010 - Well #7, 2 mgd.
(10) Auburn has discussed purchase of an unquantified share of PL #5 in order to serve Lea Hill by gravity, also to enable blending with groundwater for quality objectives (p. IV-22). No supply from PL#5. Auburn could also act as a regional source by feeding pipeline #5 with groundwater.

Sources of information: Comprehensive Water System Plan, June 1983 (Pool Engineering, Inc.); letter 2/6/87, Currie to Wubbena; Currie, personal communication.

TABLE I-2a

FEDERAL WAY WATER AND SEWER
WITHOUT PIPELINE NO. 5
EXISTING CONDITION (1)

Year	1980	1985	1990	1995	2000	2010	2020	2030	2040
Service population (2):		65,447	84,143	97,201	107,213	118,351	129,488	145,460	161,432
DEMAND									
Ann. Avg. gpcd		124	124	124	124	124	124	124	124
Peak gpcd (3)		323	310	310	310	310	310	310	310
Peak/Avg. ratio		2.6	2.5	2.5	2.5	2.5	2.5	2.5	2.5
Unaccounted-for % (4)		13%							
System avg. demand (mgd) (5)		8.1	10.4	12.1	13.3	14.7	16.1	18.0	20.0
System peak demand (mgd) (5)		21.2	26.1	30.1	33.2	36.7	40.1	45.1	50.0
SOURCES									
Description		19 wells (6)		PL#5(7)					
Capacity (mgd)		24.1	29.4	29.4	29.4	29.4	29.4	29.4	29.4
Water rights			38.1						
BALANCE: SURPLUS OR (DEFICIT)									
Average (mgd)		16.0	19.0	17.3	16.1	14.7	13.3	11.4	9.4
Peak (mgd)		3.0	3.3	(0.7)	(3.8)	(7.3)	(10.7)	(15.7)	(20.6)

NOTES:

(1) As described in 1989 Federal Way Water and Sewer District Water System Plan.
(2) Moderate growth projection from Water System Plan used through 2000. 2020 taken from June 1988 PSCOG forecast. From 2020 to 2040 straight-line projection. Data for 2010 linearly extrapolated.
(3) Per Bernie Christensen, URS, Water System Plan uses 310 gpcd for peak day.
(4) Per Jim Miller, FWWS.
(5) Average and peak day demand through 2000 taken from Water System Plan, Table III-7. After 2000, based on calculated average gallons per capita per day (gpcd) and peak to average day demand factor.
(6) Capacity figures from Jim Miller, FWWS.
(7) FWWS share of RWA 15 mgd allocation of PL#5 is 30.77%, or 4.62 mgd. This analysis assumes indefinite delay.

Sources of information:
Water System Plan, 1989 (URS), and updated per phone conversations with Jim Miller, FWWS and Bernie Christensen, URS on June 1, 1989.

Options open to the District:
Rely on the construction of Pipeline #5;
Assess potential of deep aquifer;
Explore purchase from Auburn, which depends on at least partial construction of PL #5; or from other purveyors;
Investigate demand management.

TABLE I-2b

FEDERAL WAY WATER AND SEWER
WITHOUT PIPELINE NO. 5
WITH AN INCREASE IN MULTI-FAMILY UNITS (1)

Year	1980	1985	1990	1995	2000	2010	2020	2030	2040
Service population (2):		65,447	84,143	97,201	107,213	118,351	129,488	145,460	161,432
DEMAND									
Ann. Avg. gpcd		124	124	122	118	118	118	118	118
Peak gpcd (3)		323	310	304	295	295	295	295	295
Peak/Avg. ratio		2.6	2.5	2.5	2.5	2.5	2.5	2.5	2.5
Unaccounted-for %									
System avg. demand (mgd) (4)		8.1	10.4	11.8	12.6	13.9	15.3	17.1	19.0
System peak demand (mgd) (4)		21.2	26.1	29.5	31.6	34.9	38.1	42.8	47.5
SOURCES									
Description		19 wells (5)		PL#5(6)					
Capacity (mgd)		24.1	29.4	29.4	29.4	29.4	29.4	29.4	29.4
Water rights			38.1						
BALANCE: SURPLUS OR (DEFICIT)									
Average (mgd)		16.0	19.0	17.6	16.8	15.5	14.1	12.3	10.4
Peak (mgd)		3.0	3.3	(0.1)	(2.2)	(5.5)	(8.7)	(13.4)	(18.1)

NOTES:
(1) Assumes urban/transitional mix for an average water savings of 2% in 1995, and 5% in 2000 and thereafter.
(2) Moderate growth projection from Water System Plan used through 2000. 2020 taken from June 1988 PSCOG forecast. From 2020 to 2040 straight-line projection. Data for 2010 linearly extrapolated.
(3) Per Bernie Christensen, URS, Water System Plan uses 310 gpcd for peak day.
(4) Average and peak day demand through 2000 taken from Water System Plan, Table III-7. After 2000, based on calculated average gallons per capita per day (gpcd) and peak to average day demand factor.
(5) Capacity figures from Jim Miller, FWWS.
(6) FWWS share of RWA 15 mgd allocation of PL#5 is 30.77%, or 4.62 mgd. This analysis assumes indefinite delay.

Sources of information:
Water System Plan, 1989 (URS), and updated per phone conversations with Jim Miller, FWWS and Bernie Christensen, URS on June 1, 1989.

Options open to the District:
Rely on the construction of Pipeline #5;
Assess potential of deep aquifer;
Explore purchase from Auburn, which depends on at least partial construction of PL #5; or from other purveyors;
Investigate demand management.

TABLE I-2c

FEDERAL WAY WATER AND SEWER
WITHOUT PIPELINE NO. 5
WITH WATER CONSERVATION (1)

Year	1980	1985	1990	1995	2000	2010	2020	2030	2040
Service population (2):		65,447	84,143	97,201	107,213	118,351	129,488	145,460	161,432
DEMAND									
Ann. Avg. gpcd		124	124	118	112	112	112	112	112
Peak gpcd (3)		323	310	295	279	279	279	279	279
Peak/Avg. ratio		2.6	2.5	2.5	2.5	2.5	2.5	2.5	2.5
Unaccounted-for %									
System avg. demand (mgd) (4)		8.1	10.4	11.5	12.0	13.2	14.5	16.2	18.0
System peak demand (mgd) (4)		21.2	26.1	28.6	29.9	33.0	36.1	40.6	45.0
SOURCES									
Description		19 wells (5)		PL#5(6)					
Capacity (mgd)		24.1	29.4	29.4	29.4	29.4	29.4	29.4	29.4
Water rights			38.1						
BALANCE: SURPLUS OR (DEFICIT)									
Average (mgd)		16.0	19.0	17.9	17.4	16.2	14.9	13.2	11.4
Peak (mgd)		3.0	3.3	0.8	(0.5)	(3.6)	(6.7)	(11.2)	(15.6)

NOTES:
(1) Assumes water savings of 5% in 1995, and 10% in 2000 and thereafter.
(2) Moderate growth projection from Water System Plan used through 2000. 2020 taken from June 1988 PSCOG forecast. From 2020 to 2040 straight-line projection. Data for 2010 linearly extrapolated.
(3) Per Bernie Christensen, URS, Water System Plan uses 310 gpcd for peak day.
(4) Average and peak day demand through 2000 taken from Water System Plan, Table III-7. After 2000, based on calculated average gallons per capita per day (gpcd) and peak to average day demand factor.
(5) Capacity figures from Jim Miller, FWWS.
(6) FWWS share of RWA 15 mgd allocation of PL#5 is 30.77%, or 4.62 mgd. This analysis assumes indefinite delay.

Sources of information:
Water System Plan, 1989 (URS), and updated per phone conversations with Jim Miller, FWWS and Bernie Christensen, URS on June 1, 1989.

Options open to the District:
Rely on the construction of Pipeline #5;
Assess potential of deep aquifer;
Explore purchase from Auburn, which depends on at least partial construction of PL #5; or from other purveyors;

TABLE I-2d

FEDERAL WAY WATER AND SEWER
WITHOUT PIPELINE NO. 5
WITH CONSERVATION AND INCREASE IN MULTI-FAMILY UNITS (1)

Year	1980	1985	1990	1995	2000	2010	2020	2030	2040
Service population (2):		65,447	84,143	97,201	107,213	118,351	129,488	145,460	161,432
DEMAND									
Ann. Avg. gpcd		124	124	115	105	105	105	105	105
Peak gpcd (3)		323	310	288	264	264	264	264	264
Peak/Avg. ratio		2.6	2.5	2.5	2.5	2.5	2.5	2.5	2.5
Unaccounted-for %									
System avg. demand (mgd) (4)		8.1	10.4	12.1	13.3	12.5	13.6	15.3	17.0
System peak demand (mgd) (4)		21.2	27.2	28.0	28.3	31.2	34.1	38.3	42.5
SOURCES									
Description		19 wells (5)		PL#5(6)					
Capacity (mgd)		24.1	29.4	29.4	29.4	29.4	29.4	29.4	29.4
Water rights			38.1						
BALANCE: SURPLUS OR (DEFICIT)									
Average (mgd)		16.0	19.0	17.3	16.1	16.9	15.8	14.1	12.4
Peak (mgd)		3.0	2.2	1.4	1.1	(1.8)	(4.7)	(8.9)	(13.1)

NOTES:
(1) Assumes urban/transitional mix for an average water savings of 2% in 1995, and 5% in 2000 and thereafter.
(2) Moderate growth projection from Water System Plan used through 2000. 2020 taken from June 1988 PSCOG forecast. From 2020 to 2040 straight-line projection. Data for 2010 linearly extrapolated.
(3) Per Bernie Christensen, URS, Water System Plan uses 310 gpcd for peak day.
(4) Per Jim Miller, FWWS.
(5) Average and peak day demand through 2000 taken from Water System Plan, Table III-7. After 2000, based on calculated average gallons per capita per day (gpcd) and peak to average day demand factor.
(6) Capacity figures from Jim Miller, FWWS.
(7) FWWS share of RWA 15 mgd allocation of PL#5 is 30.77%, or 4.62 mgd. This analysis assumes indefinite delay.

Sources of information:
Water System Plan, 1989 (URS), and updated per phone conversations with Jim Miller, FWWS and Bernie Christensen, URS on June 1, 1989.

Options open to the District:
Rely on the construction of Pipeline #5;
Assess potential of deep aquifer;
Explore purchase from Auburn, which depends on at least partial construction of PL #5; or from other purveyors;
Investigate demand management.

TABLE I-3a

CITY OF KENT
WITHOUT PIPELINE NO. 5
EXISTING CONDITION (1)

Year	1980	1985	1990	1995	2000	2010	2020	2030	2040
Service population (2):	24,943	33,506	39,146	46,218	53,289	56,161	59,033	61,905	64,777
DEMAND									
Ann. Avg. gpcd		192	192	192	192	192	192	192	192
Peak gpcd		388	356	353	351	351	351	351	351
Peak/Avg. ratio (3)		2.0	1.9	1.8	1.8	1.8	1.8	1.8	1.8
Unaccounted-for %									
System avg. demand (mgd) (4)		6.4	7.5	8.9	10.2	10.8	11.3	11.9	12.4
System peak demand (mgd) (5)	11.5	13.0	13.9	16.3	18.7	19.7	20.7	21.7	22.8
SOURCES				PL#5 (7)					
Description		(6)	Wells-Interties(7)			Impoundment+Wells(7)			
Capacity, peak (mgd)		17.6	19.4	19.4	19.4	29.4	33.4	33.4	33.4
Water rights			40.8						
BALANCE: SURPLUS OR (DEFICIT)									
Average (mgd)		11.1	11.9	10.5	9.2	18.6	22.1	21.5	21.0
Peak (mgd)		4.6	5.5	3.1	0.7	9.7	12.7	11.7	10.6

NOTES:
(1) As described in 1988 Water System Plan.
(2) Population projections were linearly extrapolated from Water System Plan through 2000. Actual PSCOG data for 2010 and 2020 using estimated percentages of FAZ and service area are less than Kent's 2000 population estimate. Therefore, a straight-line projection from Kent's 2000 figure to 2040 based on straight-line projection of June 1988 PSCOG data from 2020 to 2040.
(3) Based on 1985 peak to average day ratio.
(4) Average day for 1985 taken from Water System Plan. Projected based on average gpcd for 1985.
(5) Peak day demand through 2000 taken from Water System Plan, Table 14, pp. 93.
(6) Includes 7 wells and springs, plus interties with KCWD75 and Tukwila.
(7) CIP sequence (as shown in Table 20, p. 121 of Water System Plan):
1989 - 212th St. wells at 1.96 mgd;
1990 - 42nd Ave. wells at 2.75 mgd;
1990 - Assume discontinuation of Interties less 2.92 mgd;
1993 - Pipeline 5 is delayed indefinitely (Kent share is 4.62 mgd).
2006 - Impoundment & WTP at 7 mgd peak capacity (relies on springs included above or PL5 for source);
2011 - Auburn well field at 10 mgd; and
2017 - Additional 4 mgd of treatment.

Sources of information:
Water System Plan for the City of Kent, 1988; PSCOG Forecasts; D. Wickstrom, personal communication.

TABLE I-3b

CITY OF KENT
WITHOUT PIPELINE NO. 5
WITH AN INCREASE IN MULTI-FAMILY UNITS (1)

Year	1980	1985	1990	1995	2000	2010	2020	2030	2040
Service population (2):	24,943	33,506	39,146	46,218	53,289	56,161	59,033	61,905	64,777
DEMAND									
Ann. Avg. gpcd		192	192	189	185	185	185	185	185
Peak gpcd		388	356	340	334	334	334	334	334
Peak/Avg. ratio (3)		2.0	1.9	1.8	1.8	1.8	1.8	1.8	1.8
Unaccounted-for %									
System avg. demand (mgd) (4)		6.4	7.5	8.7	9.9	10.4	10.9	11.5	12.0
System peak demand (mgd) (5)	11.5	13.0	13.9	15.7	17.8	18.7	19.7	20.6	21.6
SOURCES				PL#5 (7)					
Description		(6)	Wells-Interties(7)			Impoundment+Wells(7)			
Capacity, peak (mgd)		17.6	19.4	19.4	19.4	29.4	33.4	33.4	33.4
Water rights			40.8						
BALANCE: SURPLUS OR (DEFICIT)									
Average (mgd)		11.1	11.9	10.7	9.5	19.0	22.5	21.9	21.4
Peak (mgd)		4.6	5.5	3.7	1.6	10.7	13.7	12.8	11.8

NOTES:
(1) Assumes water savings of 1.5% in 1995, and 3.5% in 2000 and thereafter because of urbanization.
(2) Population projections were linearly extrapolated from Water System Plan through 2000. Actual PSCOG data for 2010 and 2020 using estimated percentages of FAZ and service area are less than Kent's 2000 population estimate. Therefore, a straight-line projection from Kent's 2000 figure to 2040 based on straight-line projection of June 1988 PSCOG data from 2020 to 2040.
(3) Based on 1985 peak to average day ratio.
(4) Average day for 1985 taken from Water System Plan. Projected based on average gpcd for 1985.
(5) Peak day demand through 2000 taken from Water System Plan, Table 14, pp. 93.
(6) Includes 7 wells and springs, plus interties with KCWD75 and Tukwila.
(7) CIP sequence (as shown in Table 20, p. 121 of Water System Plan):
    1989 - 212th St. wells at 1.96 mgd;
    1990 - 42nd Ave. wells at 2.75 mgd;
    1990 - Assume discontinuation of Interties less 2.92 mgd;
    1993 - Pipeline 5 is delayed indefinitely (Kent share is 4.62 mgd).
    2006 - Impoundment & WTP at 7 mgd peak capacity (relies on springs included above or PL5 for source);
    2011 - Auburn well field at 10 mgd; and
    2017 - Additional 4 mgd of treatment.

Sources of information:
Water System Plan for the City of Kent, 1988; PSCOG Forecasts; D. Wickstrom, personal communication.

TABLE I-3c

CITY OF KENT
WITHOUT PIPELINE NO. 5
WITH WATER CONSERVATION (1)

Year	1980	1985	1990	1995	2000	2010	2020	2030	2040
Service population (2):	24,943	33,506	39,146	46,218	53,289	56,161	59,033	61,905	64,777
DEMAND									
Ann. Avg. gpcd		192	192	182	173	173	173	173	173
Peak gpcd		388	356	328	311	311	311	311	311
Peak/Avg. ratio (3)		2.0	1.9	1.8	1.8	1.8	1.8	1.8	1.8
Unaccounted-for %									
System avg. demand (mgd) (4)		6.4	7.5	8.4	9.2	9.7	10.2	10.7	11.2
System peak demand (mgd) (5)	11.5	13.0	13.9	15.2	16.6	17.5	18.4	19.2	20.1
SOURCES				PL#5 (7)					
Description		(6)	Wells-Interties(7)			Impoundment+Wells(7)			
Capacity, peak (mgd)		17.6	19.4	19.4	19.4	29.4	33.4	33.4	33.4
Water rights			40.8						
BALANCE: SURPLUS OR (DEFICIT)									
Average (mgd)		11.1	11.9	11.0	10.2	19.7	23.2	22.7	22.2
Peak (mgd)		4.6	5.5	4.2	2.8	11.9	15.0	14.2	13.3

NOTES:
(1) Assumes water savings of 5% in 1995, and 10% in 2000 and thereafter.
(2) Population projections were linearly extrapolated from Water System Plan through 2000. Actual PSCOG data for 2010 and 2020 using estimated percentages of FAZ and service area are less than Kent's 2000 population estimate. Therefore, a straight-line projection from Kent's 2000 figure to 2040 based on straight-line projection of June 1988 PSCOG data from 2020 to 2040.
(3) Based on 1985 peak to average day ratio.
(4) Average day for 1985 taken from Water System Plan. Projected based on average gpcd for 1985.
(5) Peak day demand through 2000 taken from Water System Plan, Table 14, pp. 93.
(6) Includes 7 wells and springs, plus interties with KCWD75 and Tukwila.
(7) CIP sequence (as shown in Table 20, p. 121 of Water System Plan):
    1989 - 212th St. wells at 1.96 mgd;
    1990 - 42nd Ave. wells at 2.75 mgd;
    1990 - Assume discontinuation of Interties less 2.92 mgd;
    1993 - Pipeline 5 is delayed indefinitely (Kent share is 4.62 mgd).
    2006 - Impoundment & WTP at 7 mgd peak capacity (relies on springs included above or PL5 for source);
    2011 - Auburn well field at 10 mgd; and
    2017 - Additional 4 mgd of treatment.

Sources of information:
Water System Plan for the City of Kent, 1988; PSCOG Forecasts; D. Wickstrom, personal communication.

TABLE I-3d

CITY OF KENT
WITHOUT PIPELINE NO. 5
WITH CONSERVATION AND INCREASE IN MULTI-FAMILY UNITS (1)

Year	1980	1985	1990	1995	2000	2010	2020	2030	2040
Service population (2):	24,943	33,506	39,146	46,218	53,289	56,161	59,033	61,905	64,777
DEMAND									
Ann. Avg. gpcd		192	192	180	166	166	166	166	166
Peak gpcd		388	356	323	299	299	299	299	299
Peak/Avg. ratio (3)		2.0	1.9	1.8	1.8	1.8	1.8	1.8	1.8
Unaccounted-for %									
System avg. demand (mgd) (4)		6.4	7.5	8.3	8.9	9.3	9.8	10.3	10.8
System peak demand (mgd) (5)	11.5	13.0	13.9	14.9	15.9	16.8	17.6	18.5	19.4
SOURCES				PL#5 (7)					
Description		(6)	Wells-Interties(7)			Impoundment+Wells(7)			
Capacity, peak (mgd)		17.6	19.4	19.4	19.4	29.4	33.4	33.4	33.4
Water rights			40.8						
BALANCE: SURPLUS OR (DEFICIT)									
Average (mgd)		11.1	11.9	11.1	10.5	20.1	23.6	23.1	22.6
Peak (mgd)		4.6	5.5	4.5	3.5	12.6	15.8	14.9	14.0

NOTES:
(1) Assumes combined water savings of 6.5% in 1995, and 13.5% in 2000 and thereafter because of urbanization, and conservation.
(2) Population projections were linearly extrapolated from Water System Plan through 2000. Actual PSCOG data for 2010 and 2020 using estimated percentages of FAZ and service area are less than Kent's 2000 population estimate. Therefore, a straight-line projection from Kent's 2000 figure to 2040 based on straight-line projection of June 1988 PSCOG data from 2020 to 2040.
(3) Based on 1985 peak to average day ratio.
(4) Average day for 1985 taken from Water System Plan. Projected based on average gpcd for 1985.
(5) Peak day demand through 2000 taken from Water System Plan, Table 14, pp. 93.
(6) Includes 7 wells and springs, plus interties with KCWD75 and Tukwila.
(7) CIP sequence (as shown in Table 20, p. 121 of Water System Plan):
    1989 - 212th St. wells at 1.96 mgd;
    1990 - 42nd Ave. wells at 2.75 mgd;
    1990 - Assume discontinuation of Interties less 2.92 mgd;
    1993 - Pipeline 5 is delayed indefinitely (Kent share is 4.62 mgd).
    2006 - Impoundment & WTP at 7 mgd peak capacity (relies on springs included above or PL5 for source);
    2011 - Auburn well field at 10 mgd; and
    2017 - Additional 4 mgd of treatment.

Sources of information:
Water System Plan for the City of Kent, 1988; PSCOG Forecasts; D. Wickstrom, personal communication.

TABLE I-4a

KCWD NO. 75
NOT DIRECTLY EFFECTED BY PIPELINE NO. 5
EXISTING CONDITION (1)

Year	1980	1985	1990	1995	2000	2010	2020	2030	2040
Service population (2):		48,939	53,277	55,464	60,015	64,414	70,972	76,207	81,442
DEMAND									
Ann. Avg. gpcd (3)		150	149	150	153	153	153	153	153
Peak gpcd (3)		334	377	380	386	386	386	386	386
Peak/Avg. ratio (4)		2.2	2.5	2.5	2.5	2.5	2.5	2.5	2.5
Unaccounted-for % (5)		17%	16%	10%	10%	10%	10%	10%	10%
System avg. demand (mgd) (6)		7.4	7.9	8.3	9.2	9.8	10.8	11.6	12.4
System peak demand (mgd)(6)		16.4	20.1	21.1	23.2	24.9	27.4	29.4	31.4
SOURCES									
Description	PL#4(7)	Wells(8)	Highline(9)						
Capacity (mgd)	22.5	28.8	28.8	28.8	28.8	28.8	28.8	28.8	28.8
Water rights	Wells, 19 mgd; Green River, 26 mgd; NF Snoqualmie, 26 mgd.								
BALANCE: SURPLUS OR (DEFICIT)									
Average (mgd)		21.5	20.9	20.5	19.7	19.0	18.0	17.2	16.4
Peak (mgd)		12.5	8.8	7.8	5.7	4.0	1.4	(0.6)	(2.6)

NOTES:
(1) As described in 1988 Draft Water System Plan.
(2) Population projections were taken from Water System Plan through 2000. 2020 taken from June 1988 PSCOG forecast. From 2020 to 2040 straight-line projection. Data for 2010 linearly extrapolated.
(3) Based on projected demand and estimated population.
(4) Derived based on projected average and peak day demand.
(5) Unaccounted-for water usage estimated in Draft Plan as percentage of total average daily use.
(6) Average and peak day taken from Water System Plan through 2000.
(7) Contract amount for Seattle supply is for 20 mgd. PL#4 hydraulically capable of supplying 22.5 mgd.
(8) Des Moines Well 3.60 mgd and Angle Lake Well 2.74 mgd. Operationally limited to 3.25 mgd.
(9) Highline well field expected to yield 12 mgd; WD75 share undetermined.

Sources of information:
Draft Comprehensive Water System Plan, June 1988 (CH2M-Hill)

TABLE I-4b

KCWD NO. 75
NOT DIRECTLY EFFECTED BY PIPELINE NO. 5
WITH AN INCREASE IN MULTI-FAMILY UNITS (1)

Year	1980	1985	1990	1995	2000	2010	2020	2030	2040
Service population (2):		48,939	53,277	55,464	60,015	64,414	70,972	76,207	81,442
DEMAND									
Ann. Avg. gpcd (3)		150	149	148	145	145	145	145	145
Peak gpcd (4)		334	377	374	366	366	366	366	366
Peak/Avg. ratio (4)		2.2	2.5	2.5	2.5	2.5	2.5	2.5	2.5
Unaccounted-for % (5)		17%	16%	10%	10%	10%	10%	10%	10%
System avg. demand (mgd)		7.4	7.9	8.2	8.7	9.3	10.3	11.0	11.8
System peak demand (mgd)(6)		16.4	20.1	20.7	22.0	23.6	26.0	27.9	29.8
SOURCES									
Description	PL#4(7)	Wells(8)	Highline(9)						
Capacity (mgd)	22.5	28.8	28.8	28.8	28.8	28.8	28.8	28.8	28.8
Water rights	Wells, 19 mgd; Green River, 26 mgd; NF Snoqualmie, 26 mgd.								
BALANCE: SURPLUS OR (DEFICIT)									
Average (mgd)		21.5	20.9	20.6	20.2	19.5	18.6	17.8	17.1
Peak (mgd)		12.5	8.8	8.1	6.9	5.3	2.9	0.9	(1.0)

NOTES:
(1) Assumes water savings of 1.5% in 1995, and 3.5% in 2000 and thereafter because urbanized area.
(2) Population projections were taken from Water System Plan through 2000. 2020 taken from June 1988 PSCOG forecast. From 2020 to 2040 straight-line projection. Data for 2010 linearly extrapolated.
(3) Based on projected demand and estimated population.
(4) Derived based on projected average and peak day demand.
(5) Unaccounted-for water usage estimated in Draft Plan as percentage of total average daily use.
(6) Average and peak day taken from Water System Plan through 2000.
(7) Contract amount for Seattle supply is for 20 mgd. PL#4 hydraulically capable of supplying 22.5 mgd.
(8) Des Moines Well 3.60 mgd and Angle Lake Well 2.74 mgd. Operationally limited to 3.25 mgd.
(9) Highline well field expected to yield 12 mgd; WD75 share undetermined.

Sources of information:
Draft Comprehensive Water System Plan, June 1988 (CH2M-Hill)

TABLE I-4c

KCWD NO. 75
NOT DIRECTLY EFFECTED BY PIPELINE NO. 5
WITH WATER CONSERVATION (1)

Year	1980	1985	1990	1995	2000	2010	2020	2030	2040
Service population (2):		48,939	53,277	55,464	60,015	64,414	70,972	76,207	81,442
DEMAND									
Ann. Avg. gpcd (3)		150	149	141	134	134	134	134	134
Peak gpcd (4)		334	377	358	339	339	339	339	339
Peak/Avg. ratio (4)		2.2	2.5	2.5	2.5	2.5	2.5	2.5	2.5
Unaccounted-for % (5)		17%	16%	10%	10%	10%	10%	10%	10%
System avg. demand (mgd)		7.4	7.9	7.8	8.0	8.6	9.5	10.2	10.9
System peak demand (mgd)(6)		16.4	20.1	19.8	20.3	21.8	24.1	25.8	27.6
SOURCES									
Description	PL#4(7)	Wells(8)	Highline(9)						
Capacity (mgd)	22.5	28.8	28.8	28.8	28.8	28.8	28.8	28.8	28.8
Water rights	Wells, 19 mgd; Green River, 26 mgd; NF Snoqualmie, 26 mgd.								
BALANCE: SURPLUS OR (DEFICIT)									
Average (mgd)		21.5	20.9	21.0	20.8	20.2	19.3	18.6	17.9
Peak (mgd)		12.5	8.8	9.0	8.5	7.0	4.8	3.0	1.2

NOTES:
(1) Assumes water savings of 5% in 1995, and 10% in 2000 and thereafter.
(2) Population projections were taken from Water System Plan through 2000. 2020 taken from June 1988 PSCOG forecast. From 2020 to 2040 straight-line projection. Data for 2010 linearly extrapolated.
(3) Based on projected demand and estimated population.
(4) Derived based on projected average and peak day demand.
(5) Unaccounted-for water usage estimated in Draft Plan as percentage of total average daily use.
(6) Average and peak day taken from Water System Plan through 2000.
(7) Contract amount for Seattle supply is for 20 mgd. PL#4 hydraulically capable of supplying 22.5 mgd.
(8) Des Moines Well 3.60 mgd and Angle Lake Well 2.74 mgd. Operationally limited to 3.25 mgd.
(9) Highline well field expected to yield 12 mgd; WD75 share undetermined.

Sources of information:
Draft Comprehensive Water System Plan, June 1988 (CH2M-Hill)

TABLE I-4d

KCWD NO. 75
NOT DIRECTLY EFFECTED BY PIPELINE NO. 5
WITH CONSERVATION AND INCREASE IN MULTI-FAMILY UNITS (1)

Year	1980	1985	1990	1995	2000	2010	2020	2030	2040
Service population (2):		48,939	53,277	55,464	60,015	64,414	70,972	76,207	81,442
DEMAND									
Ann. Avg. gpcd (3)		150	149	140	130	130	130	130	130
Peak gpcd (4)		334	377	355	328	328	328	328	328
Peak/Avg. ratio (4)		2.2	2.5	2.5	2.5	2.5	2.5	2.5	2.5
Unaccounted-for % (5)		17%	16%	10%	10%	10%	10%	10%	10%
System avg. demand (mgd)		7.4	7.9	7.8	7.8	8.4	9.2	9.9	10.6
System peak demand (mgd)(6)		16.4	20.1	19.7	19.7	21.1	23.3	25.0	26.7
SOURCES									
Description	PL#4(7)	Wells(8)	Highline(9)						
Capacity (mgd)	22.5	28.8	28.8	28.8	28.8	28.8	28.8	28.8	28.8
Water rights	Wells, 19 mgd; Green River, 26 mgd; NF Snoqualmie, 26 mgd.								
BALANCE: SURPLUS OR (DEFICIT)									
Average (mgd)		21.5	20.9	21.1	21.1	20.5	19.6	19.0	18.3
Peak (mgd)		12.5	8.8	9.2	9.1	7.7	5.5	3.8	2.1

NOTES:
(1) Assumes combined water savings of 6.5% in 1995, and 13.5% in 2000 and thereafter because urbanized area.
(2) Population projections were taken from Water System Plan through 2000. 2020 taken from June 1988 PSCOG forecast. From 2020 to 2040 straight-line projection. Data for 2010 linearly extrapolated.
(3) Based on projected demand and estimated population.
(4) Derived based on projected average and peak day demand.
(5) Unaccounted-for water usage estimated in Draft Plan as percentage of total average daily use.
(6) Average and peak day taken from Water System Plan through 2000.
(7) Contract amount for Seattle supply is for 20 mgd. PL#4 hydraulically capable of supplying 22.5 mgd.
(8) Des Moines Well 3.60 mgd and Angle Lake Well 2.74 mgd. Operationally limited to 3.25 mgd.
(9) Highline well field expected to yield 12 mgd; WD75 share undetermined.

Sources of information:
Draft Comprehensive Water System Plan, June 1988 (CH2M-Hill)

TABLE I-5a

COVINGTON WATER DISTRICT
WITHOUT PIPELINE NO. 5
EXISTING CONDITION (1)

Year	1980	1985	1990	1995	2000	2010	2020	2030	2040
Service population (2)		19,986	23,020	28,250	34,450	51,278	68,106	81,599	95,092
DEMAND									
Ann. Avg. gpcd (3)		117	117	117	117	117	117	117	117
Peak gpcd (3)		224	224	224	224	224	224	224	224
Peak/Avg. ratio (3)		1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9
Unaccounted-for % (4)			15%						
System avg. demand (mgd) (5)		2.3	2.7	3.3	4.0	6.0	8.0	9.5	11.1
System peak demand (mgd) (5)		4.5	5.2	6.3	7.7	11.5	15.3	18.3	21.3
SOURCES									
Description		Wells(6)	(7)	PL#5(8)					
Capacity (mgd)		4.8	5.5	5.5	5.5	5.5	5.5	5.5	5.5
Water rights		6.2							
BALANCE: SURPLUS OR (DEFICIT)									
Average (mgd)		2.5	2.8	2.2	1.5	(0.5)	(2.4)	(4.0)	(5.6)
Peak (mgd)		0.3	0.4	(0.8)	(2.2)	(6.0)	(9.7)	(12.8)	(15.8)

NOTES:
(1) As described in 1989 Water System Plan.
(2) Population projections were taken from Water System Plan through 2000. 2020 taken from June 1988 PSCOG forecast. From 2020 to 2040 straight-line projection. Data for 2010 linearly extrapolated.
(3) Taken from Water System Plan, Table III-1.
(4) Leak survey done in 1985 disclosed 0.6 mgd loss. District has continuing program.
(5) Average and peak day demand through 2000 taken from Water System Plan, Table III-1.
(6) Amounts shown are for 5 wells at Lake Sawyer; recharge estimated at 6-12 mgd. 1 well abandoned. Aquifer is shallow and has high transmissivity, with consequent contamination potential.
(7) Includes Witte Road Well with capacity of 500 gpm.
(8) District has contracted for 3.46 mgd from PL#5 (23.08% of RWA's 15 mgd). This table assumes no pipeline is built.

Sources of information:
Water System Plan, 1989 (URS); J. Nelson, Covington Water District.

TABLE I-5b

COVINGTON WATER DISTRICT
WITHOUT PIPELINE NO. 5
NO INCREASE IN MULTI-FAMILY UNITS (1)

Year	1980	1985	1990	1995	2000	2010	2020	2030	2040
Service population (2)		19,986	23,020	28,250	34,450	51,278	68,106	81,599	95,092
DEMAND									
Ann. Avg. gpcd (3)		117	117	117	117	117	117	117	117
Peak gpcd (3)		224	224	224	224	224	224	224	224
Peak/Avg. ratio (3)		1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9
Unaccounted-for % (4)			15%						
System avg. demand (mgd) (5)		2.3	2.7	3.3	4.0	6.0	8.0	9.5	11.1
System peak demand (mgd) (5)		4.5	5.2	6.3	7.7	11.5	15.3	18.3	21.3
SOURCES									
Description		Wells(6)	(7)	PL#5(8)					
Capacity (mgd)		4.8	5.5	5.5	5.5	5.5	5.5	5.5	5.5
Water rights		6.2							
BALANCE: SURPLUS OR (DEFICIT)									
Average (mgd)		2.5	2.8	2.2	1.5	(0.5)	(2.5)	(4.0)	(5.6)
Peak (mgd)		0.3	0.4	(0.8)	(2.2)	(6.0)	(9.8)	(12.8)	(15.8)

NOTES:
(1) No reduction in water use assumed because of rural nature of area.
(2) Population projections were taken from Water System Plan through 2000. 2020 taken from June 1988 PSCOG forecast. From 2020 to 2040 straight-line projection. Data for 2010 linearly extrapolated.
(3) Taken from Water System Plan, Table III-1.
(4) Leak survey done in 1985 disclosed 0.6 mgd loss. District has continuing program.
(5) Average and peak day demand through 2000 taken from Water System Plan, Table III-1.
(6) Amounts shown are for 5 wells at Lake Sawyer; recharge estimated at 6-12 mgd. 1 well abandoned. Aquifer is shallow and has high transmissivity, with consequent contamination potential.
(7) Includes Witte Road Well with capacity of 500 gpm.
(8) District has contracted for 3.46 mgd from PL#5 (23.08% of RWA's 15 mgd). This table assumes no pipeline is built.

Sources of information:
Water System Plan, 1989 (URS); J. Nelson, Covington Water District.

TABLE I-5c

COVINGTON WATER DISTRICT
WITHOUT PIPELINE NO. 5
WITH WATER CONSERVATION (1)

Year	1980	1985	1990	1995	2000	2010	2020	2030	2040
Service population (2)		19,986	23,020	28,250	34,450	51,278	68,106	81,599	95,092
DEMAND									
Ann. Avg. gpcd (3)		117	117	111	105	105	105	105	105
Peak gpcd (3)		224	224	211	200	200	200	200	200
Peak/Avg. ratio (3)		1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9
Unaccounted-for % (4)			15%						
System avg. demand (mgd) (5)		2.3	2.7	3.1	3.6	5.4	7.2	8.6	10.0
System peak demand (mgd) (5)		4.5	5.2	6.0	6.9	10.2	13.6	16.3	19.0
SOURCES									
Description		Wells(6)	(7)	PL#5(8)					
Capacity (mgd)		4.8	5.5	5.5	5.5	5.5	5.5	5.5	5.5
Water rights		6.2							
BALANCE: SURPLUS OR (DEFICIT)									
Average (mgd)		2.5	2.8	2.4	1.9	0.1	(1.7)	(3.1)	(4.5)
Peak (mgd)		0.3	0.4	(0.5)	(1.4)	(4.7)	(8.1)	(10.8)	(13.5)

NOTES:
(1) Assumes water savings of 5% in 1995, and 10% in 2000 and thereafter.
(2) Population projections were taken from Water System Plan through 2000. 2020 taken from June 1988 PSCOG forecast. From 2020 to 2040 straight-line projection. Data for 2010 linearly extrapolated.
(3) Taken from Water System Plan, Table III-1.
(4) Leak survey done in 1985 disclosed 0.6 mgd loss. District has continuing program.
(5) Average and peak day demand through 2000 taken from Water System Plan, Table III-1.
(6) Amounts shown are for 5 wells at Lake Sawyer; recharge estimated at 6-12 mgd. 1 well abandoned. Aquifer is shallow and has high transmissivity, with consequent contamination potential.
(7) Includes Witte Road Well with capacity of 500 gpm.
(8) District has contracted for 3.46 mgd from PL#5 (23.08% of RWA's 15 mgd). This table assumes no pipeline is built.

Sources of information:
Water System Plan, 1989 (URS); J. Nelson, Covington Water District.

TABLE I-5d

COVINGTON WATER DISTRICT
WITHOUT PIPELINE NO. 5
WITH CONSERVATION AND INCREASE IN MULTI-FAMILY UNITS (1)

Year	1980	1985	1990	1995	2000	2010	2020	2030	2040
Service population (2)		19,986	23,020	28,250	34,450	51,278	68,106	81,599	95,092
DEMAND									
Ann. Avg. gpcd (3)		117	117	111	105	105	105	105	105
Peak gpcd (3)		224	224	211	200	200	200	200	200
Peak/Avg. ratio (3)		1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9
Unaccounted-for % (4)			15%						
System avg. demand (mgd) (5)		2.3	2.7	3.1	3.6	5.4	7.2	8.6	10.0
System peak demand (mgd) (5)		4.5	5.2	6.0	6.9	10.2	13.6	16.3	19.0
SOURCES									
Description		Wells(6)	(7)	PL#5(8)					
Capacity (mgd)		4.8	5.5	5.5	5.5	5.5	5.5	5.5	5.5
Water rights		6.2							
BALANCE: SURPLUS OR (DEFICIT)									
Average (mgd)		2.5	2.8	2.4	1.9	0.1	(1.7)	(3.1)	(4.5)
Peak (mgd)		0.3	0.4	(0.5)	(1.4)	(4.7)	(8.1)	(10.8)	(13.5)

NOTES:
(1) Assumes water conservation savings of 5% in 1995, and 10% in 2000 and thereafter because rural area.
(2) Population projections were taken from Water System Plan through 2000. 2020 taken from June 1988 PSCOG forecast. From 2020 to 2040 straight-line projection. Data for 2010 linearly extrapolated.
(3) Taken from Water System Plan, Table III-1.
(4) Leak survey done in 1985 disclosed 0.6 mgd loss. District has continuing program.
(5) Average and peak day demand through 2000 taken from Water System Plan, Table III-1.
(6) Amounts shown are for 5 wells at Lake Sawyer; recharge estimated at 6-12 mgd. 1 well abandoned. Aquifer is shallow and has high transmissivity, with consequent contamination potential.
(7) Includes Witte Road Well with capacity of 500 gpm.
(8) District has contracted for 3.46 mgd from PL#5 (23.08% of RWA's 15 mgd). This table assumes no pipeline is built.

Sources of information:
Water System Plan, 1989 (URS); J. Nelson, Covington Water District.

TABLE I-6a

KCWD NO. 111
WITHOUT PIPELINE NO. 5
EXISTING CONDITION (1)

Year	1980	1985	1990	1995	2000	2010	2020	2030	2040
Service population (2):		9,520	10,585	13,298	16,010	20,457	24,903	29,548	34,193
DEMAND									
Ann. Avg. gpcd (3)		84	86	84	86	86	86	86	86
Peak gpcd (3)		239	240	235	240	240	240	240	240
Peak/Avg. ratio (3)		2.8	2.8	2.8	2.8	2.8	2.8	2.8	2.8
Unaccounted-for % (4)		10.0							
System avg. demand (mgd) (5)		0.8	0.9	1.1	1.4	1.8	2.1	2.5	2.9
System peak demand (mgd) (5)		2.3	2.5	3.1	3.8	4.9	6.0	7.1	8.3
SOURCES									
Description	6 wells (6)		(7)	PL#5 (8)					
Capacity (mgd)		2.8	3.2	3.2	3.2	3.2	3.2	3.2	3.2
Water rights		2.9							
BALANCE: SURPLUS OR (DEFICIT)									
Average (mgd)		2.0	2.2	2.0	1.8	1.4	1.0	0.6	0.2
Peak (mgd)		0.5	0.6	0.0	(0.7)	(1.8)	(2.9)	(4.0)	(5.1)

NOTES:
(1) As described in 1989 Water System Plan.
(2) Population projections were taken from Water System Plan through 2000. 2020 taken from June 1988 PSCOG forecast. From 2020 to 2040 straight-line projection. Data for 2010 linearly projected.
(3) Taken from Water System Plan, Table II-3, p. II-14.
(4) Taken from Water System Plan, p. II-11.
(5) Average and peak day demand through 2000 taken from Water System Plan, Table II-3. After 2000, based on calculated average gallons per capita per day (gpcd) and peak to average day demand factor.
(6) Includes 650 gpm in application for Well No. 6; capacity is 650-700 gpm.
(7) Includes Well No. 7 with capacity of 250 gpm.
(8) Requested allocation from PL#5 is 2.3 mgd; assumed here to be delayed indefinitely.

Sources of information: Water System Plan, 1989 (URS)

TABLE I-6b

KCWD NO. 111
WITHOUT PIPELINE NO. 5
WITH AN INCREASE IN MULTI-FAMILY UNITS (1)

Year	1980	1985	1990	1995	2000	2010	2020	2030	2040
Service population (2):		9,520	10,585	13,030	16,010	24,687	31,728	38,770	46,650
DEMAND									
Ann. Avg. gpcd (3)		86	86	83	80	80	80	80	80
Peak gpcd (3)		240	240	234	224	224	224	224	224
Peak/Avg. ratio (3)		2.8	2.8	2.8	2.8	2.8	2.8	2.8	2.8
Unaccounted-for % (4)		10.0							
System avg. demand (mgd) (5)		0.8	0.9	1.1	1.3	2.0	2.5	3.1	3.7
System peak demand (mgd) (5)		2.3	2.5	3.1	3.6	5.5	7.1	8.7	10.4
SOURCES									
Description		6 wells (6)		(7) PL#5 (8)					
Capacity (mgd)		2.8	3.2	3.2	3.2	3.2	3.2	3.2	3.2
Water rights		2.9							
BALANCE: SURPLUS OR (DEFICIT)									
Average (mgd)		2.0	2.3	2.1	1.9	1.2	0.6	0.1	(0.6)
Peak (mgd)		0.5	0.6	0.1	(0.4)	(2.4)	(3.9)	(5.5)	(7.3)

NOTES:
(1) Assumes water savings of 3% in 1995, and 7% in 2000 and thereafter because transitional area.
(2) Population projections were taken from Water System Plan through 2000. 2020 taken from June 1988 PSCOG forecast. From 2020 to 2040 straight-line projection. Data for 2010 linearly projected.
(3) Taken from Water System Plan, Table II-3, p. II-14.
(4) Taken from Water System Plan, p. II-11.
(5) Average and peak day demand through 2000 taken from Water System Plan, Table II-3. After 2000, based on calculated average gallons per capita per day (gpcd) and peak to average day demand factor.
(6) Includes 650 gpm in application for Well No. 6; capacity is 650-700 gpm.
(7) Includes Well No. 7 with capacity of 250 gpm.
(8) Requested allocation from PL#5 is 2.3 mgd; assumed here to be delayed indefinitely.

Sources of information: Water System Plan, 1989 (URS)

TABLE I-6c

KCWD NO. 111
WITHOUT PIPELINE NO. 5
WITH WATER CONSERVATION (1)

Year	1980	1985	1990	1995	2000	2010	2020	2030	2040
Service population (2):		9,520	10,585	13,298	16,010	20,457	24,903	29,548	34,193
DEMAND									
Ann. Avg. gpcd (3)		86	86	82	77	77	77	77	77
Peak gpcd (3)		240	240	229	217	217	217	217	217
Peak/Avg. ratio (3)		2.8	2.8	2.8	2.8	2.8	2.8	2.8	2.8
Unaccounted-for % (4)		10.0							
System avg. demand (mgd) (5)		0.8	0.9	1.1	1.2	1.6	1.9	2.3	2.6
System peak demand (mgd) (5)		2.3	2.5	3.1	3.5	4.4	5.4	6.4	7.4
SOURCES									
Description	6 wells (6)		(7)	PL#5 (8)					
Capacity (mgd)		2.8	3.2	3.2	3.2	3.2	3.2	3.2	3.2
Water rights		2.9							
BALANCE: SURPLUS OR (DEFICIT)									
Average (mgd)		2.0	2.3	2.1	1.9	1.6	1.2	0.9	0.5
Peak (mgd)		0.5	0.6	0.1	(0.3)	(1.3)	(2.2)	(3.2)	(4.3)

NOTES:
(1) Assumes water savings of 5% in 1995, and 10% in 2000 and thereafter.
(2) Population projections were taken from Water System Plan through 2000. 2020 taken from June 1988 PSCOG forecast. From 2020 to 2040 straight-line projection. Data for 2010 linearly projected.
(3) Taken from Water System Plan, Table II-3, p. II-14.
(4) Taken from Water System Plan, p. II-11.
(5) Average and peak day demand through 2000 taken from Water System Plan, Table II-3. After 2000, based on calculated average gallons per capita per day (gpcd) and peak to average day demand factor.
(6) Includes 650 gpm in application for Well No. 6; capacity is 650-700 gpm.
(7) Includes Well No. 7 with capacity of 250 gpm.
(8) Requested allocation from PL#5 is 2.3 mgd; assumed here to be delayed indefinitely.

Sources of information: Water System Plan, 1989 (URS)

TABLE I-6d

KCWD NO. 111
WITHOUT PIPELINE NO. 5
WITH CONSERVATION AND INCREASE IN MULTI-FAMILY UNITS (1)

Year	1980	1985	1990	1995	2000	2010	2020	2030	2040
Service population (2):		9,520	10,585	13,298	16,010	20,457	24,903	29,548	34,193
DEMAND									
Ann. Avg. gpcd (3)		84	86	79	71	71	71	71	71
Peak gpcd (3)		239	240	222	200	200	200	200	200
Peak/Avg. ratio (3)		2.8	2.8	2.8	2.8	2.8	2.8	2.8	2.8
Unaccounted-for % (4)		10.0							
System avg. demand (mgd) (5)		0.8	0.9	1.1	1.1	1.5	1.8	2.1	2.4
System peak demand (mgd) (5)		2.3	2.5	3.1	3.2	4.1	5.0	5.9	6.8
SOURCES									
Description	6 wells (6)		(7)	PL#5 (8)					
Capacity (mgd)		2.8	3.2	3.2	3.2	3.2	3.2	3.2	3.2
Water rights		2.9							
BALANCE: SURPLUS OR (DEFICIT)									
Average (mgd)		2.0	2.2	2.1	2.0	1.7	1.4	1.1	0.7
Peak (mgd)		0.5	0.6	0.1	(0.0)	(0.9)	(1.8)	(2.7)	(3.7)

NOTES:
(1) Assumes combined water savings of 8% in 1995, and 17% in 2000 and thereafter because transitional area.
(2) Population projections were taken from Water System Plan through 2000. 2020 taken from June 1988 PSCOG forecast. From 2020 to 2040 straight-line projection. Data for 2010 linearly projected.
(3) Taken from Water System Plan, Table II-3, p. II-14.
(4) Taken from Water System Plan, p. II-11.
(5) Average and peak day demand through 2000 taken from Water System Plan, Table II-3. After 2000, based on calculated average gallons per capita per day (gpcd) and peak to average day demand factor.
(6) Includes 650 gpm in application for Well No. 6; capacity is 650-700 gpm.
(7) Includes Well No. 7 with capacity of 250 gpm.
(8) Requested allocation from PL#5 is 2.3 mgd; assumed here to be delayed indefinitely.

Sources of information: Water System Plan, 1989 (URS)

APPENDIX J

SEATTLE-TACOMA INTERTIE

APPENDIX J

SEATTLE-TACOMA INTERTIE

Below is a discussion of the proposed Seattle-Tacoma (Sea-Tac) intertie taken directly from Volume I of the Tacoma Water Division Water System Plan, July 1987.

The Sea-Tac water supply intertie has been a factor in regional water supply planning since the 1970 City of Seattle Comprehensive Water Plan. Subsequent Plans by Seattle and Tacoma have incorporated the Intertie as a component in their long-range plans. However, additional detailed examination of design and operational alternatives and close examination of costs and benefits needs to be completed. The recent confirmation of Tacoma's second Green River water right will permit development and operation of this new source of municipal water supply. Seattle's plans for redevelopment of the Lake Youngs water supply facilities through construction of a pumping station and new reservoir will significantly expedite the potential transfer of water between the two systems.

Additional investigations will be required to identify precise design and operating criteria, acquire the necessary right-of-way, and to develop the special flow and pressure control facilities to operate Tacoma's Pipeline No. 5, the Sea-Tac Intertie, and Seattle's pumping station in a safe and efficient manner. The economic benefits of the project have yet to be established.

The South King County CWSP will also evaluate the use of the Sea-Tac Intertie as an integral part of the regional transmission/intertie system.

The Sea-Tac Intertie will provide an increase in the firm yield of Seattle sources if over-year storage is a consideration. In the future, as storage on the Cedar River is increased, the intertie will increase the utilization of this storage by providing an additional source of water to replenish it during the late fall and early summer.

Tacoma could receive a benefit from the intertie by using Seattle's storage in summer to increase the firm yield from the Green River. The Intertie could help augment supplies when turbidity is a problem, and will allow the South Tacoma aquifer to recover from the heavy pumping of the past decade. Eventually, if Tacoma develops storage at Howard A. Hanson dam, the increase in yield to Seattle provided by the intertie will represent a corresponding decrease in yield to Tacoma because the same Green River source will be used to fill both storage systems.

The intertie could provide a mechanism for Tacoma to more fully utilize the water available under the second water right with its Instream Flow conditions. As Tacoma's demands on the second diversion increase, this intertie benefit would diminish.

APPENDIX K

HYDRAULIC ANALYSIS OF PIPELINE NO. 5

APPENDIX K

HYDRAULIC ANALYSIS OF PIPELINE NO. 5

1. INTRODUCTION

An analysis of the proposed Pipeline No. 5 is presented in this Appendices. A description of the pipeline is followed by a description of the computer program used to hydraulically model the pipeline. A detailed explanation of the assumptions made in modelling the pipeline and the results of the analysis are also included. The purpose of this portion of the Plan was to provide South King County Regional Water Association (RWA) utilities with potential hydraulic grade conditions in pipeline in order for the utilities to be able to cost and design pressure reducing/pump stations compatible with operating head conditions of their own systems.

2. DESCRIPTION OF PIPELINE NO. 5

Pipeline No. 5 begins at the City of Tacoma's Green River Headworks, at an elevation of approximately 900 feet. The pipeline basically follows a westerly route initially along Green River, then south of Lake Sawyer to the Auburn valley, where it begins to descend in a southwesterly direction towards Federal Way, through the Tacoma tideflats, and finally terminates at Tacoma's Pipeline No. 4 near Portland Avenue Reservoir. The pipeline directly transacts almost all of the South King County RWA utilities including KCWD No. 111, KCWD No. 105, Kent, Auburn, and Federal Way Water and Sewer, with the exception of KCWD No. 75. Water from Pipeline No. 5 would have to be wheeled through Federal Way in order to reach KCWD No. 75.

An intertie with Seattle is also proposed. Several alternatives have been considered. However, the most likely routing will be from Pipeline No. 5 in the Auburn area directly northward to Lake Youngs/Soos Creek. The other alternatives include two different routing schemes from the pipeline. Either Kanaskat or Morganville to the Cedar River at Landsburg, and from the Pipeline No. 5 near Kanaskat to Taylor Creek near Seattle's Cedar River Headworks. The Lake Youngs/Soos Creek alternative was the one modelled.

The proposed diameter of the pipe ranges from 60 inches at the Headworks down to 48 inches near Portland Reservoir at Pipeline No. 4. The proposed intertie to Seattle is anticipated to be 32 inches in diameter. All total, there are approximately 6,600 feet of 60-inch, 82,100 feet of 54-inch, and 88,100 feet of 48-inch pipe from the Headworks to Tacoma; and approximately 36,000 feet of 32-inch pipe from Pipeline No. 5 to Lake Youngs.

3. DESCRIPTION OF HYDRAULIC ANALYSIS PROGRAM

The hydraulic analysis of Pipeline No. 5 was conducted using software by Engineered Software called Flo-Series. It is a menu-driven system which uses a database containing component data which can be readily updated. The model is also designed to interface with AutoCAD graphics.

The program is designed to handle approximately 10,000 pipes. A greater number of nodes can be modelled by using up to three alpha-numeric characters for identification. If only numeric numbering is used for nodes then the program is limited to an entry of almost 1,000 nodes. However, the actual number of pipes and nodes is limited by the computer's available random access memory (RAM) and reasonable processing time. In addition, the program allows the user to select a range of accuracy iterations for each run. As a general rule, a maximum default setting of 1.5 percent deviation or 25 iterations was used to solve the hydraulic analysis. For Pipeline No. 5, the program generally solved within a few iterations because of the simplicity of the modelling.

The program utilizes data describing nodes by demand, elevation, and connecting pipelines. The network pipes are referenced from another database. This includes length, diameter, type and schedule of material, as well as pipe fitting descriptions.

4. ASSUMPTIONS

Below is a list of assumptions used in performing a hydraulic analysis of Pipeline No. 5.

- Green River Headworks fixed grade elevation of 900 feet.
- Seattle-Lake Youngs fixed grade elevation of 493 feet.
- Seattle-Soos Creek fixed grade elevation of 610 feet.
- Tacoma-Tideflats minimum fixed grade elevation of 265 feet.
- Tacoma-Pipeline No. 4/Portland Reservoir fixed grade elevation of 520 to 590 feet, with an average fixed grade elevation of approximately 540 feet.
- Flow control valve located on Westside of Lake Sawyer near bend in pipe at ground elevation of 425 feet.
- No headloss assumed for flow control device. However, headloss estimated to be approximately 26 to 40 feet at 60 MGD depending on control valve design.

- o No air relief valves assumed to be operating.
- o Full pipe flow analysis from Headworks to Tacoma and Seattle, and from Seattle to Tacoma.
- o Pipe buried at grade level. May need to be buried deeper, particularly at Node Z04 which has a surface elevation of 860 feet.
- o Absolute pipe roughness factor of 0.005.
- o South King County contract amount of 15 MGD.
- o South King County 2005 peak day demand of 14.9 MGD based on deficit estimate as discussed in Section VII.
- o South King County 2005 peak day demand of 19.52 MGD based on deficit estimate, which includes City of Kent's contract amount of 4.62 MGD.
- o South King County 2020 peak day demand of 29.60 MGD based on deficit estimate as discussed in Section VII.
- o South King County 2020 peak day demand of 34.22 MGD based on deficit estimate, which includes City of Kent's contract amount of 4.62 MGD
- o No deficit is anticipated for the City of Kent. However, Kent feels they will have a need of their contracted amount of water from Pipeline #5, and therefore, was included in some of the runs in Scenarios C and D

5. DESCRIPTION OF SCENARIOS

Seven different scenarios were considered. Scenarios A, B, C, and D assume all flow is from the Green River Headworks at a fixed grade elevation of 900 feet. Scenarios E and F assume all flow is from Seattle-Soos Creek at a fixed grade elevation of 610 feet. A description of each of the scenarios follows:

Scenario A - Different fixed grades for Tacoma at Pipeline #4 of 540 and 590 feet, and Seattle at Lake Youngs of 493 feet or at Soos Creek of 610 feet. South King County has a contract demand of 15 MGD for all runs. The resulting is a flow in pipeline ranging from 15 MGD to 88 MGD.

Scenario B - All flow to Tacoma Pipeline #4 as fixed demand ranging from 15 MGD to 65 MGD. No flow to South King County.

Scenario C - South King County 2005 peak day deficit with and without Kent's contract amount of 4.62 MGD, and flow in pipeline from 15 MGD to 65 MGD.

Scenario D - South King County 2020 peak day deficit with and without Kent's contract amount of 4.62 MGD, and flow in pipeline from 30 MGD to 65 MGD.

Scenario E - All flow from 8 MGD to 35 MGD to Tacoma Tideflats (FG = 595 feet to 265 feet).

Scenario F - 15 MGD to South King County and excess up to 50 MGD Tacoma Tideflats.

6. SUMMARY OF EVALUATION CRITERIA

The criteria used to evaluate the hydraulic analyses for each of the computer runs were:

- Adequate Pressure in Pipeline

  Pressures in the pipeline were considered adequate when pressures above 20 and below 200 psi were maintained.

- Adequate Hydraulic Grade for Connecting Systems

  Hydraulic grade in pipeline was considered adequate if it was higher than the connecting utilities maximum and minimum operating heads.

- Acceptable Pipeline Velocities and Head Loss

  Velocities less than 8 feet per second (ft/sec) and head loss of less than 12 feet per 1,000 feet were considered acceptable. Velocities over 8 ft/sec constituted a closer review of hydraulic conditions.

7. SUMMARY OF ANALYSIS

The results of the hydraulic analysis runs for each of the scenarios is shown in Tables K-1 through K-6 and presented as graphs in Exhibits K-1 through K-14 for several locations along the pipeline. A summary table, Table K-7 list the minimum and maximum results obtained for Auburn, Federal Way, Kent, KCWD No. 75, Covington Water District, and KCWD No. 111.

The minimum hydraulic grades calculated could be as much as 40 feet less than shown due to the presence of a flow control valve anticipated to be located upstream of the system's diversion points at Lake Sawyer. However, the smallest difference between the maximum system operating heads for Federal Way, Kent, Covington Water District, and KCWD No. 111 is more than 65 feet above the minimum hydraulic grade anticipated in Pipeline No. 5.

Pressures as high as almost 400 psi are realized because of the variability in elevation from the Headworks to Tacoma, specifically in the Auburn valley. There is also a high elevation area immediately west of Tacoma's Headworks which could result in slightly negative pressures, unless the pipe is buried deeper at this location.

8. CONCLUSIONS AND RECOMMENDATIONS

The graphs, Exhibits K1a to K6b, show the minimum and maximum system operating heads for Federal Way, Kent, Covington Water District, and KCWD No. 111. When water is flowing from the Green River Headworks, these systems will need to have pressure reducing valves installed. If no water is available from the Green River and it must be supplied from the City of Seattle, Soos Creek supply, then each of these water systems will need to have pump stations or they could collectively install one at the Seattle-Tacoma intertie. Individual pump stations are probably the preferred alternative since land and building will already have to be provided at the connection for meters and pressure reducing valves.

If more than 20 MGD is desired from this intertie, Tacoma may also be interested in contributing to a single pump station, because negative pressures are experienced when more than this is supplied from Seattle to the Tacoma Tideflats. Although, hydraulically, if the supply is coming from Seattle and feeding directly to the Tideflats at a fixed grade elevation of 265 feet, the model shows approximately 35 MGD of water could be wheeled. The maximum resulting pressures in the Pipeline No. 5 would be about negative 90 psi, which would not occur because of air release valves, proposed to be located at several locations along the pipeline between Seattle and Tacoma. Therefore, realistically, all the flow that could be expected from Seattle without a pump station is 20 MGD.

TABLE K-1

SCENARIO A - SUPPLY FROM GREEN, FG=900

DESCRIPTION		ELEVATION:					
System Name/Location	NODE	(Feet)	RESULTS				
Flow Into (Out of) System (MGD)							
Tacoma/Headworks	FG	900	(15.00)	(65.00)	(79.23)	(83.83)	(87.81)
Tacoma/Tideflats	-	-	0	0	0	0	0
Tacoma/Pipe #4	FG	540, 590	0	30.00	42.08	38.57	43.93
Seattle	FG	493, 610	0.00	20.00	22.15	30.26	28.88
Auburn	Z13	510	0	0	0	0	0
Federal Way	Z22	460	4.62	4.62	4.62	4.62	4.62
Kent	Z14	425	4.62	4.62	4.62	4.62	4.62
KCWD #75	-	-	-	-	-	-	-
KCWD #105	Z08	530	3.46	3.46	3.46	3.46	3.46
KCWD #111	Z12	450	2.30	2.30	2.30	2.30	2.30
Hydraulic Gradeline (Feet)							
Flow CV	Z07	490	895	820	783	769	757
Tacoma/Tideflats	Z28	50	892	734	639	631	593
Tacoma/Pipe #4	Z35	305	892	709	590	590	540
Seattle	Z34	500	893	689	613	498	498
Auburn	Z13	510	893	777	717	698	678
Federal Way	Z22	460	892	760	687	672	646
Kent	Z14	425	893	773	712	694	672
KCWD #75	-	-	-	-	-	-	-
KCWD #105	Z08	530	894	806	763	747	732
KCWD #111	Z12	450	893	777	718	699	679
Pressure (psi)							
Minimum	Z04	860	16	(0)	(9)	(12)	(14)
Maximum	Z17	40	369	316	289	281	271
Maximum Velocity (ft/sec)			1.85	6.32	7.71	8.38	8.54

TABLE K-2

SCENARIO B - SUPPLY FROM GREEN, FG=900

DESCRIPTION		ELEVATION:					
System Name/Location	NODE	(Feet)	RESULTS				
Flow Into (Out of) System (MGD)							
Tacoma/Headworks	FG	900	(15.00)	(25.00)	(45.00)	(50.00)	(65.00)
Tacoma/Tideflats	-	-	0	0	0	0	0
Tacoma/Pipe #4	Fixed Demand		15.00	25.00	45.00	50.00	65.00
Seattle	-	-	0	0	0	0	0
Auburn	Z13	510	0	0	0	0	0
Federal Way	Z22	460	0	0	0	0	0
Kent	Z14	425	0	0	0	0	0
KCWD #75	-	-	-	-	-	-	-
KCWD #105	Z08	530	0	0	0	0	0
KCWD #111	Z12	450	0	0	0	0	0
Hydraulic Gradeline (Feet)							
Flow CV	Z07	490	895	887	861	852	820
Tacoma/Tideflats	Z28	50	882	852	752	718	598
Tacoma/Pipe #4	Z35	305	875	834	696	651	485
Seattle	Z34	500	893	881	841	827	779
Auburn	Z13	510	892	879	834	819	766
Federal Way	Z22	460	888	870	807	786	711
Kent	Z14	425	891	877	830	815	758
KCWD #75	-	-	-	-	-	-	-
KCWD #105	Z08	530	894	885	854	844	806
KCWD #111	Z12	450	892	879	835	820	768
Pressure (psi)							
Minimum	Z04	860	16	15	9	7	(0)
Maximum	Z17	40	369	355	340	333	306
Maximum Velocity (ft/sec)			1.85	3.08	5.54	6.16	8.00

TABLE K-3

SCENARIO C - SUPPLY FROM GREEN, FG=900, 2005

DESCRIPTION System Name/Location	NODE	ELEVATION: (Feet)	RESULTS					
Flow Into (Out of) System (MGD)								
Tacoma/Headworks	FG	900	(14.90)	(19.52)	(65.00)	-	-	
Tacoma/Tideflats	-	-	0	0	0	-	-	
Tacoma/Pipe #4	-	-	0	0	45.48	-	-	
Seattle	-	-	0	0	0	-	-	
Auburn	Z13	510	0	0	0	-	-	
Federal Way	Z22	460	9.2	9.2	9.2	-	-	
Kent	Z14	425	0	4.62	4.62	-	-	
KCWD #75	-	-	-	-	-	-	-	
KCWD #105	Z08	530	3.65	3.65	3.65	-	-	
KCWD #111	Z12	450	2.05	2.05	2.05	-	-	
Hydraulic Gradeline (Feet)								
Flow CV	Z07	490	895	892	820	-	-	
Tacoma/Tideflats	Z28	50	892	886	674	-	-	
Tacoma/Pipe #4	Z35	305	892	886	617	-	-	
Seattle	Z34	500	893	889	782	-	-	
Auburn	Z13	510	893	888	770	-	-	
Federal Way	Z22	460	892	886	730	-	-	
Kent	Z14	425	893	887	764	-	-	
KCWD #75	-	-	-	-	-	-	-	
KCWD #105	Z08	530	894	891	806	-	-	
KCWD #111	Z12	450	893	888	772	-	-	
Pressure (psi)								
Minimum	Z04	860	16	16	(0)	-	-	
Maximum	Z17	40	370	367	310	-	-	
Maximum Velocity (ft/sec)			1.45	1.90	6.32	-	-	

TABLE K-4

SCENARIO D - SUPPLY FROM GREEN, FG=900, 2020

DESCRIPTION		ELEVATION:						
System Name/Location	NODE	(Feet)	RESULTS					
Flow Into (Out of) System (MGD)								
Tacoma/Headworks	FG	900	(29.60)	(34.22)	(65.00)	-	-	
Tacoma/Tideflats	-	-	0	0	0	-	-	
Tacoma/Pipe #4	-	-	0	0	30.78	-	-	
Seattle	-	-	0	0	0	-	-	
Auburn	Z13	510	0	0	0	-	-	
Federal Way	Z22	460	16.9	16.9	16.9	-	-	
Kent	Z14	425	0	4.62	4.62	-	-	
KCWD #75	-	-	-	-	-	-	-	
KCWD #105	Z08	530	7.9	7.9	7.9	-	-	
KCWD #111	Z12	450	4.8	4.8	4.8	-	-	
Hydraulic Gradeline (Feet)								
Flow CV	Z07	490	882	877	820	-	-	
Tacoma/Tideflats	Z28	50	870	861	757	-	-	
Tacoma/Pipe #4	Z35	305	870	861	749	-	-	
Seattle	Z34	500	876	868	732	-	-	
Auburn	Z13	510	874	866	780	-	-	
Federal Way	Z22	460	870	861	764	-	-	
Kent	Z14	425	874	865	777	-	-	
KCWD #75	-	-	-	-	-	-	-	
KCWD #105	Z08	530	879	873	806	-	-	
KCWD #111	Z12	450	875	866	780	-	-	
Pressure (psi)								
Minimum	Z04	860	13	12	(0)	-	-	
Maximum	Z17	40	361	357	318	-	-	
Maximum Velocity (ft/sec)			2.88	3.33	6.32	-	-	

TABLE K-5

SCENARIO E - SUPPLY FROM SEATTLE, FG=610

DESCRIPTION		ELEVATION:						
System Name/Location	NODE	(Feet)	:		RESULTS			
Flow Into (Out of) System (MGD)			:					
Tacoma/Headworks	-	-	:	0	0	0	0	0
Tacoma/Tideflats	FG	variable	:	8.00	17.66	19.60	27.41	35.38
Seattle	FG	610	:	(8.00)	(17.66)	(19.60)	(27.41)	(35.38)
Auburn	Z13	510	:	0	0	0	0	0
Federal Way	Z22	460	:	0	0	0	0	0
Kent	Z14	425	:	0	0	0	0	0
KCWD #75	-	-	:	-	-	-	-	-
KCWD #105	Z08	530	:	0	0	0	0	0
KCWD #111	Z12	450	:	0	0	0	0	0
Hydraulic Gradeline (Feet)			:					
Flow CV	Z07	490	:	593	535	518	434	321
Tacoma/Tideflats	Z28	50	:	590	520	500	400	265
Tacoma/Pipe #4	Z35	305	:	590	520	500	400	265
Seattle	Z34	500	:	610	608	608	606	603
Auburn	Z13	510	:	593	534	517	432	317
Federal Way	Z22	460	:	592	529	511	421	289
Kent	Z14	425	:	593	533	516	430	314
KCWD #75	-	-	:	-	-	-	-	-
KCWD #105	Z08	530	:	593	535	518	434	321
KCWD #111	Z12	450	:	593	534	517	432	317
Pressure (psi)			:					
Minimum	Z33, Z21	560,510	:	19	9	1	(37)	(90)
Maximum	Z17	40	:	240	231	206	168	117
Maximum Velocity (ft/sec)			:	2.22	4.89	5.43	7.59	9.80

TABLE K-6

SCENARIO F - SUPPLY FROM SEATTLE, FG=610

DESCRIPTION		ELEVATION:						
System Name/Location	NODE	(Feet)			RESULTS			
Flow Into (Out of) System (MGD)								
Tacoma/Headworks	-	-		0	0	0	0	0
Tacoma/Tideflats Fixed Demand				-	2.66	4.60	12.41	20.38
Seattle	FG	610		-	(17.66)	(19.60)	(27.41)	(35.38)
Auburn	Z13	510		-	0	0	0	0
Federal Way	Z22	460		-	4.62	4.62	4.62	4.62
Kent	Z14	425		-	4.62	4.62	4.62	4.62
KCWD #75	-	-		-	-	-	-	-
KCWD #105	Z08	530		-	3.46	3.46	3.46	3.46
KCWD #111	Z12	450		-	2.30	2.30	2.30	2.30
Hydraulic Gradeline (Feet)								
Flow CV	Z07	490		-	535	518	434	-
Tacoma/Tideflats	Z28	50		-	533	515	423	-
Tacoma/Pipe #4	Z35	305		-	533	515	423	-
Seattle	Z34	500		-	608	608	606	-
Auburn	Z13	510		-	534	517	432	-
Federal Way	Z22	460		-	533	516	428	-
Kent	Z14	425		-	534	517	431	-
KCWD #75	-	-		-	-	-	-	-
KCWD #105	Z08	530		-	535	518	434	-
KCWD #111	Z12	450		-	534	517	433	-
Pressure (psi)								
Minimum	Z21, Z08	510,530		-	10	(5)	(45)	-
Maximum	Z17	40		-	214	207	169	-
Maximum Velocity (ft/sec)				-	4.89	5.43	7.59	-

EXHIBIT K-1a

AUBURN – PIPELINE #5

NODE Z13, ELEVATION=510 FEET

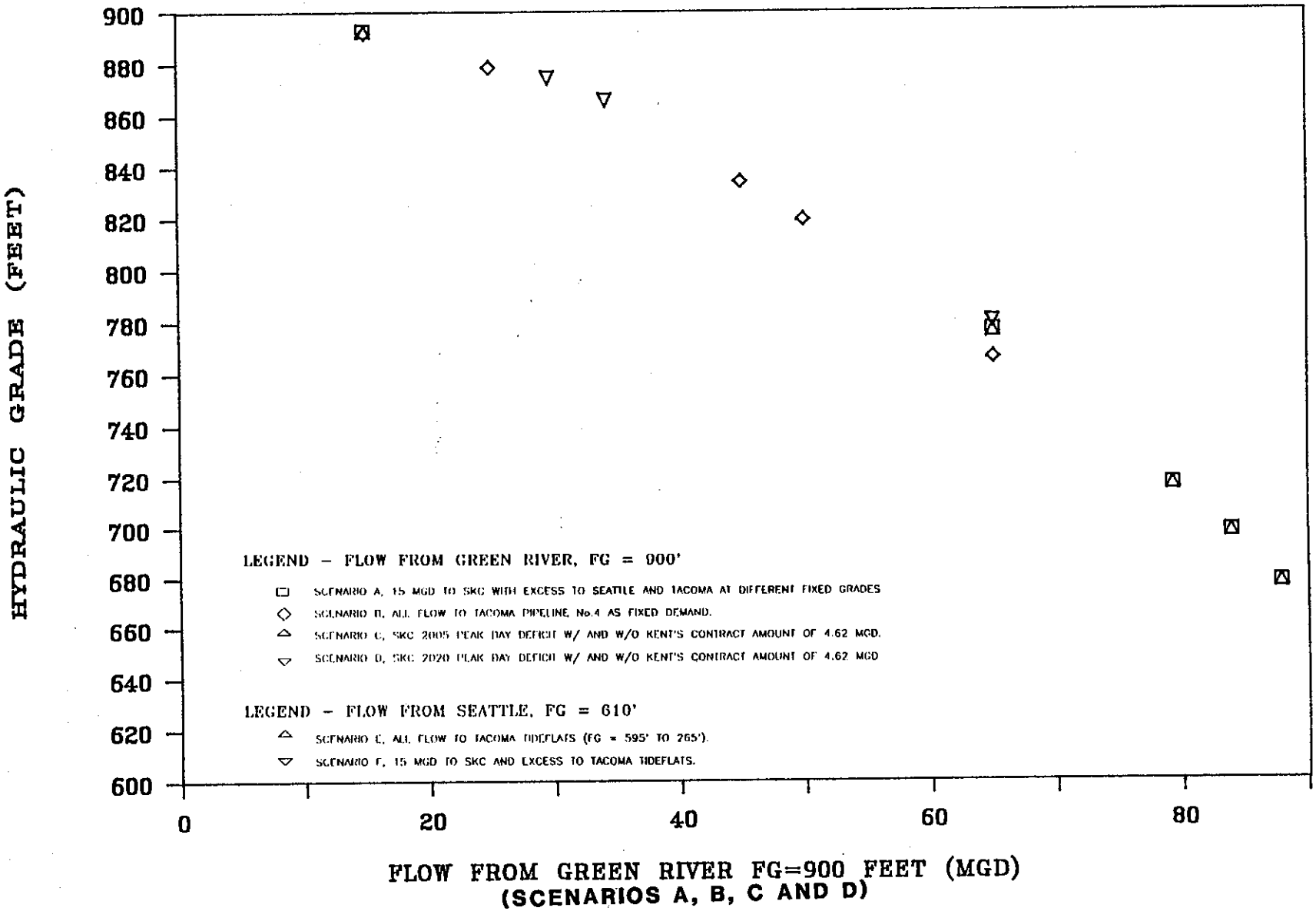
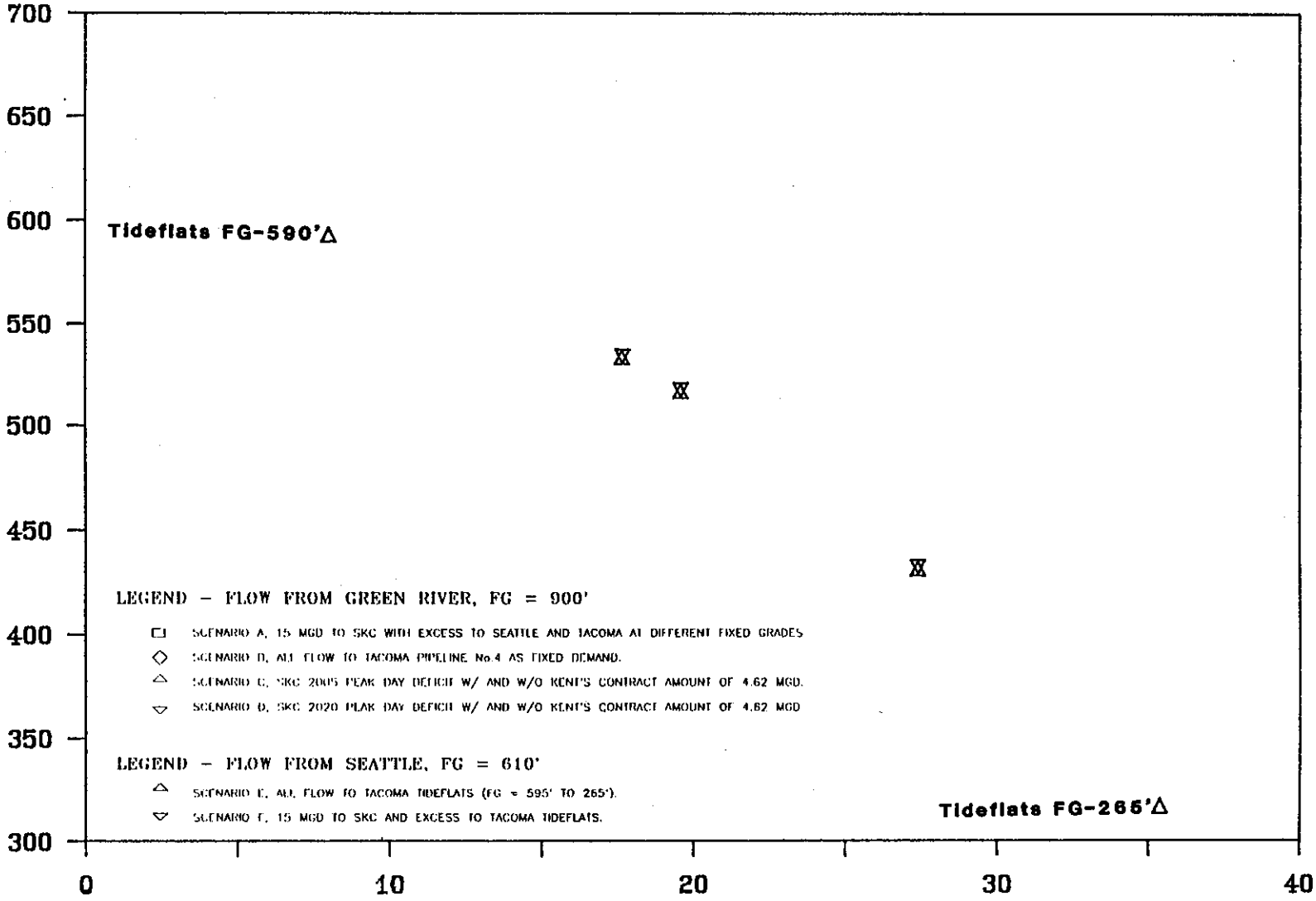


EXHIBIT K-1b

AUBURN – PIPELINE #5

NODE Z13, ELEVATION=510 FEET



FLOW FROM SEATTLE FG=610 FEET (MGD)

Δ ALL TO TIDEFLATS (SCENARIO E)

▽ W/ 15 MGD TO SKC (SCENARIO F)

EXHIBIT K-2a

KENT – PIPELINE #5

NODE Z14, ELEVATION=425 FEET

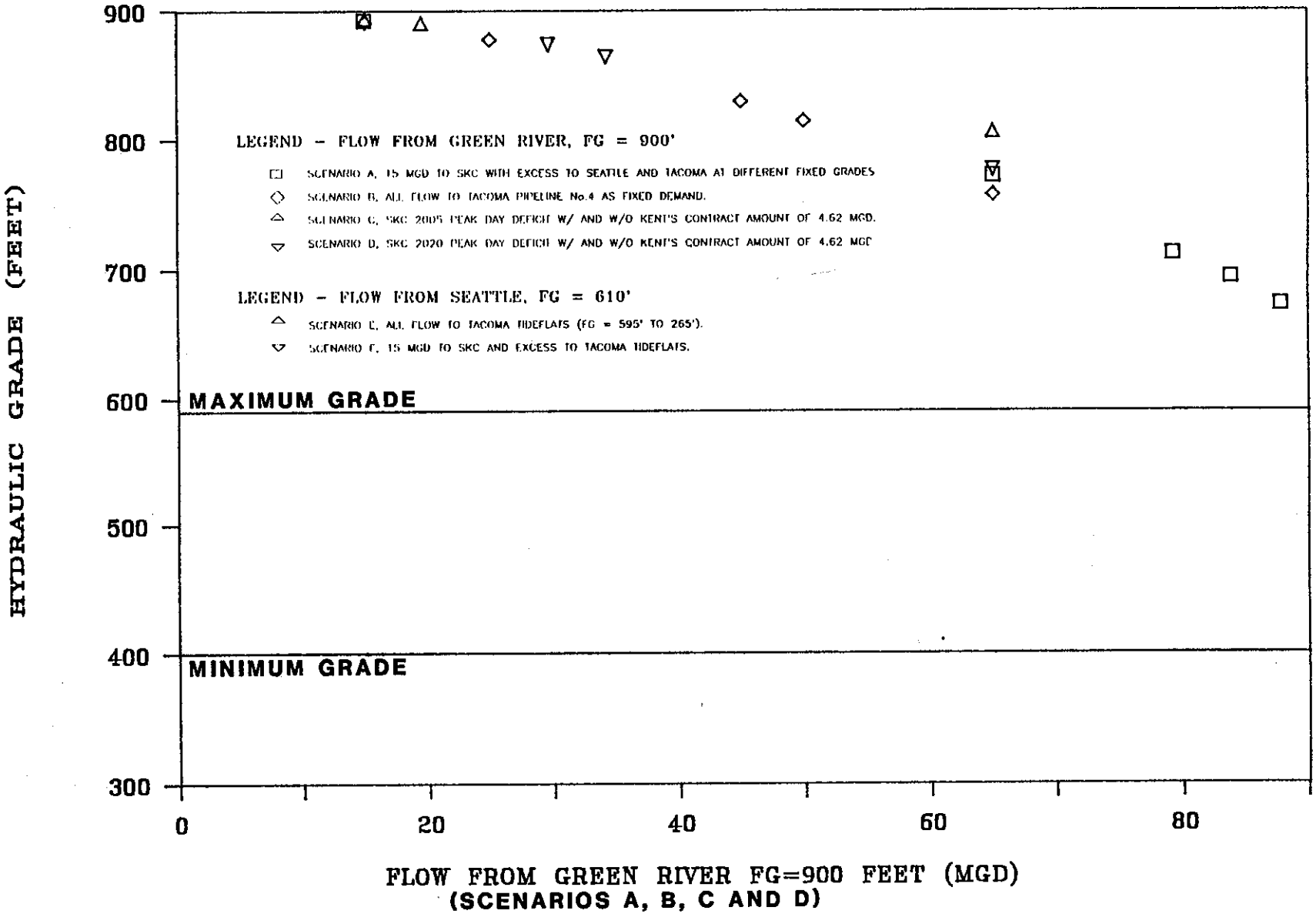
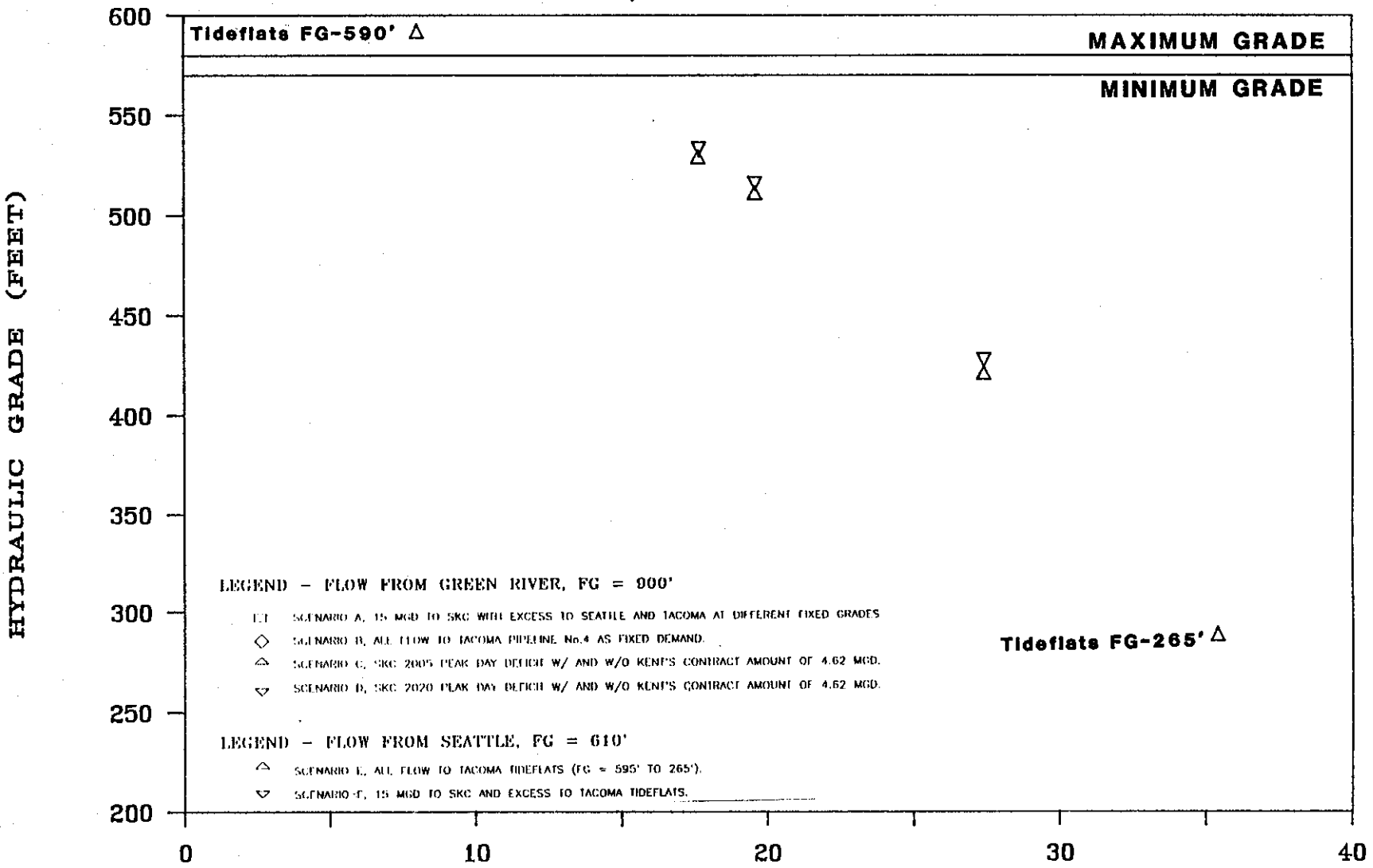


EXHIBIT K-2b

FWWS – PIPELINE #5

NODE Z22, ELEVATION=460 FEET



△ ALL TO TIDEFLATS (SCENARIO E)

▽ W/ 15 MGD TO SKC (SCENARIO F)

EXHIBIT K-3a

FWWS – PIPELINE #5

NODE Z22, ELEVATION=460 FEET

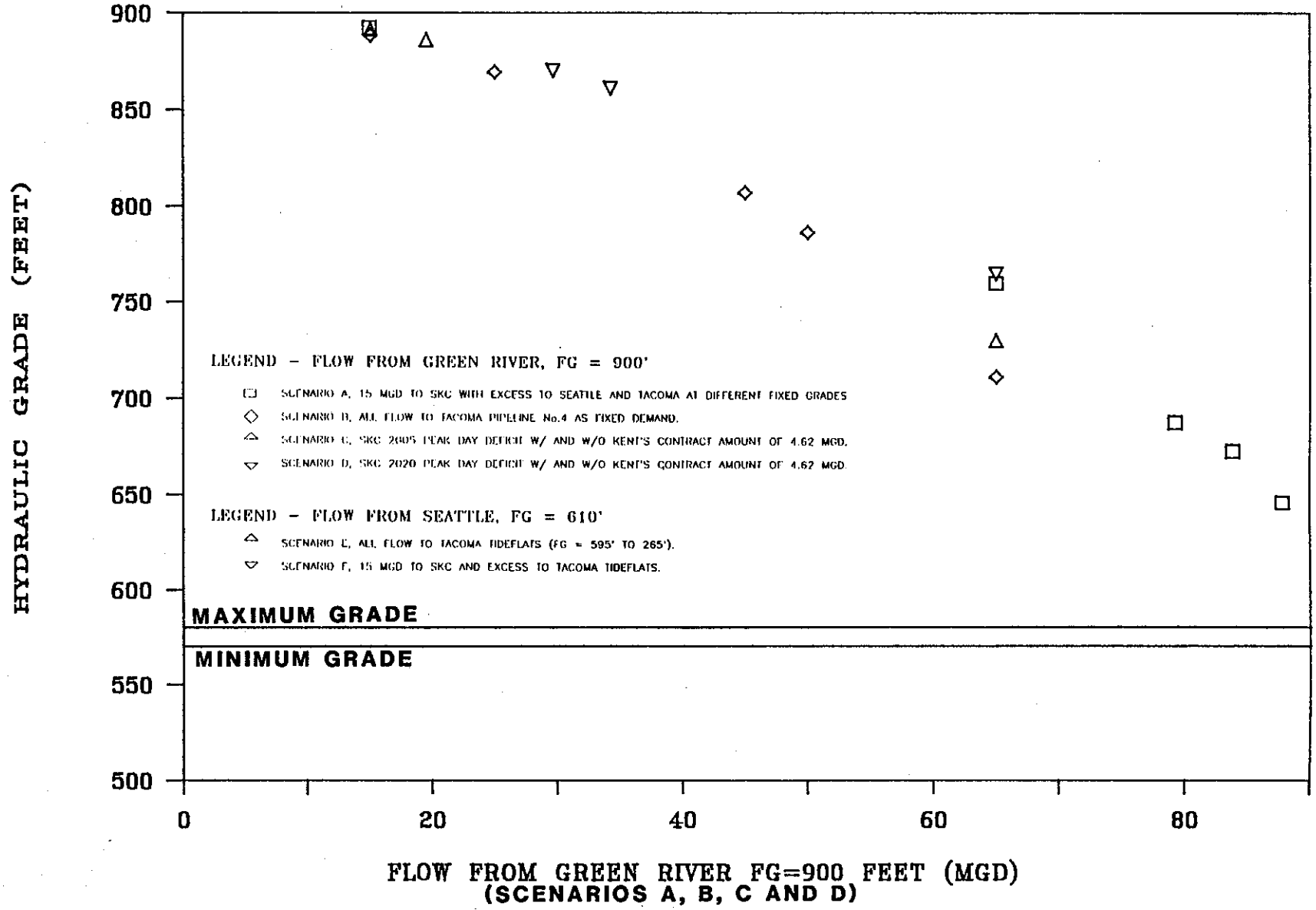


EXHIBIT K-3b

KENT – PIPELINE #5

NODE Z14, ELEVATION=425 FEET

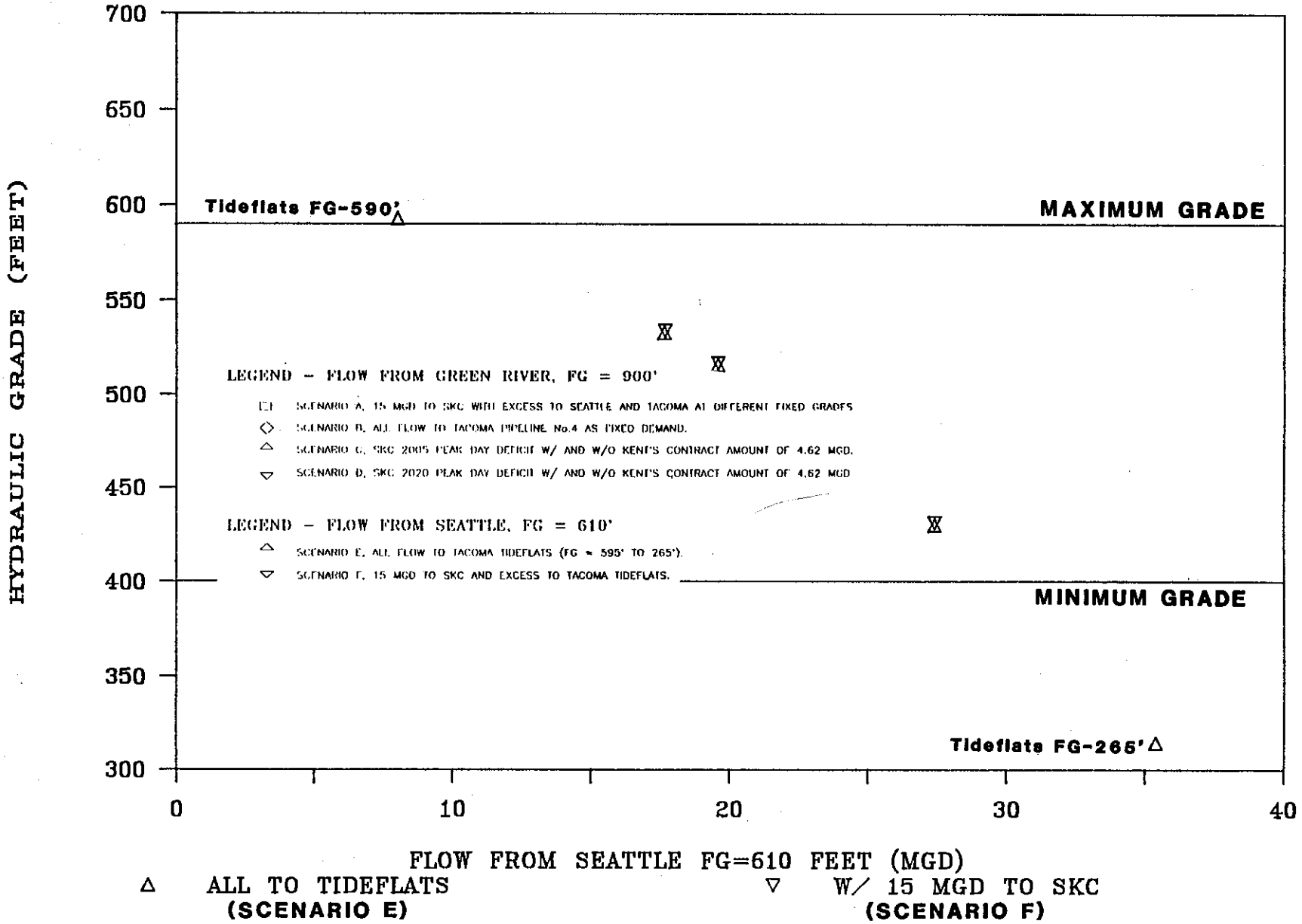


EXHIBIT K-4a

KCWD #105 – PIPELINE #5

NODE Z08, ELEVATION=530 FEET

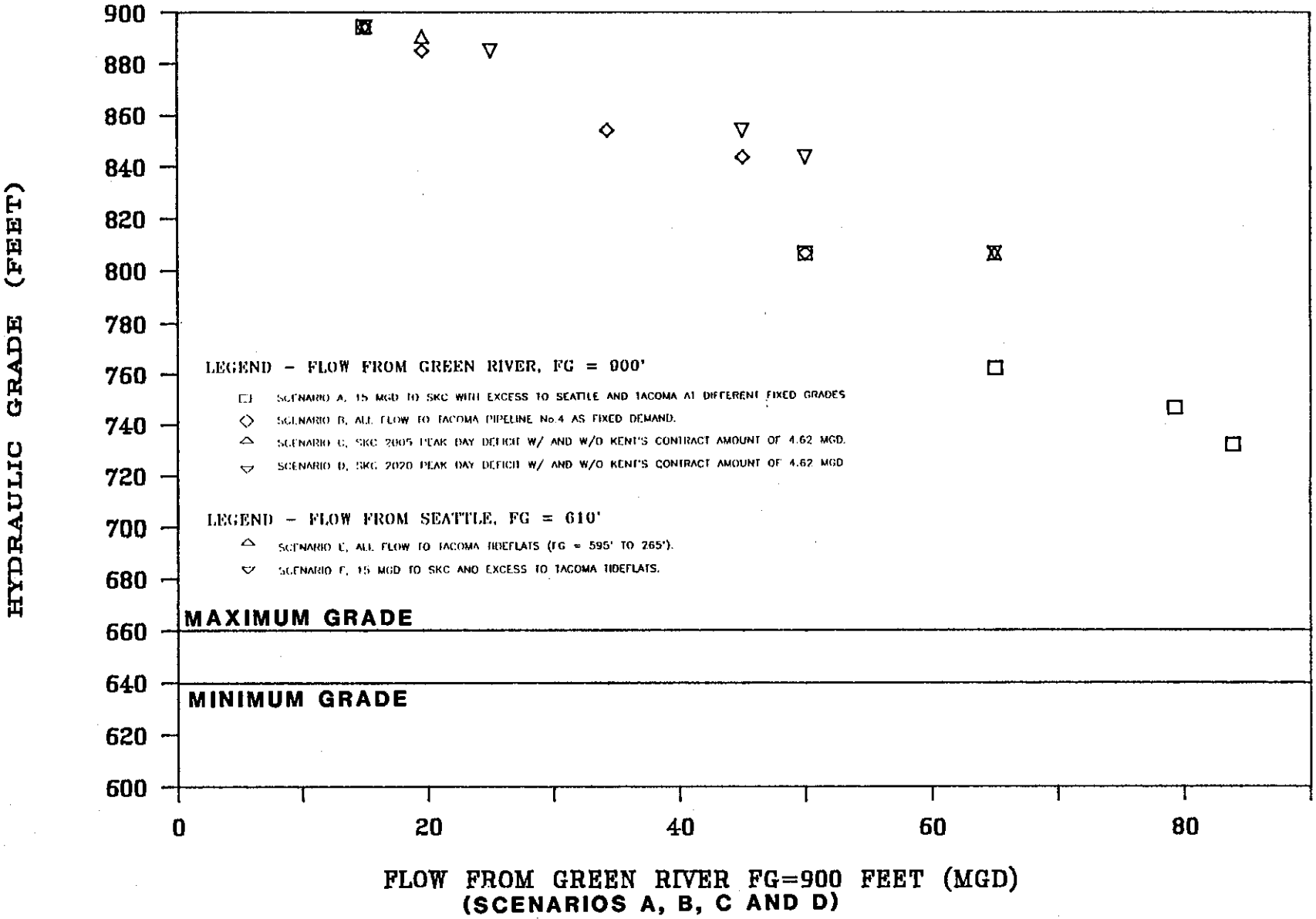


EXHIBIT K-4b

KCWD #105 – PIPELINE #5

NODE Z08, ELEVATION=530 FEET

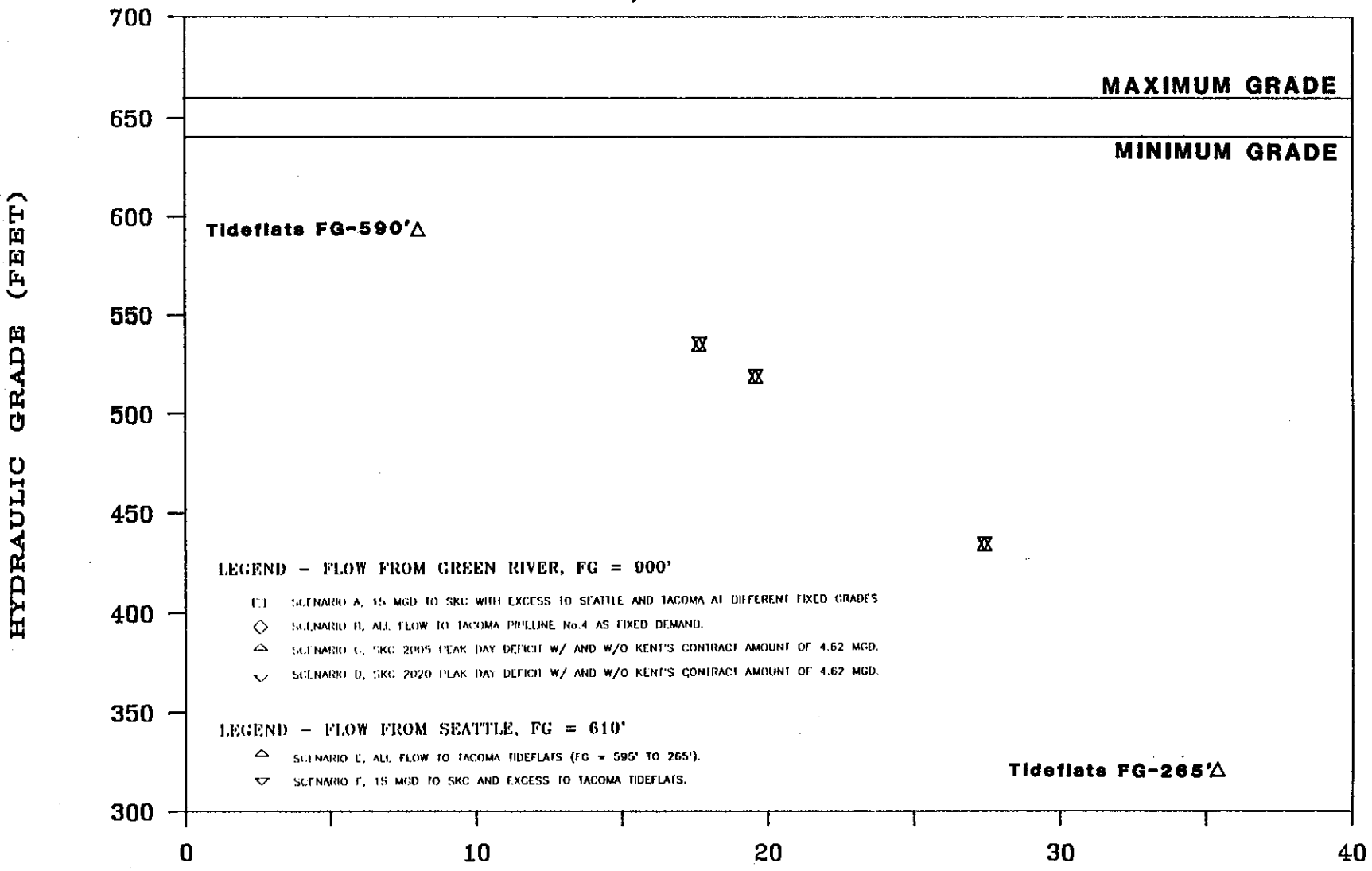
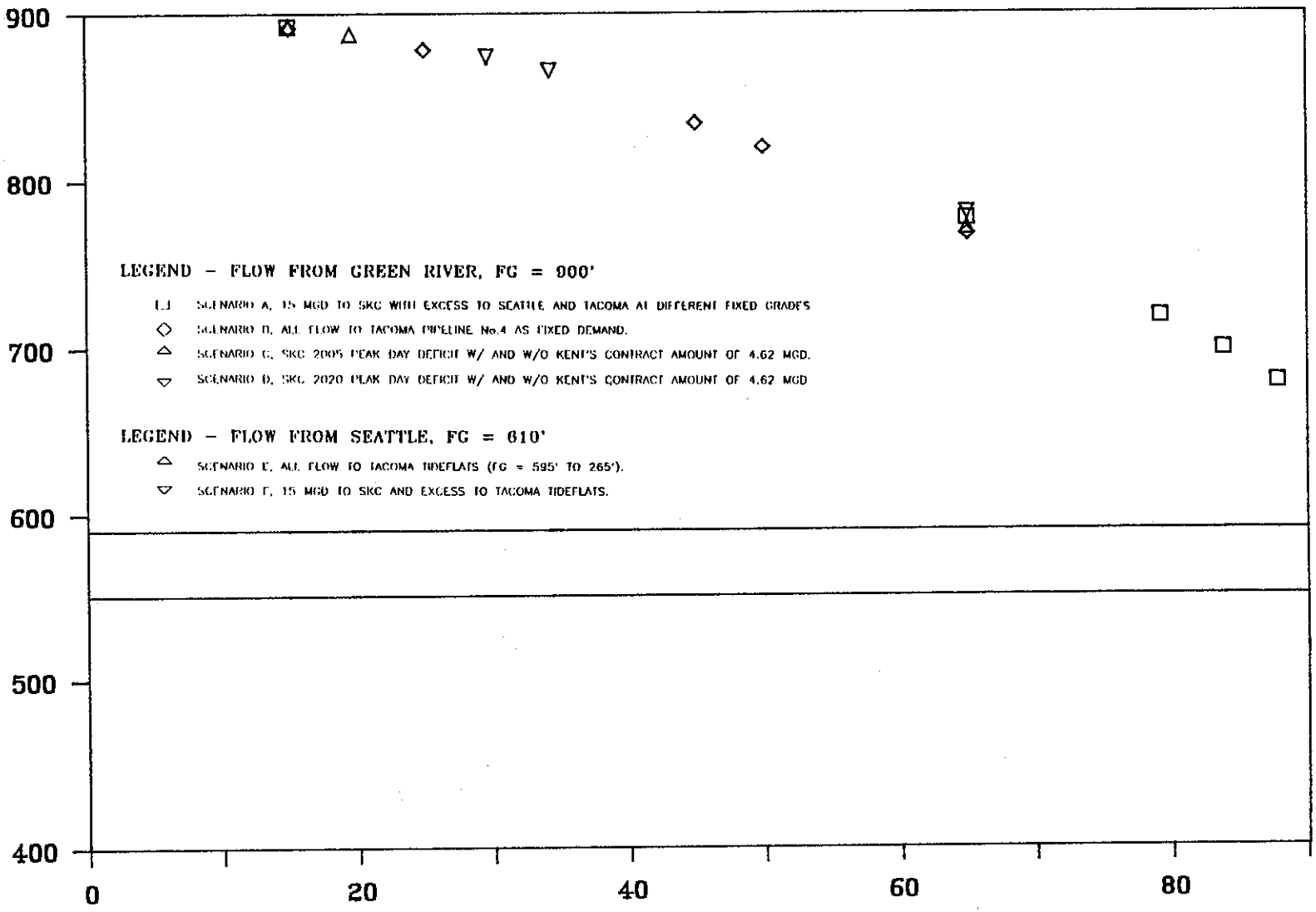


EXHIBIT K-5a

KCWD #111 – PIPELINE #5

NODE Z11, ELEVATION=450 FEET



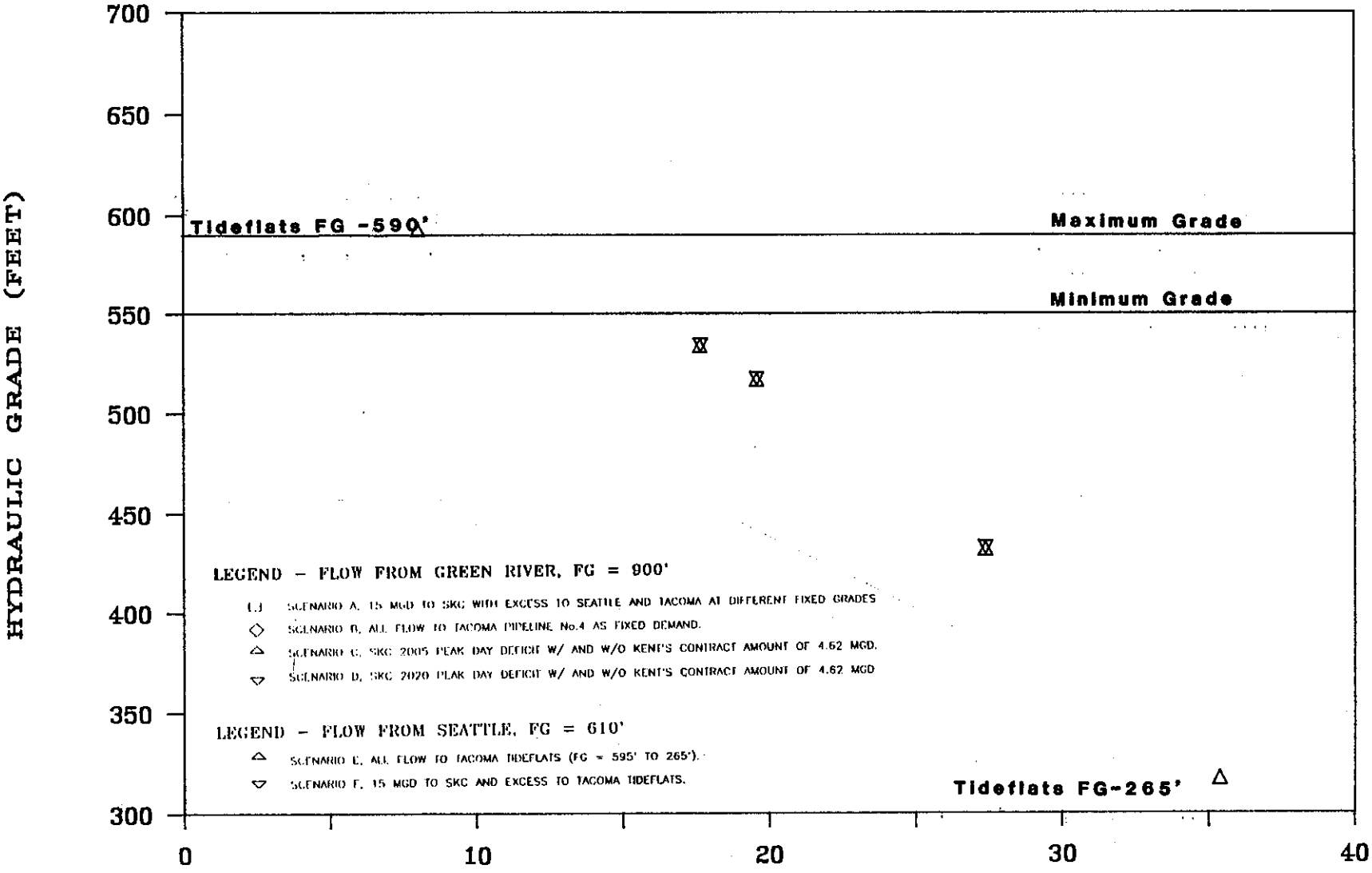
FLOW FROM GREEN RIVER FG=900 FEET (MGD)

SKC 15 MGD ◇ PIPELINE #4 ONLY △ 2005 ▽ 20

EXHIBIT K-5b

KCWD #111 – PIPELINE #5

NODE Z12, ELEVATION=450 FEET



FLOW FROM SEATTLE FG=610 FEET (MGD)

△ FLOW TO TIDEFLATS
SCENARIO E

▽ W/ 15 MGD TO SKC
SCENARIO F

EXHIBIT K-6a

TACOMA TIDEFLATS – PIPELINE #5

NODE Z28, ELEVATION=50 FEET

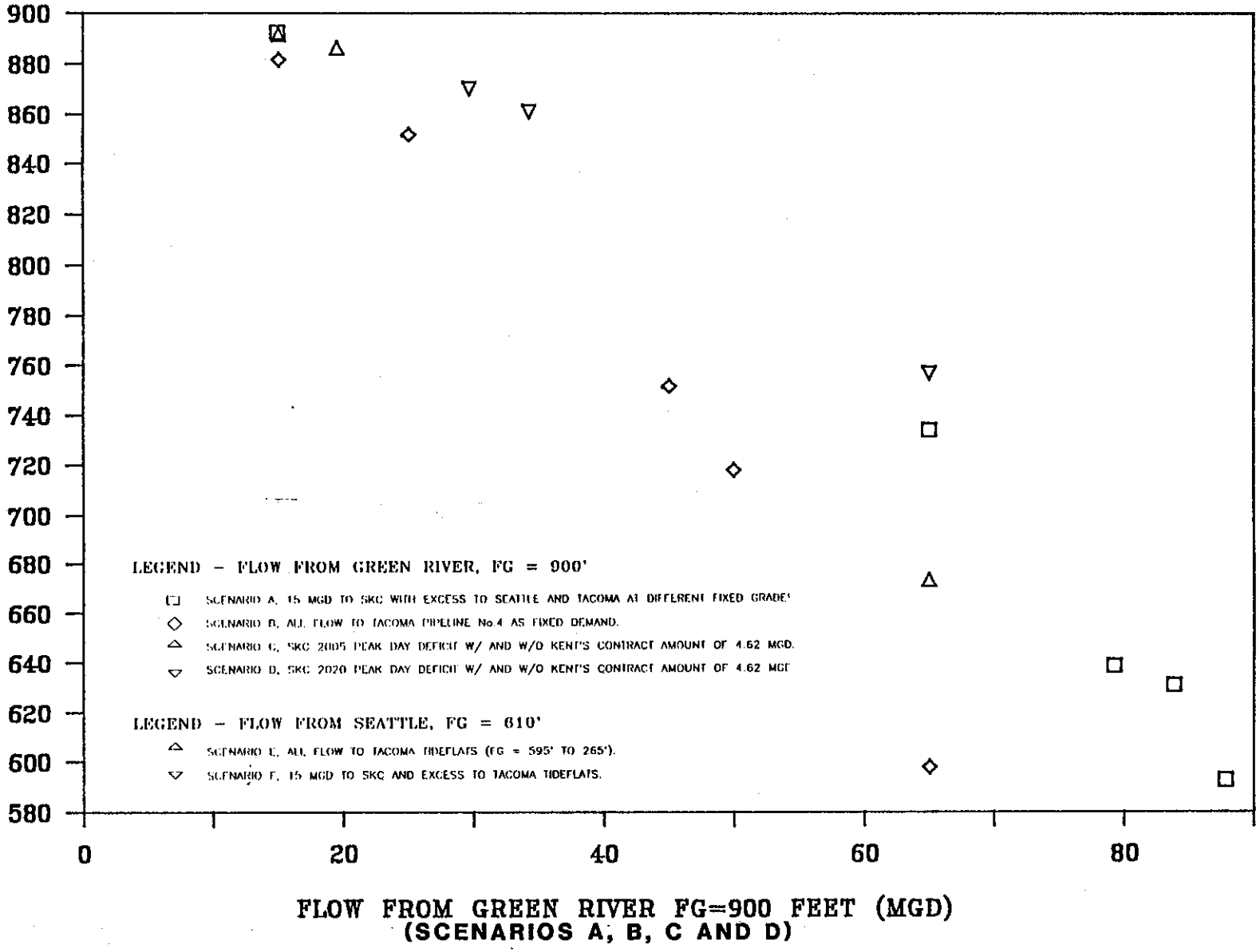


EXHIBIT K-6b

TACOMA TIDEFLATS – PIPELINE #5

NODE Z28, ELEVATION=50 FEET

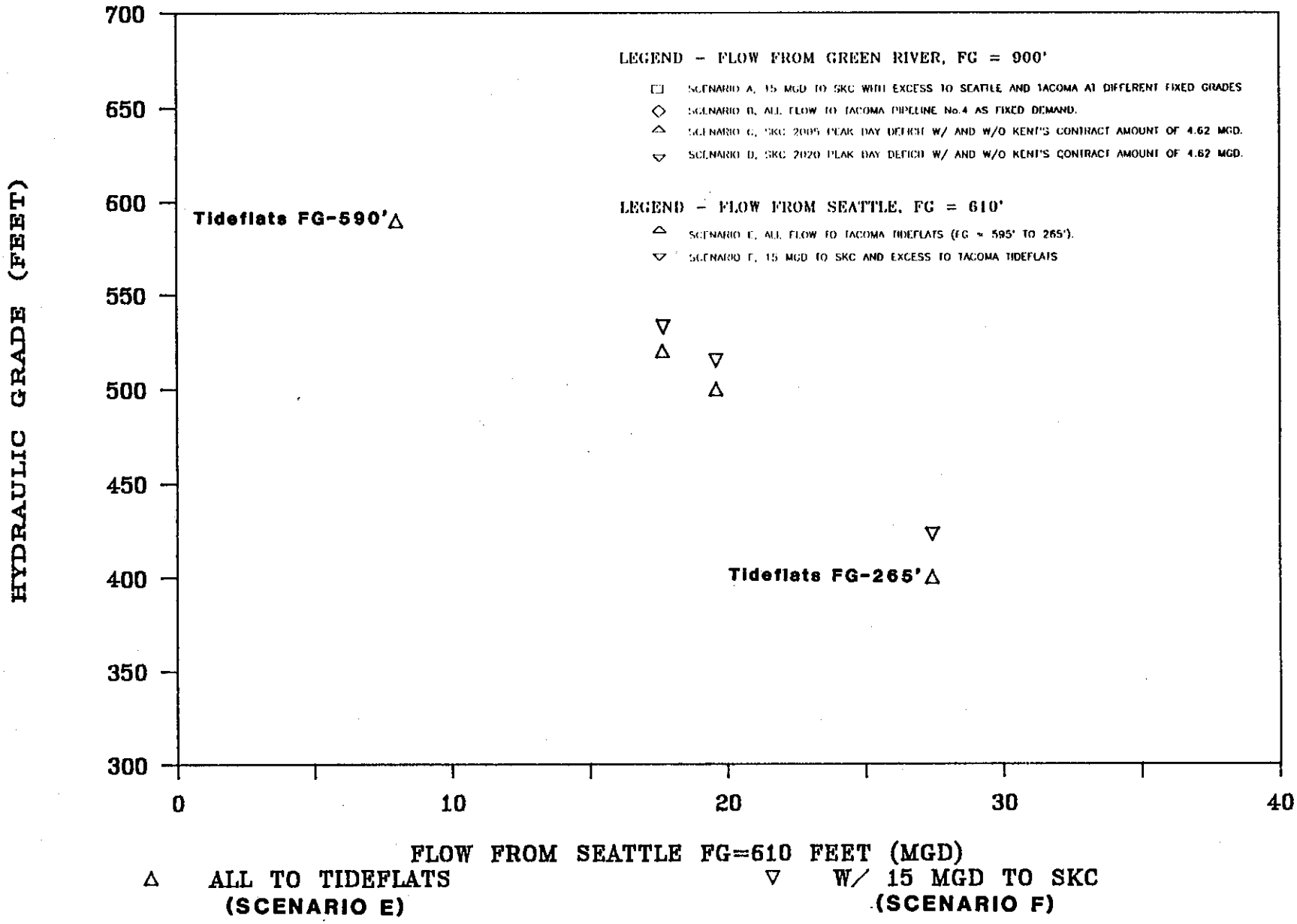


EXHIBIT K-7

FLOW CONTROL VALVE – PIPELINE #5

NODE Z07, ELEVATION=490 FEET

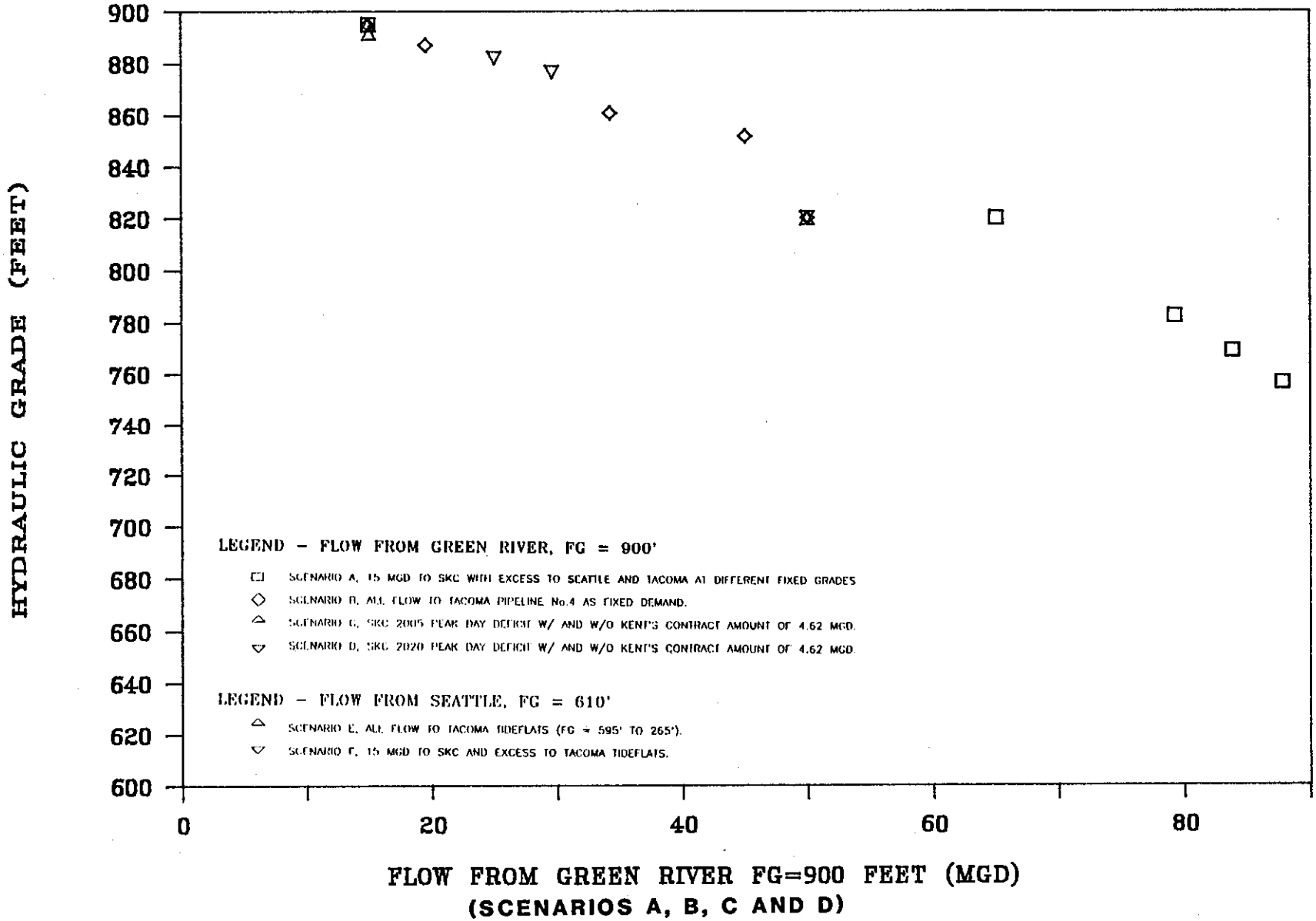
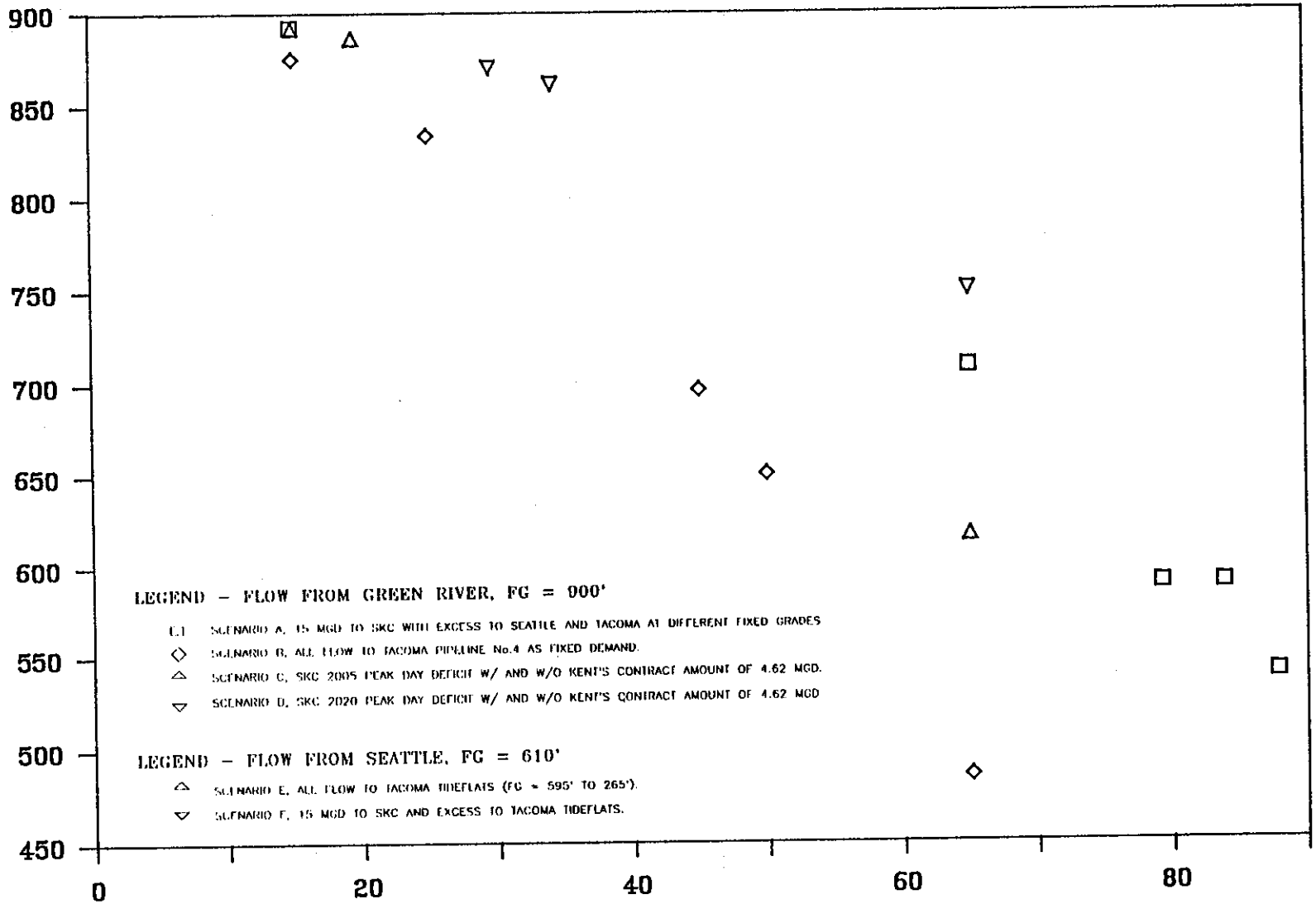


EXHIBIT K-8

TACOMA PIPELINE #4 – PIPELINE #5

NODE Z35, ELEVATION=305 FEET



FLOW FROM GREEN RIVER FG=900 FEET (MGD)
(SCENARIOS A, B, C AND D)