2006 Comprehensive Water Plan Update

Volume I

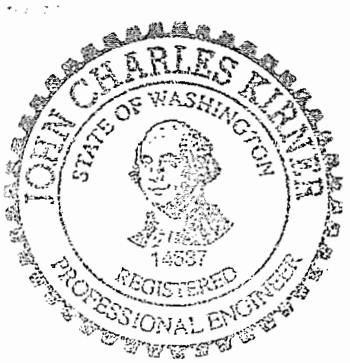
TACOMA WATER
TACOMA PUBLIC UTILITIES

Approved
Washington State
DOH
January 23, 2008

Approved
City of Tacoma
Public Utility Board
August 13, 2008/U-10235

CERTIFICATION

This Comprehensive Water System Plan for the City of Tacoma Water Division was prepared under the direction of the following registered professional engineers.



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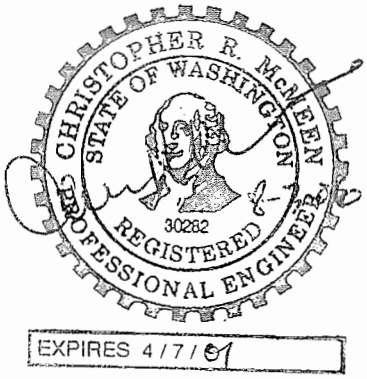
CERTIFICATION – continued



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GLOSSARY OF TERMS

The following terms are used in this report.

Consumption. The actual volume of water used by the water system customers. This volume is measured at each customer's connection to the distribution system.

Coordinated Water System Plan. A plan for public water systems within a critical water supply service area which identifies the present and future water system concerns and sets forth a means for meeting those concerns in the most efficient manner possible.

Critical Water Supply Service Area. A geographical area designated by the State Department of Health or county legislative authority characterized by public water system problems related to inadequate water quality, unreliable service, and/or lack of coordinated water system planning. It may be further characterized by a proliferation of small, inadequate public water systems, or by water supply problems which threaten the present or future water quality or reliability of service in such a manner that efficient and orderly development may best be achieved through coordinated planning by public water systems in the area.

Demand. The quantity of water obtained from the water supply source over a given period of time to meet the needs of domestic, commercial, industrial and public use as well as firefighting water, system losses, and other miscellaneous water uses. Demands are normally discussed in terms of flow rate, such as millions gallons per day (MGD) or gallons per minute (gpm). The flow rates can be described in terms of volume of water delivered during a specific time period. Flow rates pertinent to the analysis and design of water systems are:

Average Day Demand (ADD). The total volume of water delivered to the water system in a year divided by the number of days in the year.

Maximum Month Demand (MMD). The total volume of water delivered to the water system during the month of maximum water use divided by the number of days in the month.

Maximum Day Demand (MDD). The volume of water delivered to the water system on the year's maximum water use day.

Peak-Hour Demand (PHD). The volume of water delivered to the water system in the hour of maximum use, usually during the maximum day.

Peak 4-Day Demand. The total volume of water delivered to the water system during the highest 4 consecutive days of water use during the year, divided by 4.

Equalizing Storage. The reservoir capacity required to meet the daily demand peaks that exceed the supply capacity in order to compensate for demands over the average hour, maximum day demand supplied at system inlets.

Finished Water. Resultant potable water after treatment.

Fire Flow. The rate of water flow required to fight fires.

Fire Storage. The reservoir capacity require to sustain fire flows over a given period of time.

Gravity Flow. The conveyance of water from one point to another with no mechanical assistance, i.e. pumps.

Hydraulic Analysis. The study of the water system network evaluating water flows within the distribution system under worst case conditions such as peak hourly design flow plus fire flow, when required. Hydraulic analysis includes consideration of all factors affecting system energy losses.

Maximum contaminant level. The maximum permissible level of a contaminant in water the purveyor delivers to any public water system user, measured at the locations identified under WAC 246-290-300.

Peaking Factor. A dimensionless parameter used to express the relationship among maximum day demand, peak-hour demand, peak 4-day demand and maximum month demand as a ratio to the average day demand. The peaking factor used for design purposes is often based on the most severe peaking trends observed on a historical basis.

Purveyor. An agency or utility that owns or operates a water system for wholesale or retail service.

Reserve or Emergency Storage. The reservoir capacity provided to meet emergencies such as supply failure, pipeline failure, pump station failure or power outages.

Service (Pressure) Zone. A water subsystem operating at a common hydraulic elevation.

Turbidity. A measure of suspended particles in water.

Unaccounted-for (Unmetered) Water. The difference between the amount of water metered at the production point and the metered volume of water consumed. Unaccounted-for water can result from uses such as system flushing, firefighting and leakage.

Water Shortage Response Plan. Policies and activities (including curtailment) to be implemented to reduce water use on a short-term basis during or in anticipation of a water shortage.

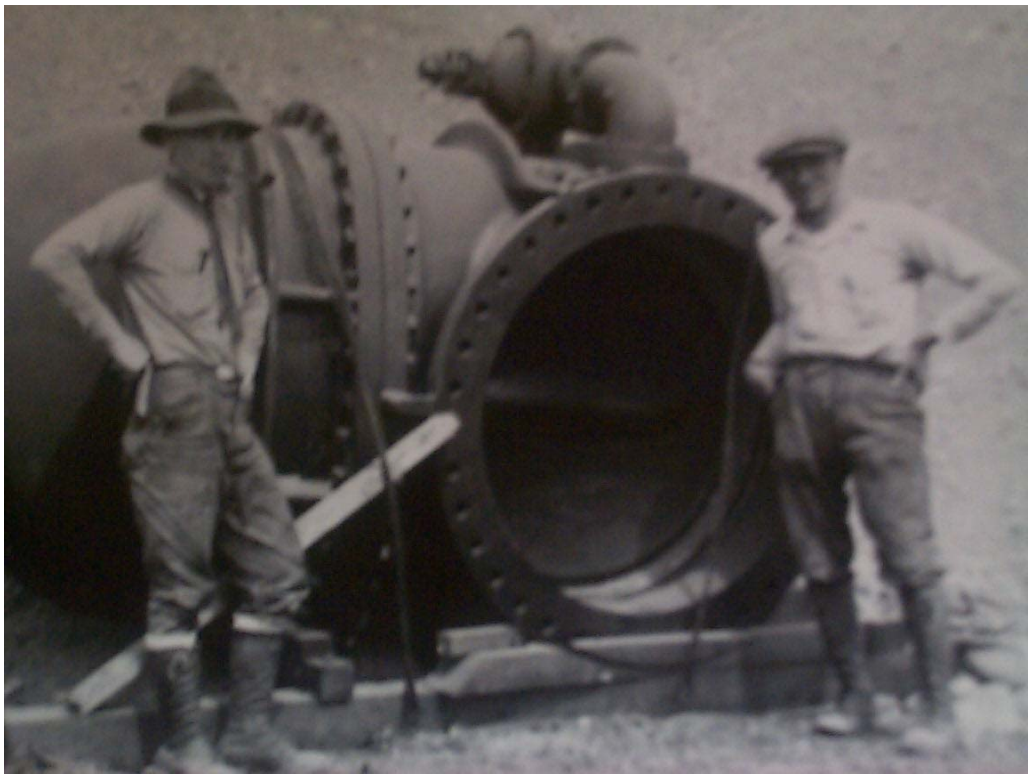
Water Wheeling. The transmission of water through the available capacity in the second utility's transmission network for the financial benefit of both.

LIST OF ABBREVIATIONS

AAD	average annual demand
ADD	average day demand
af/yr	acre-feet per year
AMR	automated meter reading
ccf	hundred cubic feet
cfs	cubic feet per second
CIP	capital improvement program
CT	concentration time
CWSP	coordinated water system plan
D/DBP	Disinfectants/Disinfection Byproducts Rule
DOH	Washington State Department of Health
Ecology	Washington State Department of Ecology
EOP	Emergency Operating Plan
EPA	US Environmental Protection Agency
ESA	Endangered Species Act
ERU	equivalent residential unit
FDWR	Green River First Diversion Water Right
FWS	US Fish and Wildlife Service
GIS	geographic information system
GMA	Washington State Growth Management Act
gpcd	gallons per capita per day
gpd	gallons per day
gpm	gallons per minute
HCP	Habitat Conservation Plan
MCL	maximum contaminant level
MDD	maximum day demand
MG	million gallons
MGD	million gallons per day
MIT	Muckleshoot Indian Tribe
MOU	Memorandum of Understanding
NMFS	National Marine Fisheries Service
NTU	Nephelometric Turbidity Unit

OFM	State of Washington Office of Financial Management
psi	pounds per square inch
PSAPCA	Puget Sound Air Pollution Control Agency
PSRC	Puget Sound Regional Council
RCW	Revised Code of Washington
RWSS	Regional Water Supply System
SCADA	supervisory control and data acquisition
SDC	system development charge
SDWA	Safe Drinking Water Act
SDWR	Green River Second Diversion Water Right
SEPA	State Environmental Policy Act
SMA	Satellite Management Agency
SMART	Systematic Maintenance and Renewal Team
STGPD	South Tacoma Groundwater Protection District
SWTR	Surface Water Treatment Rule
TPCHD	Tacoma-Pierce County Health Department
TPU	Tacoma Public Utilities
UGA	Urban Growth Area
USACE	US Army Corps of Engineers
WAC	Washington Administrative Code
WISHA	Washington Industrial Safety and Health Act
WDFW	Washington Department of Fish and Wildlife
WUCC	Washington Water Utilities Coordinating Council

EXECUTIVE SUMMARY



Purpose of the Comprehensive Water System Plan

Tacoma Water's planning activities center on the need to meet increasing demands in an expanding service area, to address local, state, and federal government planning policies and regulations, to satisfy Washington State Department of Health (DOH) planning guidelines and to satisfactorily address customer expectations. The 2006 Tacoma Water Comprehensive Water System Plan (2006 Update) serves as a tool to assist Tacoma Water in making the best use of available resources in order to provide quality water services and protect the health of its customers. The 2006 Update complies with DOH regulations under Washington Administrative Code 246-290-100 which requires water purveyors to update water system plans every six years and, therefore, replaces the September 2000 Comprehensive Water System Plan as Tacoma Water's foundation for future decisions pertaining to the complete water system. The Green River Watershed Management Plan has also been updated and is included as Volume II.

Changes Since the last Water System Plan

Many changes have occurred which affect water system planning since Tacoma Water last prepared a water system plan. Such significant changes include:

- On October 21, 2005 water began flowing through Tacoma Water's 34-mile Second Supply Project Pipeline. A new regional partnership between Tacoma Water, the Lakehaven Utility District, the Covington Water District and the City of Kent was formed to share in the expense, and utilize the supply, associated with Tacoma Water's Green River Second Diversion Water Right.

- The Howard Hanson Dam Additional Storage Project received approval and installation of the cofferdam needed for construction of the fish trap and haul facilities is proceeding under U.S. Army Corps of Engineers direction.

- Tacoma Water began providing Satellite System Management Agency services to the City of Tacoma owned Tacoma Narrows Airport.

- Tacoma Water has acquired the following independent water systems: SE Tacoma Mutual, Hyada Mutual and Day Island.

- New wholesale water contracts have been reached, including with the Cascade Water Alliance.

- The requirement to conduct a vulnerability assessment was established when the Public Health Security and Bioterrorism Preparedness and Response Act of 2002 (HR3448) was passed.

- The 2003 Municipal Water Law (HB 1338) identified additional water system planning elements related to water rights, system capacity, service area consistency and conservation.

- The Environmental Protection Agency promulgated the Long Term 2 Enhanced Surface Water Treatment Rule that contained, among other things, new federal requirements for covering open finished water reservoirs.

- The Tacoma Water Habitat Conservation Plan was approved in 2001.

- Franchise agreements were reached with the City of Lakewood and the City of Fircrest to serve in portion of those cities.

- Tacoma Water developed its first 10-year Business Plan in 2003. Since that time, the Business Plan has been revaluated and revised every other year as the first step in establishing the upcoming biennial budget and associated rate cases, and identifying projected needs for the subsequent four biennial budget periods.

Water Service Area and Water Use

Tacoma Water provides water service to residences, businesses and industries located in the cities of Tacoma, University Place and Ruston; in portions of the cities of Puyallup, Orting, Bonney Lake, Fircrest, Lakewood and Federal Way; and, in portions of Pierce and southern King county. Tacoma Water also provides wholesale water supplies to 14 independent water systems operating in Pierce and King counties and provides management services to the Tacoma Narrows Airport located on the Gig Harbor Peninsula. Tacoma Water is a participant in, and operator of, the Second Supply Project: A new regional water partnership between Tacoma Water, the Lakehaven Utility District, the City of Kent and the Covington Water District.

Taken together Tacoma Water provides retail water service to approximately 94,000 connections or an estimated population of 302,392. While single-family residential connections account for the majority (89 percent) of Tacoma Water's customer base, water use by the single-family customer class accounts for 34 percent of total water consumption. On the other hand, one industrial connection (the Simpson Tacoma Kraft Mill) accounts for 29 percent of total water consumption. The multi-family customer class makes up 5 percent of Tacoma Water's customer base and 11 percent of total consumption, with commercial connections accounting for 6 percent of the customer base and 15 percent of consumption.

The total average daily billed consumption for all Tacoma Water customers in 2005 was 51.1 million gallons. This is lower than the 1995 average daily billed consumption (59.35 million gallons) despite the passage of 10 years and an increase in customer connections of approximately 18 percent. Average day water use at the Simpson Pulp Mill in 1995 was 20 million gallons. By 2005, average day water use has been reduced to 14.9 million gallons at the Simpson Pulp Mill.

Tacoma Water's residential per capita (or per person) water use has consistently dropped since 1990. For example, in 1990 the residential per capita water use was 92 gallons per day, decreased to 90 gallons per day in 1995 and to 76 gallons per day in 2005. Year 2005 residential per capita water use is significantly lower than what occurred in year 2004 (83 gallons per day) due, in part, to the implementation of Stage One of the four-stage Tacoma Water, Water Shortage Response Plan, which began in March and ended in July.

Water Resources

Tacoma Water relies on the conjunctive use of surface and groundwater to meet customers' demands for water. The Green River, located in King County, is Tacoma Water's primary source of water. Tacoma Water's Green River First Diversion water right can supply up to 73 million gallons of water each day. The supply under this water right can be replaced with water from seven wells located along the North Fork of the Green River when water in the river is turbid (or cloudy). An agreement reached with the Muckleshoot Indian Tribe in 1995 requires Tacoma Water to guarantee minimum river flows. In the event the established flows are not met, Tacoma Water must reduce use of the First Diversion water right or, following the completion of the Howard Hanson Dam Additional Storage Project, use water stored at Howard Hanson Dam for streamflow support.

Tacoma Water's Green River Second Diversion water right can provide up to 65 million gallons of water each day. This diversion is subject to minimum streamflow standards, is a resource

shared with Tacoma Water and its Second Supply Project Partners and allows water to be stored in the spring for use in the summer. When completed, the Howard Hanson Additional Storage Project will allow the storage of up to 20,000 acre-feet behind Howard Hanson Dam. Such stored water can be used as needed by Tacoma Water and its Partners to support Tacoma Water's instream flow commitments. Tacoma Water's share of the Second Diversion water right equals 27 million gallons of water a day. Tacoma Water's share of stored water equals up to 8,333 acre-feet: 30 million gallons a day if used at a uniform rate over a 90-day period.

In addition to surface and groundwater sources in the Green River Watershed, Tacoma Water owns 24 wells located in and around the city. Tacoma Water's wells have a short-term combined pumping capacity of approximately 60 million gallons per day. These groundwater sources supply approximately 15 percent of total annual water requirements. In some cases, Tacoma Water wells have not yet been fully developed to utilize the individual water rights associated with the various sources of supply.

Future Water Demands and Water Supply

With the October 20, 2005 start up of the Second Supply Project Pipeline, Tacoma Water relies on four basic sources of supply. These include the First Diversion water right from the Green River, the Second Diversion water right from the Green River, the North Fork well system and the system of 25 groundwater sources located in and near the City. Each of Tacoma Water's four basic sources of supply have unique constraints and conditions associated with their use. Given the complexity of the supply system, Tacoma Water utilizes a resource model in order to determine the most efficient means of meeting demands. The most recent resource model was prepared in July 2007 and is titled Water Availability Study.

The water demands incorporated into the resource model include Tacoma Water's most current demands as prepared in December 2003 (Expected Growth and High Growth scenarios), new water demands associated with a new wholesale water contract reached with the Cascade Water Alliance and additional average day wholesale demands of 1.67 million gallons per day, across all years. Such wholesale demands were contracted for after the 2003 demand forecast was prepared.

The July 2007 Water Availability Study evaluates the amount of water available in years 2020, 2025 and 2030 given projected water demands and water supply constraints. The Water Availability Study concludes that year 2025 will be the most difficult time period to meet demands. By 2030, the Cascade Water Alliance term-limited supply will drop from 6 million gallons a day to 1 million gallons a day, making year 2030 demands less than year 2025. For the Expected Growth Demand scenario, all demands will be met through 2030. In 2025 and 2030 there is an additional 2.2 million gallons per day and 4.1 million gallons per day available supply, respectively. For the High Growth Demand scenario, the years 2025 and 2030 experience shortfalls, with the 2025 shortfall expected to be 2.5 million gallons per day.

Tacoma Water plans to develop additional groundwater resources, consistent with existing water rights, at the South Tacoma Aquifer and Tideflats Wellfields, to implement the Tacoma Water Conservation Program, to cooperate in regional projects including projects involving the use of reclaimed water as may be implemented by local sewer utilities, and to pursue the acquisition of existing water rights that may become available in order to maintain adequate resources to meet projected demands.

Water System Evaluation

Transmission System

Tacoma Water's primary transmission system conveys water from the Green River (or North Fork Wellfield) to the service area and consists of Pipeline Nos. 1, 2, 4 and the newly constructed Second Supply Project Pipeline (also known as Pipeline No. 5). The basic strategy of the transmission system is to make use of the gravity flow of water from the Green River or North Fork Wellfield to the service area for reliable and economical service. Tacoma Water's secondary transmission system consists of 140 miles of main ranging in diameter from 28 to 96-inches.

Tacoma Water implements a transmission main renewal and replacement program to estimate capital expenses required to keep the existing transmission main infrastructure operable into the future. Through this program, transmission main replacement or renewal projects involving the following infrastructure, and in the following locations, have been identified as necessary to complete: Pipeline No. 1 in the Puyallup River valley; Pipeline No. 2 near Canyon Road; Tideflats Trunk Main 1 in the vicinity of the Tacoma Dome; Pipeline No. 1 near Boise Creek; and, Pipeline No. 2 west of Woodland Avenue along 128th Street.

Distribution System

Tacoma Water's distribution system encompasses an area of approximately 150 square miles. The distribution system contains nearly 1,200 miles of pipe ranging in diameter from 2 to 24-inches. The distribution system is designed to provide adequate looping and available water pressure generally ranges from an average of 55 pounds per square inch (psi) in residential areas up to 100 psi in industrial zones. All of Tacoma Water's customers are served through metered connections, varying in size from 5/8 inch to 30-inches.

Hydraulic modeling of the transmission and distribution system completed for the 2006 Update identifies several areas that are experiencing low flows based on existing maximum day and peak hour demands. Specific deficient areas include: Fife Heights; Stadium District; East Tacoma; North End; and, South L Street. The deficiencies are currently being addressed either through main replacement projects currently underway or planned or will undergo further study to determine the best solution to improve water service.

Storage System

Tacoma Water has built a storage system consisting of the 210- million-gallon McMillin Reservoir plus 16 other reservoirs, standpipes and tanks that can store up to 78 million gallons of additional water.

The Tacoma Water system, as a whole, has excess storage capacity; however, some individual service zones do not currently have adequate storage for anticipated growth. More storage and/or pump capacity is planned for the Prairie Ridge and Sunrise Standpipe zones to stay ahead of future growth.

The McMillin Reservoir is the last remaining uncovered reservoir in the Tacoma Water system and currently has approximately 150 million gallons of excess storage. Adverse impacts on water quality and recent federal water quality regulations require that the McMillin basins be replaced with enclosed tanks. To reduce the cost of covering the reservoirs and to increase the turnover rate, the size of McMillin will be reduced. Current projections call for the first of three 30-35 million gallon tanks to be constructed in 2009, with a second to be constructed in 2015.

Once two basins are in service it is likely that the remaining uncovered basin will be removed from service. The final tank would be constructed as system needs dictate, but likely in the 2019-2020 timeframe.

Water Quality

Because of the high quality of Green River water, active watershed control and ongoing compliance with regulations, Tacoma Water is one of the very few water systems in the United States that is not currently required to filter its supply.

Green River treatment facilties consist of North Fork groundwater blending and chemical treatment with chlorination, fluoridation and pH adjustment. The groundwater blending occurs within the Headworks Control Building and chemical treatment occurs approximately 2,600 feet downstream of the Headworks Control Building at the newly constructed Green River Treatment Plant – Chemical Facilities. A new Ozone Treatment Facility will be in service in mid-2007 for taste and odor control treatment.

The Tacoma Water groundwater supply system is principally treated only with chlorine for disinfection. Each groundwater source is not treated at the wellhead, rather several sources are blended together and treatment is applied at multiple confluence points.

The Long Term 2 Enhanced Surface Water Treatment Rule requires Tacoma Water to have the facilities in place to remove or inactivate *Cryptosporidium* by 2012. Tacoma Water plans to conduct a pilot study to evaluate several treatment processes for *Cryptosporidium* beginning in 2009.

Presently, the water from the South Tacoma Wells is disinfected with chlorine, but is not optimized for corrosion control nor is it fluoridated. Installation of corrosion control and fluoridation facilities for the South Tacoma Wells and other groundwater sources are planned for the 2007/2008 biennium.

Operations and Maintenance

Tacoma Water's operations and maintenance (O&M) organization is staffed by well-qualified, technically trained personnel. Staff regularly participates in safety and training programs to keep abreast of the latest changes in the water industry and to ensure a smooth and safe operation of the water system.

Maintenance programs on the distribution system began to be superseded by new construction for growth starting in the late 1970s. Throughout the 1990s, Tacoma Water focused on re-establishing adequate maintenance programs for the distribution system. The Systematic Maintenance and Renewal Team (SMART) program, hydrant maintenance, meter maintenance, and systematic flushing are all a result of those efforts. These programs are very effective and are models that other water purveyors have looked at to improve maintenance on their own systems.

A written maintenance plan provides the framework for maintenance planning in the Supply Section. Good progress has been made in reducing the backlog in maintenance of right-of-ways, tanks and pipe painting, and reservoir cleaning. Some challenges remain, such as making improvements in electrical maintenance, making further use of SAP in maintenance planning and scheduling and developing a maintenance plan for distribution.

Taken together, Tacoma Water's O&M budget for the 2005/2006 biennium is $78,484,477. This level of funding is expected to increase in the 2007/2008 biennium.

Green River Watershed Management Plan

The Green River Watershed Management Plan, included as Volume II, serves as documentation of the watershed control program implemented by Tacoma Water for the Green River Watershed. Washington Administrative Code 246-290-690 mandates that public water supply systems using unfiltered surface water develop and implement a DOH-approved watershed control program to avoid degradation of the physical, chemical, microbiological, and radiological quality of the source of the supply. As a public water supply utility with an unfiltered water source, Tacoma Water is required to update its watershed control program at least once every six years by providing documentation to the DOH. The Green River Watershed Management Plan characterizes the watershed hydrology, geography, and critical areas; details landowners and written agreements with landowners; identifies watershed characteristics and activities that may have an adverse effect on source water quality; summarizes monitoring and control of watershed activities; and discusses potential future improvements in watershed control.

Capital Improvement Program

The 2006 Update contains Tacoma Water's capital improvement program (CIP) developed to guide the growth of the Tacoma Water system through the year 2012 and beyond. Included in the CIP are:

- Water supply / conveyance projects
- Storage system projects
- Watershed and water treatment projects
- Distribution main upgrades and renewals

A CIP is to be updated every six years, consistent with water system plan update requirements. Through the development of a business plan, Tacoma Water evaluates and prioritizes system improvement needs on a more frequent, 2-year schedule.

Financial Evaluation

Revenue sources to finance the Tacoma Water capital improvement program include: policy-based rate revenue, System Development Charges, Water Quality Assurance Fund transfers, sale of surplus property and revenue bond proceeds. Tacoma Water has a sound financial base that can finance capital improvements. Bond ratings from both Moody's Investors Service and Standard and Poors indicate a high level of confidence in the utility's ability to repay related debt obligations.

Conclusion

Tacoma Water has a history of providing its customers with high quality drinking water in a cost-effective manner. The 2006 Update provides a roadmap for Tacoma Water to continue this level

of performance into the future. The 2006 Update will serve as a tool to assist Tacoma Water in making the best use of available resources in order to provide quality water services and protect the health of its customers.

The following table displays selected operating and financial data regarding Tacoma Water as of year-end 2005, 2004 and 2003.

SELECTED OPERATING AND FINANCIAL DATA

	2005	2004	2003
Average Customer Months Billed	94,003	93,906	92,740
Operating Revenue	$43,050,593	$39,844,915	$38,006,361
Net Operating Expenses	$38,830,548	$37,005,934	$33,422,026
Debt Service Coverage Ratio	2.68	2.26	2.94
Total Water Billed (Million Gallons)	18,648	20,353	20,141
Average Billed Daily Use (Million Gallons)	51.09	55.76	55.18
Maximum Daily Use (Million Gallons)	93.61	109.26	110.67

Source: Water Division, 2005, 2004 and 2003 Financial Reports
Net Operating Expenses excludes gross earnings tax and depreciation

CHAPTER 1

INTRODUCTION

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1.1 Authorization

The 2006 Tacoma Water Comprehensive Water System Plan (2006 Update) has been prepared to comply with the requirements of the Washington State Department of Health (DOH) as set forth in the Washington Administrative Code (WAC) 246-290-100, Water System Plan.

1.2 Objectives

The 2006 Update has been prepared to serve as the guiding document for the planning and design of future water system facilities and to assist Tacoma Water in developing a strategy for using its water resources in the most effective and efficient manner possible. The 2006 Update replaces the Comprehensive Water Plan Update, September 2000, as one of the utility's tools for future decisions pertaining to the complete water system. Identified in this 2006 Update are system improvements to meet the expanding and changing needs of Tacoma Water. The 2006 Update accomplishes the following objectives:

- Provides Tacoma Water with a guide to evaluate the impacts of future proposed development and land use changes on the water system.
- Identifies existing and potential water resources available to Tacoma Water.
- Provides a review of existing water quality data for Tacoma Water's system and discusses existing and forthcoming regulatory requirements as they apply to the water system.
- Conducts a water system inventory, including a description of supply, storage and distribution facilities operation.
- Establishes water system policies that will help Tacoma Water to make decisions and manage the water system, incorporating the requirements discussed in the water resource, water quality, water supply and water distribution sections of this 2006 Update.
- Documents Tacoma Water's Satellite System Management program.
- Documents planning and design criteria used by Tacoma Water.
- Identifies existing and potential future water system deficiencies by conducting storage and transmission/distribution system analyses.
- Develops a program of capital improvements, including priorities for construction and provides a financial evaluation to support the identified water system improvements.
- Documents Tacoma Water's commitment to implementing an effective conservation plan as an element of the overall Tacoma Water resource mix.
- Documents Tacoma Water's Green River Watershed Control Program.
- Responds to new water system planning requirements resulting from the 2003 Municipal Water Law (HB 1338).
- Implements the 2003 Municipal Water Law (HB 1338) expanded water right place of use benefit.
- Incorporates Tacoma Water's ten- year Business Plan Strategic Initiatives into the water system plan.

1.3 Significant Changes From 2000 Water System Plan

Tacoma Water's last water system plan was prepared in 1997-1998 and was approved by DOH in 2000. Many changes have occurred since then that affect the development of the 2006 Update. The following briefly describes both significant changes which have occurred within Tacoma Water and external to Tacoma Water which have influenced this water system update process.

- On October 21, 2005 water began flowing through Tacoma Water's 34-mile Second Supply Project Pipeline. A new regional partnership between Tacoma Water, the Lakehaven Water District, the Covington Water District and the City of Kent was formed to share in the expense, and utilize the supply, associated with Tacoma Water's Green River Second Diversion Water Right.
- The Howard Hanson Dam Additional Storage Project received approval. Installation of the cofferdam needed for construction of the fish trap and haul facilities is proceeding under Army Corps of Engineers (USACE) direction.
- Tacoma Water is providing Satellite System Management Agency (SMA) services to the City of Tacoma owned water system serving the Tacoma Narrows Airport located outside the City of Gig Harbor.
- Tacoma Water has acquired the following independent water systems: SE Tacoma Mutual, Hyada Mutual and Day Island.
- An additional 11 wholesale water contracts have been signed, including with the Cascade Water Alliance.
- In response to the events of September 11, 2001 the United States Congress passed the Public Health Security and Bioterrorism Preparedness and Response Act of 2002 (HR3448), which became effective June 12, 2002, Tacoma Water prepared a Vulnerability Assessment Plan and updated the Emergency Response Plan.
- The 2003 Municipal Water Law (HB1338), which became effective September 9, 2003, identifies additional water system planning elements related to water rights, system capacity, service area consistency and conservation.
- In 1998 the Washington State Legislature passed the Washington State Watershed Management Act (RCW 90.82) to address increasing water demand, water quality issues and the loss of critical habitat for fish and wildlife.
- On January 5, 2006 the U.S. Environmental Protection Agency (EPA) promulgated the Long Term 2 Enhanced Surface Water Treatment Rule that contained, among other things, new federal requirements for covering open finished water reservoirs.
- The Long Term 2 Enhanced Surface Water Treatment Rule also requires Tacoma Water to have the facilities in place to remove or inactivate *Cryptosporidium* by 2012.
- The Tacoma Water Habitat Conservation Plan (HCP) was approved in 2001. The HCP was developed to describe to the National Marine Fisheries Service (NMFS) and U.S. Fish and Wildlife Service (FWS) how the water utility proposes to operate its Green River municipal water supply system to be consistent with the requirements of the federal Endangered Species Act (ESA). The HCP describes the 64 habitat conservation measures that Tacoma Water has committed to implementing over the 50-year duration of the HCP.
- Franchise agreements were reached with the City of Lakewood and the City of Fircrest to serve in portions of those cities.
- Tacoma Water developed its first ten-year Business Plan in 2003. Since that time, the Business Plan has been revaluated and revised every other year as the first step in establishing

the upcoming biennial budget and associated rate cases, and identifying projected needs for the subsequent four biennial budget periods.

1.4 Planning Considerations And Approach

The 2006 Update is not a stand-alone document, but rather links all Tacoma Water planning activities together in order to provide the required justification of Tacoma Water's ability to provide water service to its identified service area(s) currently and for the future. Tacoma Water's planning activities center on the need to meet increasing demands in an expanding service area, to address local, state, and federal government planning policies and regulations, to satisfy DOH planning guidelines and to satisfactorily address customer expectations.

Planning for water service to a service area as large as Tacoma Water's service area, requires the consideration of land use plans of several jurisdictions. The dual responsibilities of supporting economic development and protecting the environment must be balanced with customer expectations of a high quality of water delivered at the lowest rate possible. Additionally, as a wholesale water provider and approved SSMA, Tacoma Water must be engaged in regional water supply planning activities to effectively respond to requests for new water service.

Chapter 2 of this 2006 Update contains a summary of the related plans and documents developed both by Tacoma Water and others which were considered during the development of the 2006 Update. Because it is Tacoma Water's intention to continue the recent practice of developing a business plan every two years to establish capital improvement and operation and maintenance priorities for the utility, special emphasis is given here to the Tacoma Water Business Plan, 2007-2016.

1.4.1 Tacoma Water Business Plan

To focus the activities of Tacoma Water as it pursues operations and maintenance and capital improvements while balancing funding limitations, Tacoma Water developed its first business plan in 2003. Tacoma Water intends to re-evaluate and revise the business plan every other year as the first step in establishing the upcoming biennial budget and associated rate cases, and to identify projected needs for the subsequent four biennial budget periods. The goals of the Tacoma Water Business Plan, 2007-2016, are as follows:

- Assure that the business activities of Tacoma Water comply with policy guidance and regulatory mandates and that they meet the expectations of customers.
- Assure that operation and maintenance and capital programs, deemed necessary by Tacoma Water management, with concurrence by the Public Utility Board, can be implemented in a financially responsible manner.
- Identify and schedule the actions and rate adjustments necessary to assure our customers of appropriate water quality, adequacy of supply; and reliability of service delivery.
- Provide predictability and focus to the business activities of Tacoma Water.
- Assure that Tacoma Water provides quality service to its customers through an emphasis on and achievement of efficient and cost effective operations.

The 2007-2016 Business Plan identifies Tacoma Water's Critical Success Factors – the broadly stated "keys to success" which must be achieved by Tacoma Water to ensure Tacoma Water's mission is achieved today and into the future. The 2007-2016 Critical Success Factors include: Water Quality, Reliabilitiy of Service, Adequacy of Supply, Rates and Finances, Environment and Work Force.

For each of Tacoma Water's Critical Success Factors, related challenges facing Tacoma Water are presented. Such challenges reflect policies and regulatory requirements, perceived customer expectations, the current work environment, environmental commitments, system growth pressures, and general issues facing water utilities.

The multitude of activities Tacoma Water must accomplish in order to provide high quality water service and the standards Tacoma Water considers desirable to operate under (known as performance measures) are also presented in the business plan.

A key component of the Tacoma Water business plan development effort is to prioritize challenges, while recognizing that lower priority challenges can not be ignored, but must be managed with a reduced emphasis. This prioritization process takes into account regulatory requirements, policy direction established for Tacoma Water by the Tacoma Public Utility Board, customer expectations and financial impacts. The development of Strategic Initiatives to address the highest priority challenges is the mechanism used for presenting Tacoma Water's highest priorities for implementation during the subsequent biennium.

For each of the identified Strategic Initiatives, the key planning, customer, operational and capital programs which must be accomplished are identified. The business plan also addresses the financing and rate requirements necessary to support the implementation of the projected operational and capital program needs. From the projection of needs, Tacoma Water derives its Capital Improvement Program (CIP) and operations and maintenance programs (O&M) for the water system. The CIP is an element of the City's Growth Management Act (GMA) Comprehensive Plan and is updated annually. Tacoma Water budgets biennially, and must revisit the CIP and O&M program in context with fiscal realities at each budget cycle.

A water system plan must contain a CIP based upon an analysis of existing system facilities' capability of supplying sufficient quality and quantity of water to meet existing and projected demands. The following Plan chapters provide the background analysis required to develop the CIP.

- Chapter 6 – Water Resources
- Chapter 9 – Water Quality and Treatment Requirements
- Chapter 10 – Water System Analysis

As identified in Chapter 11 – Capital Improvement Program, the 2006 Update's CIP is taken directly from the 2007-2016 Tacoma Water Business Plan. Because the business plan update cycle coincided with the water system plan update, the results of the required water system analysis have been incorporated into the business plan prioritization process completed to develop the 2007-2016 Business Plan. DOH requires a CIP to be updated every six years, consistent with water system plan update requirements. Through the development of a business plan, Tacoma Water evaluates and prioritizes system improvement needs on a more frequent, 2-year schedule.

Capital improvements are categorized in Chapter 11 as one of the following types of capital improvements.

- Water Supply, Transmission and Storage Improvements;
- Water Quality Improvements;
- Water Distribution Improvements; or,
- General Improvements.

The highest priorities for the 2007-2016 Business Plan, known as Strategic Initiatives, are summarized in Chapter 11 under the appropriate capital improvement program category as detailed below. Four Strategic Initiatives do not result in a capital expensive, however; and are not accounted for in the 2006 Update's CIP. Instead, the Strategic Initiatives are related to Tacoma Water's O&M programs and are, therefore, discussed in Chapter 8 – Operations and Maintenance Program, as noted below.

- Implement Conservation Programs *(Chapter 8 – Operations and Maintenance Program)*
- Emergency Preparedness & Security *(Water Supply, Transmission and Storage Improvements)*

- Distribution System Renewal and Replacement *(Water Distribution Improvements)*
- Tacoma Water Public Road Project Main Replacement *(Water Distribution Improvements)*
- Supply System Renewal and Replacement *(Water Supply, Transmission and Storage Improvements)*
- Assure Adequate Operations and Maintenance of the Existing System *Chapter 8 – Operations and Maintenance Program)*
- Long-range Water Quality/Health Requirements *(Water Quality Improvements)*
- Support of Economic Development *(Water Distribution Improvements)*
- Tacoma Water Support Facilities *(General Improvements*)
- Technology Implementation to Maintain Strategic Position *(General Improvements)*
- Tacoma Water's Environmental Stewardship Commitment (*General Improvements*)
- Long Range Watershed Ownership Strategy *(Chapter 8 – Operations and Maintenance Program)*
- Work Force Planning *(Chapter 8 – Operations and Maintenance Program)*
- McMillin Reservoir *(Water Supply, Transmission and Storage Improvements)*

1.5 Summary of 2006 Update Contents

A brief summary of the content of the chapters in the 2006 Update follows:

The **Executive Summary** provides a brief summary of the key elements of the 2006 Update and is intended to serve as a stand-alone public outreach communication tool.

Chapter 1 provides background information including the purpose of the 2006 Update, the objectives of the 2006 Update and the organization of the 2006 Update.

Chapter 2 describes the Tacoma Water service area and related plans impacting Tacoma Water operations.

Chapter 3 presents Tacoma Water's operational policies and design criteria.

Chapter 4 provides land use and population characteristics Tacoma Water must consider in projecting water demands.

Chapter 5 presents Tacoma Water's existing and historical water use characteristics and projected water demands.

Chapter 6 describes Tacoma Water's existing sources of supply and potential new sources and presents Tacoma Water's water conservation program.

Chapter 7 describes Tacoma Water's infrastructure.

Chapter 8 discusses Tacoma Water's operation and maintenance programs.

Chapter 9 describes Tacoma Water's water quality monitoring program.

Chapter 10 discusses the water system analyses and existing system deficiencies.

Chapter 11 presents the 6-year capital improvement program.

Chapter 12 summarizes the financial status of the water utility and presents a plan for funding the capital improvement program.

Volume II (Green River Watershed Management Plan) documents the Green River watershed control program.

The **Appendices** contain additional information that supplements the main chapters of the 2006 Update.

1.6 2006 Update Adoption Process

1.6.1 Public Review Process

In August 2006, Tacoma Water released the Tacoma Water Comprehensive Water Plan Update, Agency Review Draft, for review and comment by interested stakeholders, adjacent water systems and local land use authorities. Consistent with the time period associated with the required "local review for consistency" as described below, Tacoma Water allowed for a 60-day review period. Comments received during the review period and Tacoma Water's response, are contained in Appendix.D,

On October 9, 2006 Tacoma Water held a water system plan informational meeting to present the Agency Review Draft and solicit comment. The information presented at this meeting is contained in Appendix M. Additionally, on January 10, 2007 Tacoma Water met with the King County Utility Technical Review Committee as required by King County.

Following the completion of the public review period, Tacoma Water prepared a final plan for submittal to the Washington State Department of Health, Tacoma Public Utility Board, Tacoma City Council and King County Council for review and approval. Public testimony will be a component of the public hearings before the Tacoma Public Utility Board, Tacoma City Council and King County Council.

1.6.2 Local Review for Consistency

The Municipal Water Law of 2003 (HB 1338) requires water systems to document consistency with local land use plans for areas to which retail water service is provided. DOH is responsible for ensuring this consistency requirement is met. It is the responsibility of the water utility to reach out to the local land use authority(ies) to obtain a signed "consistency statement." The required retail water service area consistency statements are contained in Appendix E.

The Pierce County Coordinated Water System Plan (CWSP) requires that individual water system plans be reviewed by the Pierce County Public Works and Utilities Department, the lead agency in the implementation of the Pierce County CWSP, for consistency with the Pierce County CWSP. It is Tacoma Water's intention to utilize the 60-day review period associated with "local review for consistency" to obtain Pierce County review as required by the Pierce County CWSP. Comments from Pierce County in this regard are included in Appendix D.

King County Municipal Code Section 13.24.010 requires water purveyors operating in, or obtaining water from, unincorporated King County to obtain King County Council approval of a comprehensive water system plan after such a water system plan has been adopted by the water purveyor. It is Tacoma Water's intention to utilize the required 60-day review period associated with "local review for consistency" as the first step in obtaining the required King County Council water system plan approval. Comments received from the King County Utilities Technical Review Committee in this regard are included in Appendix D. Following the completion of the Tacoma Public Utility Board and Tacoma City Council review and approval process, Tacoma Water will formally request King County approval as outlined in King County Code Chapter 13.24.

1.6.3 SEPA

Required SEPA review documentation is provided in Appendix C.

CHAPTER 2

WATER SYSTEM BACKGROUND

CHAPTER 2

WATER SYSTEM BACKGROUND

2.1 Introduction

This chapter describes how Tacoma Water began and has evolved over the years by characterizing Tacoma Water's customer base and associated water use, service area and offered services. Related documents that affect the planning for and operation of the Tacoma Water system are summarized and included by reference.

2.2 System Background

The City of Tacoma incorporated in 1884. Tacoma Public Utilities, a City of Tacoma department, is comprised of Tacoma Power, Tacoma Rail and Tacoma Water. The Tacoma City Council appoints five people to serve on the Tacoma Public Utility Board to govern the operations of Tacoma Public Utilities. The Board sets policy for all Tacoma Public Utilities activities related to supplying customers with electricity, telecommunications, water and rail freight switching services. The Director of Utilities is appointed by the Board and is responsible for coordinating activities among the various divisions of Tacoma Public Utilities. Each division is overseen by a superintendent.

Tacoma Water serves more than 93,000 customers (or connections) in the cities of Tacoma, University Place and Ruston, plus portions of the cities of Puyallup, Federal Way, Bonney Lake, Lakewood, Fircrest, Orting, and Pierce and South King counties. Water is supplied directly to residents, businesses and industries through some 1,277 miles of water mains in sizes of up to 96-inches in diameter.

The Green River begins in the Cascade Mountains near Stampede Pass and serves as Tacoma Water's primary water supply. Tacoma Water's First Diversion water right is for up to 73 million gallons of water each day (MGD). Tacoma Water can substitute this Green River supply with water from seven wells located along the North Fork of the Green River. The wellfield can normally meet the same 73 MGD production as the Green River in the winter and spring months. The North Fork wells are used only when the water in the river is too turbid or cloudy, usually in the fall and winter, or in the event of other unusual or unacceptable water quality in the Green River.

In addition to Tacoma Water's First Diversion water right, the Green River is also the source of supply for a regional partnership formed by the City of Kent, the Covington Water District, the Lakehaven Utility District and Tacoma Water. The Second Supply Project, named after the fact that this is the second supply coming from the Green River, supplies up to 65 MGD to Tacoma Water and its Second Supply Project Partners (the Partners). The Partners participate in the Second Supply Project under the terms of the Second Supply Agreement, which defines their rights and obligations with regard to the Project. Tacoma Water has a 15/36 Participant Share and the City of Kent, the Covington Water District and the Lakehaven Utility District each have a 7/36 Participant Share. Generally, a Participant Share represents a participant's proportional right to receive and obligation to pay for water delivered by the Second Supply Project.

In addition to surface and groundwater sources from the Green River Watershed, Tacoma Water owns 24 wells located in and around the City. Tacoma Water's wells have a short-term combined pumping capacity of about 60 MGD.

Tacoma Water has a storage system consisting of the 210 million gallon (MG) McMillin Reservoir located near Puyallup, plus ten other reservoirs, standpipes and tanks that can store up to 78 MG of additional water.

Tacoma Water customers use water in a variety of ways. Residential customers used approximately 45 percent of all water delivered by the utility in 2005 while Simpson Tacoma Kraft Company used approximately 29 percent. Commercial and industrial customers used 20 percent and other customers used 6 percent.

2.2.1 Tacoma Water System History

Early in the 1880s, the City of Tacoma was a small town with no dependable supply of water. The water source was spring fed by gravity flow supplied by small, competing companies.

The City's growth surged when the construction of the transcontinental railroad was completed, with the City of Tacoma as its final destination. The efforts of Charles B. Wright to promote the selection of the City as the endpoint for this railroad line earned him the title of "Father of Tacoma". His local popularity in the late 1880s encouraged the City Council to pass Ordinance Number 96 granting Wright and his associates the privilege to supply the City with pure and fresh water. Supplying the rapidly growing city with water turned out to be a challenge. Because Wright's popularity waned as a result of poor water service, coupled with a typhoid outbreak in 1888, he decided to sell his water company. The City examined possible water sources and decided buying Wright's company would be the most expedient way to achieve a city owned and operated water system. The City purchased Wright's company in 1893 and established Tacoma Water. Customer complaints about the water at that time included descriptions of discolored, lukewarm, earthy-tasting and foul smelling water. A tour of the water supply revealed that one area was polluted by runoff from chicken farms, cesspools, and vault toilets – all susceptible to flooding.

Tacoma Water began searching for a new water source. In 1906, Tacoma Water drilled the South Tacoma Wellfield, with three of five wells resulting in useful production of water. Tacoma Water also secured water rights on the Green River, although the public voted against a proposal to construct a new surface water supply. The South Tacoma wells were drilled deeper, resulting in larger yields. The Green River gravity system was finally approved in 1910. On July 12, 1913, all water valves were opened and Green River water flowed into the City at an average rate of 42 MGD. The water was treated with chlorine for disinfection. As a result, Tacoma Water's service improved substantially.

Watershed management problems prevailed in the Green River Watershed. Contributing to pollution of the Green River were lumber camps, the Town of Lester and mineral spring spas. This prompted Tacoma Water to construct two additional chlorination plants at the headworks. Soon thereafter, the incidence of typhoid in the City was reduced substantially.

Still, Tacoma Water's problems continued. The water system was unmetered and the untreated wood transmission and distribution water mains leaked. By the early 1920s, water consumption in the City reached 400 gallons per day per person. In 1923, Tacoma Water began replacing untreated wood transmission mains with steel, concrete and creosote wood pipes reinforced with iron bands.

The City's growth continued, as well as its need for more water to attract new business. Businesses such as wood products companies needed cheap, plentiful fresh water. In response to the increasing demand for water, Tacoma Water started to plan for a second supply from the Puyallup River and Lake Kapowsin. This plan, however, was halted by the Depression. More water was delivered from the construction of additional South Tacoma wells in the early 1930s.

These wells resulted in a combined flow of 24 MGD flowing to the Hood Street Reservoir, accompanied by improvements to the pump station to handle the extra flow.

Tacoma Water received federal funds from 1933 to 1938 as a result of President Roosevelt's New Deal. Within this period, Tacoma Water accomplished many infrastructure improvements, including Green River gravity line reconstruction and the construction of Pipeline 4 from the McMillin Reservoir to the City. Many miles of wood main were replaced with cast iron pipe through Local Improvement Districts, wherein the local residents paid 90 to 95 percent of the improvement costs. A third batch of South Tacoma wells producing and additional 28.5 MGD, resulted in a total of 62 MGD available from wells.

The 1950s brought the completion of the 43-mile-long Green River pipeline replacement that had been started in 1924. The system conveyed 73 MGD to McMillin Reservoir – 30 MGD more that the original system.

The period between 1953 and 1957 was highly productive for Tacoma Water. In 1953, Tacoma Water lost money and decided that it was finally time for a long overdue rate increase and universal water use metering. The 30 percent rate increase in 1953 was the first since the City of Tacoma took over operation of the water supply in 1893. The increased revenue resulted in more construction and system improvements. Two large reservoirs were constructed: Portland Avenue and McMillin Number 2, which together doubled the City's water storage capacity. Tacoma Water also started a program to protect the Green River Watershed, of which it owned two percent.

From 1958 to 1970, Tacoma Water acquired a half dozen small mutual water companies and extended service to the northeast Tacoma area. The watershed protection battles continued with a policy of "no public access" and the Tacoma Water land acquisition in the watershed increased, especially around Howard Hanson Dam. The dam was constructed for flood control purposes by the U.S. Army Corps of Engineers (USACE) and was dedicated on May 12, 1962. This was the first and last time it was open to the public. By 1968, Tacoma Water declared the land acquisition program to protect the Green River Watershed a success.

On June 25, 1968, the Tacoma City Council passed Resolution 19775 requiring a majority vote of the residents and electors of the City prior to the initiation of any program of fluoridation of the water supply. The first special election was held on September 20, 1988, resulting in a majority decision to fluoridate Tacoma Water supplies. A second election was held in 1998 which also confirmed fluoridation. An interim fluoridation facility at the Green River Headworks was used in the early 1990s, and replaced with an improved facility in 1994. This plant was replaced with the completion of the Chemical Facilities in 2005 located at the Green River Headworks. Tacoma Water offers two locations to customers where unfluoridated water is available for self-transport: 7440 South Cedar Street and 1614 99th Street East.

The future of the water supply depended on the development of an additional source of water to meet increasing summer demands. A plan was developed in 1970 for an 11- year project that proposed another transmission main, Pipeline No. 5 (now also known as the Second Supply Project Pipeline) to carry additional water supply to the City and to blend water from the North Fork Wellfield with Green River water during high turbidity events. Phase I of the project, development of the wellfield, connecting pipe and reservoirs was completed in 1975.

Phase II, design and construction of the transmission line, was hindered by politics and evolving environmental laws in the early 1980s. The Second Diversion Water Right on the Green River was finally awarded in 1986. In 1995, an agreement with the Muckleshoot Indian Tribe (MIT) regarding the Green River was reached. All major permits and permissions for the construction of the Second Supply Project Pipeline were acquired by 1997. By 2001, a partnership agreement

between Tacoma Water, the City of Kent, the Lakehaven Utility District and the Covington Water District was enacted which covers each participants' rights and obligations regarding the use of the Second Supply Project. On October 20, 2005 water began flowing through the entire length of the 34-mile-long Second Supply Project Pipeline. On May 16, 2006 Tacoma Water made use of the Second Diversion water right to meet demands for the first time. (Please see Section 2.2.3 Second Supply Project for additional information.)

2.2.2 Wholesale Customers

Tacoma first began providing wholesale water service in the late 1910s to the Cumberland Water Cooperative. This small, residential community is served by pumping directly off Pipeline No. 1, approximately five miles downstream from the Green River diversion. A listing of current wholesale customers can be found in Table 2-1.

Currently, wholesale service is a small part of Tacoma Water's operations. Approximately 6 percent of revenue is derived from this source.

TABLE 2-1
Wholesale Customers

Andrain Water Association
Black Diamond, City of
Bonney Lake, City of
Cascade Water Alliance
Cumberland Water Co-op
Curran Road Mutual Water Association
Enumclaw, City of
Fife, City of
Firgrove Mutual Water Co.
Mt Terrace Homeowners Association
Puyallup, City of
Rainier View Water Co.
RSN Enterprises (Shady Haven Mobile Park)
Valley Water District
Water District #111
Fruitland Mutual Water Company

In 2005, Tacoma Water negotiated a wholesale contract with the Cascade Water Alliance; an alliance of King County water purveyors that includes the cities of Bellevue, Issaquah, Kirkland, Redmond and Tukwila, the Covington Water District, the Sammamish Plateau Water and Sewer District and the Skyway Water and Sewer District. Under the agreement, Tacoma Water is committed to having water available to Cascade on October 1, 2008. Additionally, on June 27,

2007 a wholesale water purchase agreement was executed with Fruitland Mutual Water Company. Under the agreement, Tacoma Water will provide Fruitland Mutual with 750,300 MGD for average day use, 1.5 MGD for peak day use and 1.3 MGD for four-day peak use. Information regarding the intertie required to begin providing wholesale water to Fruitland Mutual can be found in Table 2 - 3.

The water supply commitments associated with Tacoma Water's existing and contracted wholesale water customers, as well as potential new customers, have been incorporated into the 2006 Update's demand forecast as found in Chapter 5 – Water Demands. Additionally, details regarding the intertie(s) associated with each wholesale customer can be found in Table 2 - 3.

Currently, as a condition of new wholesale water service, the purchasing water utility must demonstrate to Tacoma Water that they have an ongoing program designed to achieve and maintain levels of unaccounted for water consistent with industry standards.

2.2.3 Second Supply Project

To meet its own future water supply requirements, as well as to increase regional supply, Tacoma Water has been developing the Second Supply Project since 1968. Tacoma Water, the City of Kent, the Covington Water District and the Lakehaven Utility District (the "Partners") participate in the Second Supply Project under the terms of the Second Supply Project Agreement. Although the Second Supply Project was developed as a joint venture known as the Regional Water Supply System (RWSS) and operation and maintenance of the RWSS is jointly funded by the Partners, the operation and maintenance of the RWSS is carried out entirely by Tacoma Water, in a manner as described in the *2002 Second Supply Project Partnership Agreement*.

The Second Supply Project consists of the following components:

- Green River water as allowed under Tacoma Water Green River Second Diversion Water Right;
- The 34-mile-long Second Supply Project Pipeline;
- Improvements made at the Tacoma Water Headworks diversion dam and intake;
- Second Supply Project fisheries and environmental enhancements, including a new fish trap-and-haul facility at the Headworks diversion dam;
- The right to store water as a result of the Howard Hanson Dam Additional Storage Project; and
- New Treatment Facilities (disinfection, pH adjustment, fluoridation and ozone).

In addition to increasing water supply, the Second Supply Project increases flexibility and reliability of water delivery in both Tacoma Water's and the other Partners' service areas, particularly after the planned improvements to the Howard Hanson Dam are completed.

As project operator, Tacoma Water is responsible for the day-to-day operation of the Second Supply Project and is obligated, consistent with the approved project annual budget then in effect, to operate and maintain the Second Supply Project in a manner that is consistent with prudent utility practice. Tacoma Water also is responsible as project operator for, among other things, monitoring the delivery of project water to each participant, and calibrating and testing of the master meter and all delivery meters no less than once each year.

After many years of preparation, major construction of the Second Supply Project began in 1999. In 2000, the Tacoma to Federal Way portion of the Second Supply Project Pipeline was completed and Lakehaven Utility District began receiving water from another portion of the Tacoma Water system. In 2002, the upper ten miles of the Second Supply Project Pipeline was

completed and placed in service, delivering water to the City of Kent and to the Covington Water District. Changes to the Headworks diversion facilities, including the addition of a new fish trap-and-haul facility, were completed in 2006. The new Phase I water treatment facilities (chlorination, fluoridation and pH adjustment) were finished and placed in service in August 2005. Ozone treatment and an integrated operations center are anticipated to be completed by 2007. On October 20, 2005, Second Supply Project water began flowing through the entire 34-mile-long Second Supply Project Pipeline.

The Second Supply Project also includes modifications to the Howard Hanson Dam to allow for additional water storage for municipal supply purposes. The Howard Hanson Dam Additional Storage Project includes the construction of a fish passage facility and certain environmental mitigation features. Installation of the cofferdam, needed for construction of the fish trap-and-haul facilities, is proceeding under USACE direction. The cofferdam placement and related rock excavation work were completed in Spring 2006.

2.2.4 Satellite System Management Agency Services

On January 8, 1997, the Tacoma Public Utility Board approved Resolution U-9242 giving Tacoma Water the authorization to apply for Washington State Department of Health (DOH) approval as a satellite system management agency or SSMA.

A presubmittal conference was held on March 12, 1997, attended by Tacoma Water, DOH and Tacoma-Pierce County Health Department (TPCHD) representatives to address the contents of Tacoma Water's SSMA plan and the requirements for SSMA approval. The first Tacoma Water SSMA Program was incorporated into the Tacoma Water Comprehensive Water System Plan Update, 2000, and therefore, was approved in conjunction with the 2000 Plan in September 2000.

Currently, SSMA services are offered to the City of Tacoma owned Narrows Airport water system located on the Gig Harbor Peninsula.

Presently, Tacoma Water responds to requests for SSMA service by providing, in writing, information to a requesting entity on services offered by Tacoma Water and alternatives to Tacoma Water providing SSMA services. The complete Tacoma Water SSMA Program is contained in Appendix A.

2.2.5 Interties

Water system interties are physical connections between two adjacent water systems. Interties are normally separated by a closed isolation valve or control valve. Emergency supply interties provide water from one system to another during emergency situations only. An emergency situation may occur when a water system loses its main source of supply or a major transmission main and is unable to provide a sufficient quantity of water to its customers. Wholesale service interties provide water from one system to another during non-emergency situations and are typically supplying water at all times.

Tacoma Water currently has 20 emergency interties with ten local water purveyors. Tacoma Water also has 20 metered wholesale connections to 14 local water purveyors. Additionally, nine interties associated with the Second Supply Project and the Partners are in place. New emergency interties and wholesale services are added at the request of local water purveyors. If the emergency intertie provides benefit to Tacoma Water, then Tacoma Water will share the cost of the intertie, commensurate with the benefit.

Tables 2–2, 2–3, and 2-4 contain the current emergency, wholesale and second supply pipeline interties with Tacoma Water. Although the Cascade Water Alliance and Tacoma Water have entered into a wholesale water contract, interties required to supply water to the Cascade Water

Alliance are not yet in place. Additionally, the intertie required to begin wholesale water service to Fruitland Mutual Water Company is not in place.

TABLE 2-2
Interties with Tacoma Water, Wholesale

Water System Name	County	Location	Date of First Use	Connection Size	Intended Use	Agreement in Place
Andrain Water Association	Pierce	7700 128th St E	10/12/1974	4”	Wholesale	No
Bonney Lake, City of	Pierce	21900 Connells Prairie Rd E	7/1/2006	4”	Wholesale	Yes
Cumberland Water Co-op	King	35399 314th Way SE	9/29/1918	6”	Wholesale	Yes
Curran Rd Mutual Water Co.	Pierce	4600 128th St E	7/30/1979	8”	Wholesale	Yes
Curran Rd Mutual Water Co.	Pierce	15200 Canyon Rd E	3/31/2004	6”	Wholesale	Yes
Enumclaw, City of	King	580 E Hwy 410	5/27/1977	12”	Wholesale	Yes
Fife, City of	Pierce	4100 Taylor Way E	10/12/1974	8”	Wholesale	No
Fife, City of	Pierce	2300 Milwaukee Way E	9/29/1982	10”	Wholesale	No
Firgrove Mutual Water Co.	Pierce	12200 144th St E	7/2/1969	12”	Wholesale	Yes
Firgrove Mutual Water Co.	Pierce	10400 132nd St E	7/1996	8”	Wholesale	Yes
Firgrove Mutual Water Co.	Pierce	11002 176th St E	6/1999	6”	Wholesale	Yes
Mt Terrace Homeowners Assn.	Pierce	9615 128th St E	10/12/1974	3”	Wholesale	No
Puyallup, City of	Pierce	11100 128th St E	1/25/1983	16”	Wholesale	Yes
RSN Enterprises	Pierce	9424 125th St Ct E	12/4/1987	2”	Wholesale	No

TABLE 2-2
Interties with Tacoma Water, Wholesale (cont.)

Water System Name	County	Location	Date of First Use	Connection Size	Intended Use	Agreement in Place
Rainier View Water Co.	Pierce	17600 176th St E	1/2005	16”	Wholesale	Yes
Valley Water District (Alderwood Estates)	Pierce	14500 134th Ave E	1/10/2000	8”	Wholesale	Yes
Valley Water District (Valley System)	Pierce	12800 128th ST E	1995	12”	Wholesale	Yes
Valley Water District (View Royal System)	Pierce	11100 222nd Ave E	10/21/2003	8”	Wholesale	Yes
Fruitland Mutual Water Company	Pierce	112th St E & Pipeline #4 Rd	2007	12”	Wholesale	Yes

TABLE 2-3
Interties with Tacoma Water, Second Supply Project Pipeline

Water System Name	County	Location	Date of First Use	Connection Size	Intended Use	Agreement in Place
Auburn, City of	King	13200 296th St SE		12”	Emergency	No
Auburn, City of	King	3200 “K” St NE		12”	Emergency	No
Auburn, City of	King	3200 “B” St NE		12”	Emergency	No
Black Diamond, City of	King	26122 Lawson St		12”	Wholesale	Yes
Covington Water District	King	18800 304th St SE		12”	Second Supply Partner	Yes
Covington Water District	King	21900 304th St SE		16”	Second Supply Partner	Yes
Covington Water District	King	14800 296th St SE		12”	Second Supply Partner	Yes
Covington Water District	King	22048 288th ST SE			Second Supply Partner	Yes
Kent, City of	King	12000 296th St SE		24”	Second Supply Partner	Yes
Kent, City of	King	12400 296th St SE		12”	Second Supply Partner	Yes
Kent, City of	King	21700 288th St SE			Second Supply Partner	Yes
Lakehaven Utility District	King	332nd St S		36”	Second Supply Partner	Yes
Lakehaven Utility District	King	313th Place S		24”	Second Supply Partner	Yes
Lakehaven Utility District	King	SW 356th Street			Second Supply Partner	Yes
Water District #111	King	12300 296th St SE		12”	Wholesale	Yes

TABLE 2-4
Interties with Tacoma Water, Emergency

Water System Name	County	Location	Date of First Use	Connection Size	Intended Use	Agreement in Place
Bonney Lake, City of, #1	Pierce	20900 112th St E	3/21/1990	8”	Emergency	Yes
Bonney Lake, City of, #2	Pierce	11800 198TH Ave E	11/19/1987	12”	Emergency	Yes
Buckley, Town of	Pierce	11200 Mundy Loss Rd E	8/1989	12”	Emergency	No
Buckley, Town of	Pierce	HWY 410 at Main St	9/29/1924	4”	Emergency	No
Fircrest, City of	Pierce	2501 Orchard St S		6”	Emergency	Yes
Firgrove Mutual Water Co.	Pierce	13100 Meridian Ave E		12”	Emergency	Yes
Lakehaven Utility District #1	King	325th St SW	1966	8”	Emergency	No
Lakehaven Utility District #2	King	349th Pl SW	7/18/1990	12”	Emergency	No
Lakewood Water District	Pierce	2599 96th St S		12”	Emergency	No
Lakewood Water District	Pierce	8000 South Tacoma Way		12”	Emergency	No
Parkland Light and Water Co.	Pierce	10000 “A” St S		10”	Emergency	No
Parkland Light and Water Co.	Pierce	108th St & Park Ave S		8”	Emergency	No
Parkland Light and Water Co.	Pierce	112th St & Golden Given Rd		8”	Emergency	No
Summit Water & Supply Co #1	Pierce	3000 128th St E	8/16/1968	8”	Emergency	No
Summit Water & Supply Co #2	Pierce	7102 Pipeline Rd E	6/11/1973	12”	Emergency	No
Summit Water & Supply Co #3	Pierce	8000 Pipeline Rd E	7/13/1953	4”	Emergency	No
Summit Water & Supply Co #4	Pierce	8600 Pipeline Rd E		12”	Emergency	Yes

TABLE 2-4
Interties with Tacoma Water, Emergency (cont.)

Water System Name	County	Location	Date of First Use	Connection Size	Intended Use	Agreement in Place
Valley Water District	Pierce	12600 144th St E	9/29/1972	2”	Emergency	Yes
Valley Water District	Pierce	SR 62 & 128th St E		2”	Emergency	Yes

2.3 Service Area

As highlighted above, Tacoma Water provides direct retail water service to customers; wholesale water service to other municipal water systems; is a participant in a new regional water sharing partnership, and; has been approved as a SSMA. The following section describes the areas to which these different services are currently offered and areas to which such services could be provided in the future.

2.3.1 Retail Service Area

Pierce County

The Public Water System Coordination Act (RCW 70.116) requires that a procedure be established to identify the existing and future service areas of public water systems operating within a "Critical Water Supply Service Area" (CWSSA). Pierce County was declared to be a CWSSA in 1983, thus requiring the development of a coordinated water system plan (CWSP) and the identification of exclusive water service areas by public water systems. It is through the signing of a *Standard Service Area Agreement Establishing Water Utility Service Area Boundaries* that water systems operating within Pierce County are granted an exclusive water service area. Although not a requirement, Tacoma Water has chosen to develop Standard Service Area Agreements with each of its adjacent water systems. Appendix F contains the most current Tacoma Water Standard Service Agreements. Such agreements are also on file with Pierce County Public Works and Utilities Department, the lead agency in the implementation of the Pierce County CWSP.

The Municipal Water Supply – Efficiency Requirements Act, Chapter 5, Laws of 2003 (Municipal Water Law), amended the State Board of Health Code (43.20 RCW) to require that municipal water suppliers provide water service to all new retail customers within a retail service area under certain conditions. A retail service area is the area within which water is or will be sold directly to the ultimate consumers.

According to the Municipal Water Law, a municipal water supplier has a duty to serve new customers within its identified retail service area if the utility:

- Can provide water service in a timely and reasonable way;
- Has sufficient water rights, or uses water from a source that has a water right;
- Has sufficient capacity to serve the water in a safe and reliable manner as determined by the DOH; and
- Is consistent with the requirements of any comprehensive plans or development regulations adopted under chapter 36.70A RCW or any other applicable adopted comprehensive plans, land use plans, or development regulations.

For the purposes of the 2006 Update, Tacoma Water's Pierce County CWSP designated water service area is synonymous with its retail service area as defined by the Municipal Water Law and is, therefore, an area to which Tacoma Water is committed to providing water service in a timely and reasonable manner. As such, this water service area includes both existing retail customers and areas to which Tacoma Water is planning to provide water service in the future as growth occurs consistent with the local jurisdiction's comprehensive plan and zoning regulations.

The Pierce County CWSP allows designated water service areas to be amended in cases where two or more water systems agree to a revision or in the event that the designated water purveyor is found to be unable or unwilling to provide timely and reasonable water service. Tacoma Water will continue the practice of revising its service area in cases where an adjacent water utility

willingly relinquishes a portion of its exclusive service and expansion of service area is consistent with Tacoma Water service area expansion policies. Additionally, should a water purveyor be found to be unwilling or unable to provide timely and reasonable water service to its designated service area, Tacoma Water will consider expanding its service area provided such an expansion is consistent with Tacoma Water service area expansion policies. Tacoma Water's service expansion policies are detailed in Chapter 3 – Policies and Design Criteria.

Tacoma Water's retail service area is generally depicted in Figure 2-1. (Please see Appendix O - Tacoma Water Service Area Maps for Tacoma Water's detailed parcel specific service area map.) The service area includes the area within the corporate boundaries of the City of Tacoma, some areas immediately adjacent to the corporate boundaries, and some areas to the south and east of the City. Approximately 93 percent of the service area is in Pierce County, with seven percent in King County. The service area generally follows the City's pipelines and is roughly bounded on the south by the military bases; on the north by 272nd Street in southern King County; on the west by Puget Sound; and on the east by the Cascade foothills. In addition to providing water service within the City of Tacoma, Tacoma Water also provides retail water service to residents of the cities of University Place and Ruston. Retail water service is also provided to portions of the cities of Lakewood, Orting, Bonney Lake, Fircest and Puyallup.

King County

Retail water service in King County includes approximately 3,250 services in the City of Federal Way that were originally part of the King County Water District 106 system and 94 services in unincorporated King County southwest of Cumberland that are served off of Pipeline No. 1.

Service area agreements required by the South King County CWSP in order to have an exclusive water service area, are contained in Appendix G.

2.3.2 Wholesale Service Area

Currently, Tacoma Water is contracted to provide wholesale water to 15 purveyors in Pierce and King counties. (See Table 2-1.) Additionally, in 2005, Tacoma Water negotiated a wholesale contract with the Cascade Water Alliance, an alliance of King County water purveyors which includes the cities of Bellevue, Issaquah, Kirkland, Redmond and Tukwila, and the Covington Water District, the Sammamish Plateau Water and Sewer District, and the Skyway Water and Sewer District. Under the Cascade Water Alliance contract, Tacoma Water is committed to having water available to Cascade on October 1, 2008. The retail service areas of Tacoma Water's principal existing wholesale customers are contained in the respective utility's water system plan and are generally depicted on Figure 2-1.

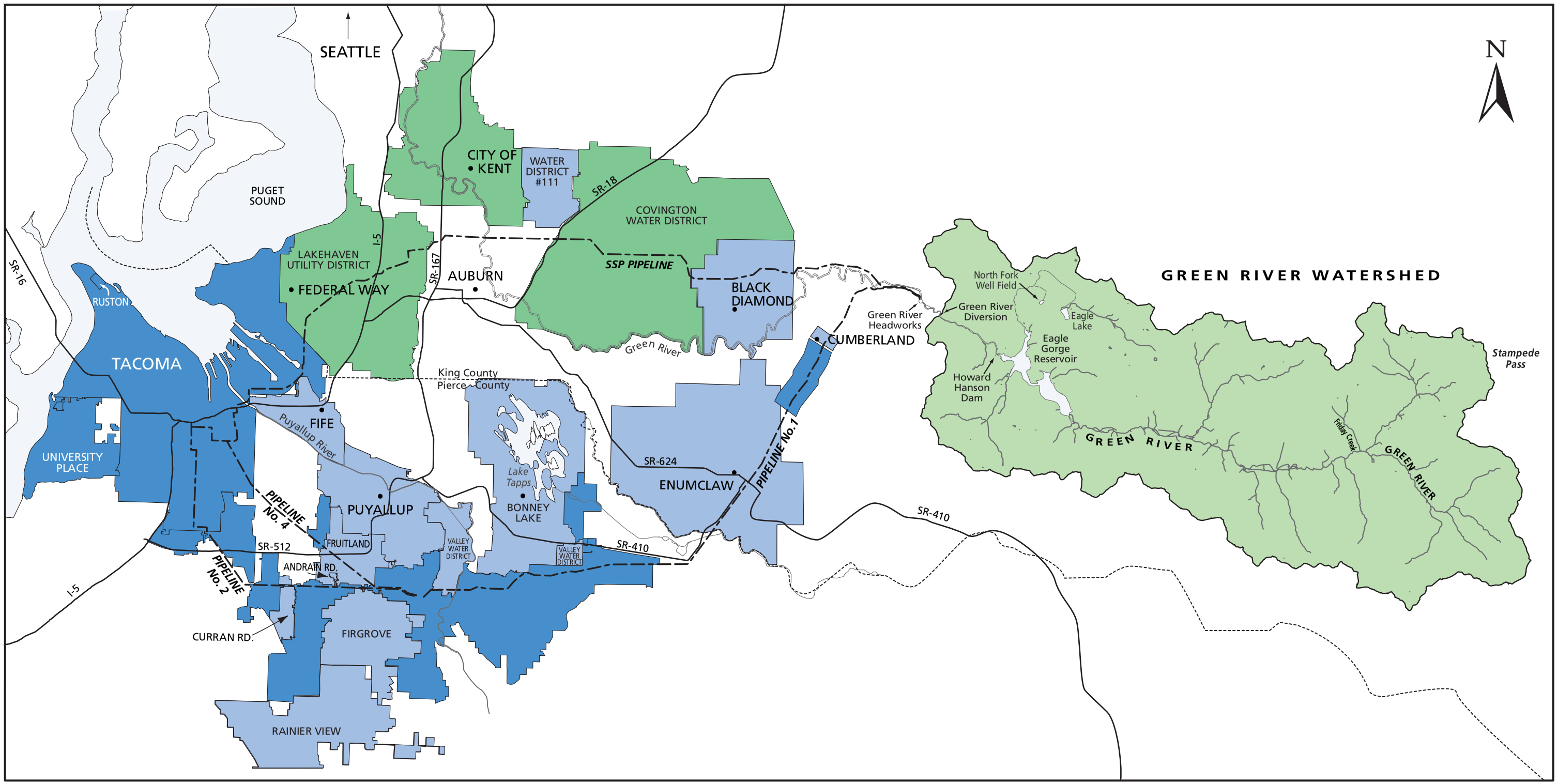
The Pierce County CWSP identifies Tacoma Water as a regional water purveyor. Tacoma Water will provide wholesale water service to water systems operating within Pierce County that request wholesale service provided such service is consistent with Tacoma Water policy. Due to the lack of a transmission network linking Tacoma to the Gig Harbor and Key Peninsulas, the likelihood of providing wholesale water service west of the Narrows Bridge is slight.

2.3.3 Satellite System Management Agency Service Area

Tacoma Water has been approved by DOH as a SSMA for both direct and contract services. Details regarding Tacoma Water's SSMA Program can be found in Appendix A.

Direct Service Area

In general, Tacoma Water will require extension of water mains to any proposed development located within its designated retail service area. Due to the existence of water mains located within 1,000 feet of each other or due to the single ownership of large tracts of land, such as the Cascadia development and the Frederickson Industrial Area, to which major water main



LEGEND

- Retail Service Area
- Wholesale Service Area
- Second Supply Project Partners

TACOMA WATER
TACOMA PUBLIC UTILITIES

JULY 2007

NOTES:

1. Additional current wholesale customers include Mt. Terrace Homeowners Association and Shady Haven MHP. Additional new wholesale customers include the Cascade Water Alliance.
2. This is a graphic representation of Tacoma Water's service area only and is not intended to represent individual tax parcel location.

Figure 2-1 **Retail, Wholesale and 2nd Supply Partners Service Areas**

extensions are planned, the likelihood of providing SSMA service within the Tacoma Water retail service area is low.

Contract Service Area

The Tacoma Water SSMA contract service area is in Pierce County east of Puget Sound, west of Range 7 East, and north of Township 16 North. Areas within Pierce County farther east and south of the SSMA contract service area were judged to be too remote for reasonable service.

Tacoma Water will also consider providing SSMA management and operations services to small independent systems in Pierce County east of Puget Sound, west of Range 7 East, and north of Township 16 North, and to systems owned by other City of Tacoma departments despite location. Currently, Tacoma Water is providing limited SSMA services to the Tacoma Narrows Airport, a City of Tacoma owned system located south of the City of Gig Harbor.

2.3.4 Characterization

The Tacoma Water service area lies primarily within the drainage basin formed by the White and Puyallup Rivers, which enter Puget Sound at Commencement Bay.

The bluffs, plateaus, and rolling hills of the western portion and the flat river plain valleys of the remainder of the service area are representative of Puget Sound lowland areas. The lowland area was formed as a result of regional glaciation that caused erosion and deposition during the ice ages. The deposited materials include clay, silt, sand, glacial till, and a thin strata of peat. In some places, the deposits may be as thick as 2,000 feet.

The climate of the area is temperate, with generally dry summers and wet, mild winters. Daily temperatures average about 70 degrees F during the summer months, and 40 to 50 degrees F in the winter. Temperature extremes in both seasons are generally of short duration. Seventy-five percent of the annual rainfall occurs during the six months from October through March, with November through January being the wettest months. Annual precipitation varies from 25 to 50 inches, depending on the specific location within the service area, with average precipitation ranging from 30 to 31 inches.

The Tacoma Water service area built environment, including land use and growth trends, is described in Chapter 4 – Land Use and Population.

2.4 Adjacent Systems

Twenty-six Group A public water systems share common boundaries with Tacoma Water.

A listing of these systems, including approximate number of connections, is contained in Table 2-5. Figure 2-2 depicts service areas. A brief discussion of the larger adjacent water systems follows.

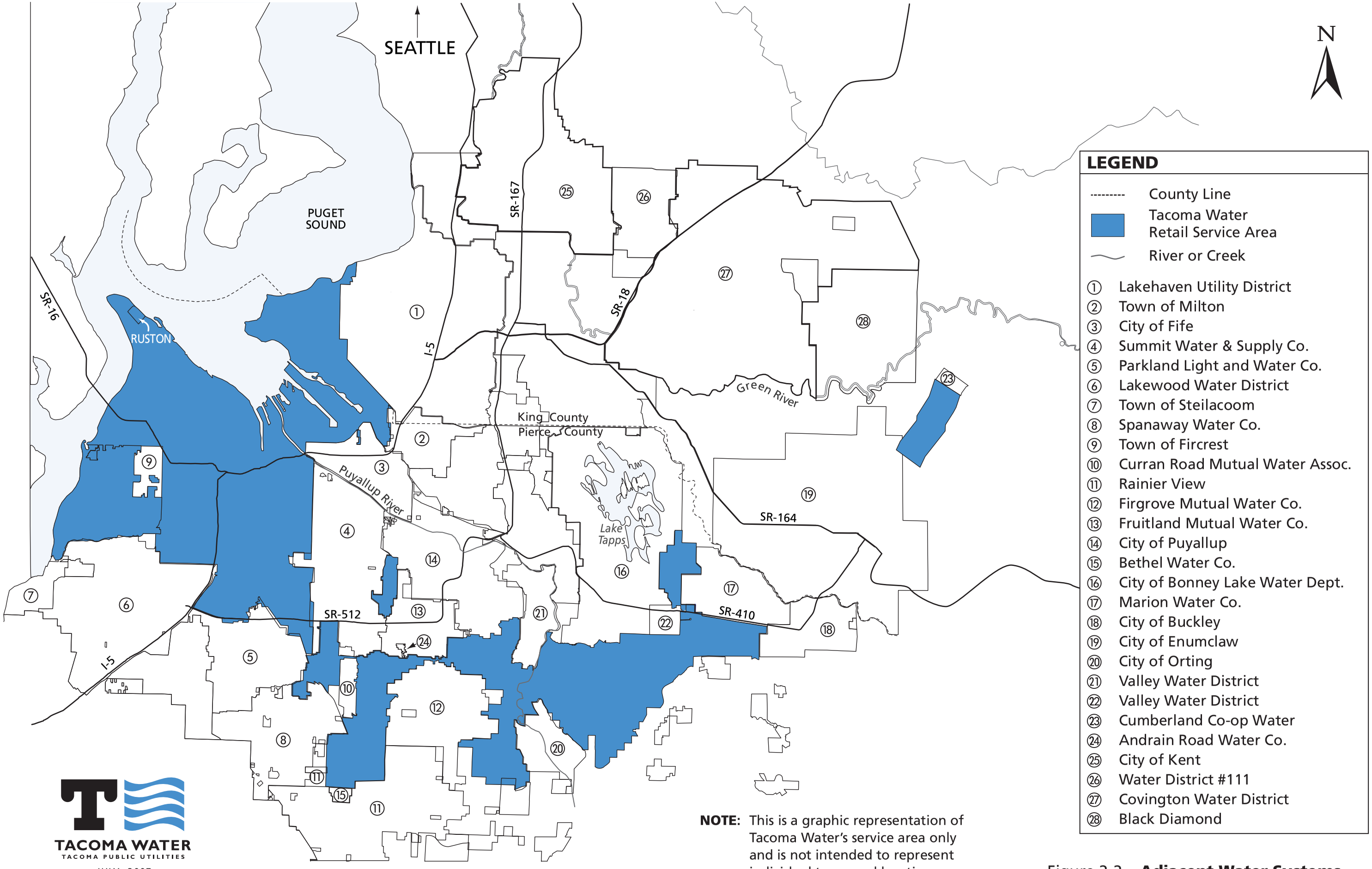


Figure 2-2 **Adjacent Water Systems**

TABLE 2-5

Adjacent Water Systems

<1,000 Connections	1,000 – 10,000 Connections	10,000 – 25,000 Connections	>25,000 Connections
• Bethel Water Company • City of Fife • City of Orting • Marion Water Co • City of Buckley • Valley Water System • View Royal • Andrain Road Water • Bethel Ranchettes • County Services Inc • Cumberland Water Cooperative • Curran Road Water	• City of Bonney Lake • City of Puyallup • Figrove Mutual Inc • Fruitland Mutual Water • Parkland Light and Water • City of Enumclaw • Spanaway Water Co • Town of Steilacoom • Summit Water and Supply • Town of Fircrest • Southwood Water System • Town of Milton	• Lakewood Water District	• Lakehaven Utility District

2.4.1 Lakewood Water District

The Lakewood Water District is located south of Tacoma Water's service area, encompassing primarily the City of Lakewood corporate boundaries. The District relies on groundwater as its source of supply, but does maintain two interties with Tacoma Water to be used on an emergency basis only. Facilities include 31 wells, of which 29 are active, and 13 storage tanks. In 2003, the District provided water service to 15,864 service connections. The District recently purchased water rights from Abitibi Consolidated Sales Corporation and intends to provide wholesale water to Pierce County water systems as a result. The District currently provides wholesale water service to the Town of Steilacoom (1996) and Summit Water and Supply Company (2003). A water system plan amendment dated February 2005 is currently undergoing DOH review.

2.4.2 Lakehaven Utility District

The Lakehaven Utility District provides water (and sewer) service within most of the City of Federal Way, small portions of the cities of Auburn, Pacific, Tacoma, Des Moines and Milton and to approximately 18 square miles of unincorporated King County. Tacoma Water provides direct service to a portion of the southwesterly section of the City of Federal Way, adjacent to the District's service area.

The District's water system includes 400 miles of mainline, 24 wells and 12 storage tanks with an approximate storage capacity of 31 MG. The District's average day demands are approximately 11.5 MGD. The District serves a population of approximately 112,000 people. The District is a partner in the Second Supply Project. District interties with Tacoma Water and associated with the Second Supply Project can be found on tables 2-3 and 2-4.

2.4.3 City of Puyallup

The City of Puyallup serves the majority of the incorporated city limits of Puyallup as well as portions of unincorporated Pierce County. The City's primary sources of supply are Salmon Springs and Maplewood Springs. The City also has a total of five operating wells and an intertie with Tacoma Water. A water system plan amendment dated May 2004 is currently undergoing DOH review. According to this plan, current City of Puyallup sources of supply are sufficient to serve system demands through 2021 after which additional source of supply development improvements or additional reliance upon the Tacoma Water intertie will be required.

2.4.4 City of Bonney Lake

The City of Bonney Lake provides water service within the city limits of Bonney Lake as well as to a large portion of unincorporated Pierce County. At the end of 2004, Bonney Lake provided water service to approximately 10,300 customer accounts. Grainger Springs, Victor Falls Springs, Tacoma Point Wellfield and Ball Park Well provide Bonney Lake's water supply. Additionally, in 2005, Bonney Lake entered into a wholesale water contract with Tacoma Water for 935,000 gallons per day, average day use; 2,000,900 gallons per day, peak day use; and, 1,800,810 gallons per day, for 4-day peak use.

Bonney Lake currently has a draft water system plan undergoing the DOH review process. According to the *City of Bonney Lake Comprehensive Water System Plan, Planning Commission Review draft, March 2006*, overall demands are expected to increase approximately 30 to 36 percent within the next 6 years and 51 to 68 percent within the next 20 years. It is estimated that Bonney Lake has sufficient water supply from its groundwater wells, springs and wholesale water contract with Tacoma Water to meet demands until approximately 2011.

2.4.5 Parkland Light and Water Company

The Parkland Light and Water Company water system is located to the south of the city limits of Tacoma and includes a portion of Tacoma's Urban Growth Area. Parkland's water is pumped from several aquifer levels of the Chambers-Clover Creek Watershed as it flows to Puget Sound. Parkland owns thirteen wells which range from 30 to 630 feet deep and serves 7,550 retail customers. Parkland entered into a tri-party agreement with the Lakewood Water District and Summit Water and Supply Company in 2003 allowing water to be wheeled through the its system from Lakewood to Summit. Parkland maintains one emergency intertie with Tacoma Water. Currently, Parkland has a water system plan dated June 2006 undergoing the DOH review process.

2.4.6 Firgrove Mutual Water Company

The Firgrove Mutual Water Company service area is located south of the City of Puyallup in an unincorporated area of central Pierce County, within the Pierce County Urban Growth Area. As year-end 2005, service connections totaled 7,642. While the service area was originally developed at relatively low, rural densities of residential development, the area is experiencing increasing urbanization, including higher residential densities as well as a mix of non-residential uses. Firgrove maintains three wholesale water connections with Tacoma Water. The Firgrove 2002 Water System Plan recognizes that the system does not have sufficient water rights to support 20 years of growth and therefore water is now being purchased from Tacoma Water, a regional wholesaler.

2.4.7 Summit Water and Supply Company

Summit Water and Supply Company serves approximately 5,175 customer accounts in a service area located immediately to the east of the city limits of Tacoma. The majority of the service area is zoned "rural separator" by the Pierce County Comprehensive Plan and is, therefore, located outside the UGA. In addition to its own groundwater sources, Summit Water also maintains a contract with the Lakewood Water District for wholesale water. Water from the Lakewood Water District is wheeled through the Parkland Light and Water Company for Summit Water's use.

2.4.8 Rainier View Water Company - Southwood Water System

Rainier View Water Company's Southwood system provides water service in unincorporated southern Pierce County with approximately 40 percent of the service area located within the Urban Growth Area. In 2001, during the development of the Southwood/Sound Water System Plan, the water system recognized that it had committed its existing capacity, based on water rights and would require additional sources of supply in order to provide for anticipated growth. For purposes of water system plan development, the Southwood/Sound system projected an increase of 700 new residential units per year between 2000 and 2010. Following the realization that new sources of water were required, the Southwood Water System entered into a wholesale water contract with Tacoma Water. Currently, the Southwood Water System maintains one intertie with Tacoma Water to provide for wholesale water.

2.4.9 Fruitland Mutual Water Company

Fruitland Mutual Water Company serves approximately 3,579 connections partially within the City of Puyallup and partially within unincorporated Pierce County in the area known as "South Hill". Fruitland Mutual Water Company currently has a water system plan undergoing the DOH approval process and is anticipated to be approved shortly. According to the draft Plan, March 2006, average day demand is projected to exceed water rights near the year of 2010. On June 27, 2007 a wholesale water purchase agreement was reached with Tacoma Water. Fruitland Mutual will prepare an amendment to its WSP to address this recent agreement.

Tacoma Water Pipeline No. 2 and Pipeline No. 4 run adjacent to or within the Fruitland Mutual service area. In some cases, the properties fronting Pipeline No. 4 retain Tacoma Water service; however, over time many of the customers have transferred to Fruitland's distribution system. (Note: New services required off of transmission mains are provided by Tacoma Water only if the customer is within the Tacoma Water service area and if there is an existing manifold with room to add the new service. If the property is located in unincorporated Pierce County, the required property side shoestring service line can not be installed in the right-of-way. Instead, the property owner requesting service is required to obtain easements from neighboring property owners prior to Tacoma Water installing the service and meter in the obtain easement. Additionally, it is Tacoma Water's intention to work with the designated water purveyor to transfer services in instances where water service is obtained directly from Tacoma Water's transmission mains,)

2.5 Inventory Of Related Plans And Documents

Planning activities carried out by Tacoma Water, other City of Tacoma departments and other jurisdictions impact the development of the 2006 Update. For example, in order to properly plan for growth, local land use plans and CWSPs developed for a service area must be considered. Watershed-based and regional planning activities also should be considered, in particular watershed management planning activities developed under the Washington State Watershed Management Act. Taken together, such planning activities - and resulting policies and regulations - establish the framework under which Tacoma Water operates. Additionally, in the

case of Tacoma Water documents, such documents may fulfill Tacoma Water's system planning obligations outside the water system plan development process and are, therefore, a supplement to the 2006 Update.

2.5.1 Tacoma Water Division

Tacoma Water System Plan – 1980

The *Tacoma Water System Plan*, (EES, 1980) contains an evaluation of Tacoma Water's system facilities, existing and future water consumption requirements, and recommendations for system improvements. Tacoma Water implemented all of the major recommendations of the 1980 plan to the extent possible. Recommendations that were not implemented were updated and incorporated into the 1987 plan. The 1980 plan assumed a future intertie with Seattle Public Utilities (formerly Seattle Water Department) as a new source of supply (20 MGD) to Seattle's wholesale customers.

Tacoma Water System Plan – 1987

The *Tacoma Water System Plan* (EES, 1987) included a bibliography or references section, updated the 1980 plan and focused on the following:

- Identifying major capital improvements and reviewing the financing and system policies associated in meeting those needs.
- Identifying public health and regulatory requirements.
- Coordinating water supply planning and development with adjacent utilities and local governments.

Three wholesale areas also were identified in the 1987 Update: the North, the South and the West supply areas. The Plan was completed in 1987 and approved by the Public Utility Board and Tacoma City Council in 1988. King County issued conditional approval in 1989 subject to development of a conservation plan; a mitigation program for the Second Supply Project Pipeline project, and easement conditions for non-motorized trail use on the Second Supply Project Pipeline right-of-way. All these conditions were met and approved by King County in 1993. In the meantime, DOH had approved the water system plan in 1992.

Tacoma Water System Plan – 2000 Update

A primary focus of the 2000 Update was to demonstrate consistency with comprehensive plans developed by jurisdictions as a result of the Washington State Growth Management Act (GMA). New policies in the 2000 Update include:

- New service requires confirmation of water availability (GMA compliance);
- A reaffirmation of Tacoma Water as a regional service provider;
- Designation of Tacoma Water as a satellite management agency for small system operation and ownership; and
- Conservation policies for major customer classes including irrigation, new power plant installations and new large retail or wholesale customers.

The 2000 Update contained an integrated resource plan to determine the best approach to increase water use efficiency and to select an optimal mix of resources to meet future system needs. Resources evaluated in the integrated resource plan included: surface water alternatives, groundwater alternatives, water reclamation and reuse and water conservation programs. The Full Regionalization (Phased) scenario was chosen for implementation, with the key component of this being the development of the Second Diversion water right and Second Supply Project

Pipeline. (See Section 6.6.1 for additional information.) At that time, it was anticipated that the Second Supply Project would include Seattle Public Utilities as a project partner.

The 2000 Update received DOH approval on September 15, 2000. The King County Utilities Technical Review Committee reviewed and conditionally approved the 2000 Update on January 10, 2001. The Tacoma Public Utilities Board and Tacoma City Council approved the 2000 Update in January and February 2002, respectively. Additionally, the King County Council approved the 2000 Update in January 2003.

Tacoma Water Business Plan

The Tacoma Water Business Plan, 2007-2016 identifies the operations and maintenance and capital improvement needs for the 2007-2009 budget biennial and for the subsequent four biennial budget periods. The business plan is re-evaluated and revised every other year as the first step in establishing the upcoming biennial budget and associated rate cases. Priorities are established based upon regulatory requirements, policy direction established for Tacoma Water by the Tacoma Public Utility Board, customer expectations and financial impacts. Please see Chapter 1 – Introduction for further explanation of the relationship between the Tacoma Water Business Plan, 2007-2016, and the Tacoma Water, Water System Plan.

Emergency Operations Plan (2005)

To prepare for emergencies, Tacoma Water has prepared an Emergency Operations Plan (EOP). The EOP details personnel, equipment and material needs during various kinds of emergencies. Personnel coordination, leadership responsibility, checklists, phone numbers and addresses of key people or groups and maps are included. Because potential emergency situations are varied, a response plan that is flexible enough to adapt to most conditions is important.

The EOP is based upon the following assumptions:

- The EOP provides only a basic framework of how Tacoma Water and related agencies will prepare for and respond to disasters. The EOP provides a basic starting point, allowing for adaptation as needed. Sufficient reference material and contact information is provided to allow for an appropriate level of initial response.
- Tacoma Water may be unable to satisfy all emergency resource requests during a major emergency, disaster or catastrophe.
- Citizens are likely to need to rely on their own resources (including stored bottled water) and provide for themselves for at least the first three days or a major disaster.

The EOP is further described in Chapter 8 – Operations and Maintenance Program.

Satellite Management Program

On January 8, 1997, Tacoma's Public Utility Board approved Resolution U-9242 giving Tacoma Water the authorization to apply to the Washington State Department of Health for approval to become a satellite system management agency or SSMA. This authorization was further defined by Tacoma Water's Customer Service Policies, April 1997, which states:

"As state and federal regulations regarding design, management, operation and maintenance of public water systems become more complex, small water system owners are finding it increasingly difficult to own, manage and operate their water systems. In recognition of this, the Division (Tacoma Water), as a state-approved Satellite Management Agency, will offer various services (management and operations, contract services, or ownership) as deemed prudent and feasible to new and existing water systems in Pierce County east of Puget Sound or other water systems owned by other City departments."

The first Tacoma Water SSMA Program was incorporated into the Tacoma Water Comprehensive Water System Plan Update, 2000 and, therefore, was approved in conjunction with the 2000 Water System Plan in September 2000.

Once again, the Tacoma Water SSMA Program is incorporated into a water system plan update process; therefore, the development of the 2006 Update serves as the required periodic review of the Tacoma Water SSMA Program. Tacoma Water continues to meet the SSMA criteria as demonstrated and documented by the contents of the Tacoma Water SSMA Program as contained in Appendix A.

Water Shortage Response Plan (2005)

Tacoma Water's Water Shortage Response Plan, March 2005 (WSRP), serves as a guide regarding the best management of Tacoma Water's supplies for the duration of any type of water shortage. The WSRP outlines the actions available to reduce customer water demand, with primary focus on non-essential water use (such as lawn watering) and additional actions that Tacoma Water may adopt to reduce supply-side uses of water.

While typical water conservation programming involves ongoing promotion of efficient water use, the WSRP is a short-term tool to organize reductions in water demand in concert with appropriate supply augmentation. The WSRP is designed to complement Tacoma Water's Water System Plan and Habitat Conservation Plan (HCP). Additionally, the WSRP:

- Reinforces Tacoma Water's objectives to be environmentally responsible and well prepared to service our customers when dealing with water shortage and system problems.
- Complements existing water conservation programs and provides guidelines and options to address extended low flows in the Green River or reduced availability of groundwater.
- Provides a menu of possible responses to emergencies such as loss of well capacity or loss of transmission capacity because of major water main or pumping system disruptions.

Tacoma Water's HCP includes provisions for reducing Green River water withdrawals to protect important fish habitat. Depending on the severity of the water shortage affecting the Green River, drought coordination meetings between Tacoma Water, local, state and federal resource agencies, the MIT and USACE may be required to "fully explore all alternatives that will allow the maintenance of guaranteed minimum stream flows" and to institute "consensus derived" water-use restrictions. Before reducing river flows at the Auburn gauge below 250 cfs, Tacoma Water is required to institute water-use restrictions consistent with Tacoma Water's HCP and 1995 agreement with the MIT.

The WSRP includes four stages of response related to droughts or other supply shortages. These include Advisory (Stage 1), Voluntary (Stage 2), Mandatory (Stage 3), and Emergency (Stage 4). Stages 1 through 3 will be used in response to droughts and water system disruptions and Stage 4 will be used in response to disasters.

The WSRP is further described in Chapter 8 – Operations and Maintenance Program.

Tacoma Water Habitat Conservation Plan, Green River Water Supply Operations and Watershed Protection, July 2001

In 1998 the National Marine Fisheries Service (NMFS) listed Puget Sound Chinook as a threatened species. Subsequently, the U.S. Fisheries & Wildlife Service (USFWS) listed bulltrout as a threatened species. Pursuant to regulations, NMFS and USFWS have extended to these threatened species the same level of protection the Endangered Species Act (ESA) provides for endangered species. This level of protection includes a prohibition on "taking" the species, which may include not only harm to members of the species, but also adverse effects or destruction of habitat. This caused water utilities throughout the region to assess their potential liability under the ESA. Tacoma Water approached these issues by developing a Habitat Conservation Plan (HCP) under Section 10 of the ESA, approved by NMFS and USFWS in 2001, to protect its source of supply operations on the Green River. Although the protection of the threatened Chinook salmon was the incentive for plan development, the HCP eventually was approved to provide coverage for 32 aquatic and terrestrial species.

By developing a HCP, Tacoma Water obtained a 50-year incidental take permit. Although an incidental take permit is not required for Tacoma Water to continue operating its municipal water supply system, having the permit substantially reduces Tacoma Water's risk of violating the ESA while operating its system. Withdrawing water without modifying operations in accordance with the HCP could potentially lead to an illegal "take" of listed species such as Puget Sound Chinook salmon.

The HCP provides a number of benefits for fish and wildlife as well as water users in the Central Puget Sound region, including:

- The HCP provides for fish passage into and out of the upper Green River Watershed. Passage was blocked to salmon in 1911 when Tacoma Water built its facilities that divert water from the river to the pipeline to Tacoma. The facilities are at river mile 61 near the community of Palmer in east King County.
- The HCP provides enhanced flows at critical times for fish in the Green River downstream of Tacoma Water's diversion facilities.
- The HCP serves as an umbrella for a number of agreements for river operations, watershed operations and forest and land management to ensure a consistent approach to fish and wildlife protection.
- The HCP ensures that Tacoma Water will be able to continue to supply water to some 300,000 people in Tacoma and Pierce and south King counties in an environmentally responsible manner.

Tacoma Water's HCP required careful coordination between two major operating entities. The USACE facility at Howard Hanson Dam and the Tacoma Water Green River diversion dam create fisheries impacts that can be addressed effectively only by working in a coordinated manner. This situation is further complicated by ESA requirements that differ for Tacoma Water's and the USACE's facilities. As a non-federal entity, Tacoma Water developed its HCP under the provisions of Section 10 of the ESA. As a federal agency, the USACE entered consultation with the NMFS and the USFW under Section 7 of ESA. Sections 7 and 10 have differing requirements, time horizons and expectations for those who operate under their provisions. Resolution of coordination issues has been and will remain one of the major challenges to implementing the ESA in the upper Green River basin.

The HCP relies on well-coordinated actions by Tacoma Water and the USACE to address major fisheries issues. In addition, a number of habitat conservation measures also address potential

impacts of Tacoma Water's land management operations on terrestrial species in the Upper Green River basin. Although not the primary focus of this habitat conservation planning effort, listed terrestrial species either are or may become present in the Upper Green River basin. Potential impacts to these species have been addressed separate from water storage and withdrawal.

As stated previously, the central aspect of the HCP is a coordinated effort, which relies on actions by Tacoma Water and USACE to address major fisheries issues. Key issues include:

Upstream fish passage around Tacoma Water's diversion and USACE's Howard Hanson Dam.

- Downstream fish passage through Howard Hanson Dam and past Tacoma Water's diversion.
- Reintroduction of large woody debris downstream of Tacoma Water's diversion.
- Reintroduction of spawning gravels below Howard Hanson Dam.
- Fish habitat restoration both above Howard Hanson Dam and below Tacoma Water's diversion.
- Wildlife habitat conservation measures on Tacoma Water's lands in the upper Green River Watershed.
- Flow issues including minimum instream flows, storage of water for fisheries releases, and increased regulation of Tacoma Water's diversion for fisheries protection.

Tacoma Water's mission as a public water supply utility causes stream flow issues to be the most significant aspect of the HCP. Tacoma Water will voluntarily reduce its First Diversion Water Right claim from the 400-cfs claim established in 1912 to the currently developed water withdrawal of 113 cfs. Tacoma Water will also amend its water rights to incorporate the higher instream flows previously agreed to with the MIT in a 1995 settlement agreement. Tacoma Water will provide funding support for a project at Howard Hanson Dam to store 5,000 acre-feet of water for stream flow augmentation during summer months. Tacoma Water will contract with the USACE to support augmented flow releases from Howard Hanson Dam during low flow periods by reducing Tacoma Water's use of surface water during years when fall rains do not arrive when normally expected. This battery of actions is the result of more than 15 years of discussions with federal, state and local resource agencies, and the MIT, to determine how Tacoma Water's operations on the Green River could best be carried out with minimal adverse impact on Green River fisheries.

The Tacoma Water HCP is the product of more than two decades of intense discussions with federal, state, and local resource agencies, as well as a decade of discussions with the MIT. Diligent water resource planning and numerous fisheries and habitat studies in the Green River basin were conducted with the intent of designing a municipal water supply project that addresses important natural resource needs as well as the water supply needs of a growing population.

In addition to preparing its HCP, Tacoma Public Utilities, in 2001, obtained ESA coverage for a wide variety of utility maintenance activities by adopting and implementing the federally approved "Regional Road Maintenance Endangered Species Act Program Guidelines." Tacoma Water has modified its operations to obtain coverage under this program for many of its day to day operations. Please see Chapter 8 – Operations and Maintenance Program for additional information.

Water Reuse Feasibility Study, May 1994

The *Water Reuse Feasibility Study* identifies the technical and economic feasibility of treating secondary effluent from three wastewater treatment plants within the Tacoma area to produce reclaimed water for beneficial uses. Potential uses identified for reclaimed water include irrigation and industrial processes. The landscape irrigation sites identified in the Tacoma area include parks, cemeteries, golf courses and schools. Twelve companies in five representative industrial segments were surveyed. The industry segments include metals, chemicals and chemical packaging, paper products, building products and electrical utilities. For each identified possible application site, estimates were made of the reclaimed water that could potentially be used.

Six alternatives were developed and evaluated for treating and using the reclaimed water for landscape irrigation and industrial processes. The alternatives range from using 0.7 MGD of reclaimed water produced at the Central Wastewater Treatment Plant to treating a total of 19.3 MGD at the Central Wastewater Treatment Plan for industrial (15.9 MGD) and irrigation purposes (3.4 MGD).

The study concludes that alternatives using reclaimed water for industrial processes appeared to be more attractive than those alternatives using reclaimed water for landscape irrigation, primarily because of the cost to install distribution facilities for a seasonal demand. Additional study is recommended to further define the feasibility of industrial reuse in the Tacoma area.

In 1997, an Industrial Conservation and Water Reuse Assessment for the Simpson Plant and for the Stone Consolidated paper mill (later known as Abitibi) studied the potential for reducing water consumption in each facility. Since that time, the Stone/Abitibi paper mill has closed.

Simpson Tacoma Kraft Mill Conservation and Water Reuse Assessment, March 1997

The *Simpson Tacoma Kraft Mill Conservation and Water Reuse Assessment* was prepared to evaluate ways to permanently decrease the water use at the Simpson Tacoma Kraft Mill through appropriate and cost effective conservation, water recovery and/or water reuse measures. By identifying ways to reduce water use at the Simpson Mill through decreasing fresh water use or replacing fresh water with another water source - such as highly treated effluent, for appropriate applications - Tacoma Water can apply the saved water as a new water source and make long-term commitments with the water to meet anticipated future demands.

The conservation and water reuse assessment was conducted in the following stages and reached the following conclusions:

Water Balance: The Simpson Mill's daily fresh water consumption, based on March 1996 data, was estimated at 20.3 MGD.

Conservation Measures: Five items are identified as new measures that could potentially reduce water use by an estimated total of eight (8) MGD.

Water Quality: Water quality requirements were identified to determine subsequent processes and equipment required for water recover and reuse.

Treatment Processes: It is estimated that up to 12 MGD of potable water could be replaced in the Simpson Mill with recovered or reclaimed water provided required water quality levels, as identified, could be met by the source water. Four treatment scenarios were evaluated.

Cost Effectiveness: The cost effectiveness of implementing recommended measures from a Simpson Mill perspective and a Tacoma Water perspective is estimated. The assessment concludes that the Simpson Mill has already implemented those conservation measures that were the most productive and cost effective based on Simpson's criteria. However, all of the

conservation measures and two of the recovery measures appear to be worth of further consideration when compared with Tacoma Water's cost effectiveness criteria.

2.5.2. Comprehensive Land Use Plans

All jurisdictions to which Tacoma Water provides water service must prepare a comprehensive plan as required by the Washington State Growth Management Act (GMA). Chapter 4 – Population and Land Use contains a description of the growth and development patterns expected as a result of the implementation of the individual jurisdiction's comprehensive plans. The following section describes the general goals and policy direction established in comprehensive plans of those jurisdictions to which Tacoma Water provides retail water service, including specific policy direction related to the provision of water service. Emphasis is given to the comprehensive plans of municipalities to which Tacoma Water is the sole water purveyor (i.e, the cities of Tacoma, University Place and Ruston).

City of Tacoma

Tacoma's Comprehensive Plan is the City's official statement concerning future growth and development. It sets forth goals, policies and strategies for the health, welfare and quality of life of Tacoma residents.

The Comprehensive Plan is adopted pursuant to the authority conferred by the Washington State Constitution, Revised Code of Washington Chapter 36.70A, and Title 13 of the Tacoma Municipal Code. The Comprehensive Plan consists of individual plan elements, including those mandated by the GMA and implementing programs, all of which are adopted by the City Council. The Plan includes five primary elements that address land use, housing, capital facilities, transportation and utilities. The first GMA-required Comprehensive Plan was adopted in 1993 and has undergone yearly amendments since that time.

The Comprehensive Plan is based upon several basic assumptions, including the following related to the provision of water service*: In order to achieve its goals, the City should develop and implement long-range and short-range plans and programs, develop effective regulations and make capital improvements in accordance with the Comprehensive Plan.*

The Comprehensive Plan contains ten goals which express the interests, aspirations and values of the community. The goals are not mandates, but express the ideals the community is striving to achieve over time. The following Comprehensive Plan goals relate to the provision of public facilities and services, including water service:

- Provide optimum utility facilities and services that meet the community's current and future needs in a reliable, efficient, economic and environmentally responsible manner.
- Ensure conservation, protection, enhancement, and proper management of natural resources and shoreline, while providing for a balanced pattern of development and the needs of the community.

Please see Chapter 3 – Policies and Design Criteria for a discussion of the Comprehensive Plan policies related to the provision of water service. Additionally, Chapter 4 – Population and Land Use contains a discussion of the development patterns expected as a result of the implementation of the Tacoma Comprehensive Plan.

Pierce County

The Pierce County Comprehensive Plan is a result of the 1990 State Legislature's enactment of the GMA. The Pierce County Comprehensive Plan has several goals with regards to domestic water systems. These goals include:

- Promoting reliable water service throughout Pierce County.
- Ensuring adequate water supplies for future growth.
- Supporting water conservation measures throughout Pierce County.
- Coordinating water resource planning.
- Implementing satellite management programs for new water systems.
- Protecting the quality of groundwater used for domestic water supplies.
- Reviewing the previously adopted plans and correcting deficiencies and inconsistencies that appear.

The Pierce County Comprehensive Plan was originally approved in November 1994 and amendments have occurred since that time. The Plan has been codified as Title 19A of the Pierce County Code.

Following the approval of the Comprehensive Plan, Pierce County began developing community plans for subareas of the County. The community planning process has allowed local citizens to express how the Comprehensive Plan and its development regulations will be carried out in their specific communities. In several instances, the provision of water service within a community planning area has been a concern to the citizen members of the planning board charged with developing the community plan.

As required by the GMA, the Pierce County Comprehensive Plan contains the 20 year population allocations for the County and its cities and towns on which UGA are sized. Pierce County adopted the third iteration of the population allocations on March 20, 2004. A discussion of these growth targets is contained in Chapter 4 – Population and Land Use as is a discussion of the development patterns expected as a result of the implementation of the Pierce County Comprehensive Plan.

King County

The first King County Comprehensive Plan was completed in 1964. The 1964 principles continue to guide King County growth policies today. The 1985, King County Comprehensive Plan identified an "urban growth boundary line". This pre-GMA boundary limited growth to areas with an existing infrastructure for facilities and services; protected natural resource lands; stated that rural areas remain largely intact; and it guided cities, service districts and the private sector in working together to manage growth responsibility.

Following the passage of the GMA, King County and cities within its boundaries developed the King County Countywide Planning Policies to meet the GMA requirements and to coordinate planning among all of its jurisdictions. The policies established an UGA within the western one-third of King County where most growth and development is projected to occur.

The first King County Comprehensive Plan resulting from the passage of the GMA occurred in 1994. Special designations are made to include agricultural production districts for the protection of farming areas, provisions for housing on larger lots in the rural area, forest production districts for the continuation of large-scale forestry activities, and open space areas for protection of the natural environment. The King County Comprehensive Plan has been amended several times, with the latest amendment approved by the King County Council on July 25, 2005.

Although the King County Comprehensive Plan recognizes potable water service is not provided by King County itself, the Comprehensive Plan does stress the importance of regional water supply planning, including the development of a King County regional water supply plan. Additionally, the King County Comprehensive Plan requires the King County Utilities Technical

Review Committee, when reviewing water system plans, to encourage water purveyors to include aggressive conservation and reuse measures in water systems plans where applicable. Additionally, the King County Comprehensive Plan supports the use of interties that allow the transfer of water resources among water utilities in urban areas to meet the projected demands for growth.

King County adopts growth targets for its cities and towns as required by the GMA. Such growth targets and a discussion of the development patterns expected as a result of the implementation of the King County Comprehensive Plan for the small portion of unincorporated King County served by Tacoma Water is presented in Chapter 4 – Population and Land Use.

University Place

The first University Place Comprehensive Plan was adopted on July 6, 1998, and was amended on December 6, 2004. The University Place Comprehensive Plan reflects a community vision of how University Place should grow and develop over the next 20 years. Four policies encompass the entire Comprehensive Plan, including the following related to the provision of water service:

University Place shall participate in coordinated and joint planning efforts with the County and neighboring jurisdictions to achieve desired patterns of growth, capital improvements and protection of natural areas, greenbelts and open space. The City also shall pursue contracts, franchises and interlocal agreements with other jurisdictions to provide quality and cost effective services to citizens.

The University Place Comprehensive Plan recognizes that water service is provided by Tacoma Water, but notes that reliability and cost are concerns citizens of University Place have related to utility provision. The Utilities Element policies promote reliable and cost-effective utility services for the community by pursuing a cooperative approach with utility providers.

Chapter 4 – Population and Land Use contains a discussion of the expected development trends resulting from the implementation of the University Place Comprehensive Plan.

Federal Way

The first Federal Way Comprehensive Plan (FWCP) was adopted on November 21, 1995, and currently undergoes annual amendments. The FWCP lays out a vision for the future of Federal Way during a 20 year period and responds to the requirements of the GMA. The FWCP recognizes that the majority of the City is provided water service by the Lakehaven Utility District, with a small portion of the City provided water service by Tacoma Water.

A discussion of the expected development trends resulting from the implementation of the Federal Way Comprehensive Plan for the small portion of the City served by Tacoma Water is presented in Chapter 4 – Population and Land Use.

Other Pierce County Municipalities (Puyallup, Bonney Lake, Orting, Fircrest and Lakewood)

Tacoma Water provides water service to portions of the cities of Puyallup, Bonney Lake, Orting, Fircrest and Lakewood. For the majority of these areas, service is occurring within city limits due to annexation of previously unincorporated areas and/or as a result of a mutual agreement between the jurisdiction and Tacoma Water. Additionally, the majority of these areas are fully built-out and are not, therefore, expected to result in additional customers. Actual customer counts, year 2005, follow:

- Puyallup: 71 Accounts
- Bonney Lake: 12 Accounts
- Orting: 6 Accounts

- Fircrest: 74 Accounts
- Lakewood: 35 Accounts

All municipalities within Pierce County prepare Comprehensive Plans as required by GMA. Tacoma Water will continue to provide water service within other jurisdictions' city limits consistent with individual comprehensive plans and development regulations.

2.5.3 Coordinated Water System Plans

Coordinated water system plans are prepared for areas declared to be a "Critical Water Supply Service Area" as authorized by the Public Water System Coordination Act (RCW 70.116). The Tacoma Water service area is covered under the Pierce County CWSP and the South King County CWSP.

Pierce County Coordinated Water System Plan (2001 Update)

The Pierce County CWSP was developed under the direction of the Piece County Water Utility Coordinating Committee (PCWUCC) with assistance by Pierce County Public Works and Utilities, Pierce County Planning and Land Services and the TPCHD. The members of the PCWUCC represent the collective efforts of all public water systems in the County with more than 50 service connections.

The purpose of the CWSP is to assist the area's water utilities in establishing an effective process for planning and development of public water systems, coordinating such efforts with County land use planning activities and restricting the proliferation of small public water systems. The CWSP accomplishes this by establishing future service area boundaries, minimum design standards, service review procedures, water system review procedures, appeals procedures, long-term regional water supply strategies, water conservation program and goals and a satellite system management program. The Pierce County Public Works and Utilities Department serves as the Lead Agency in the implementation of the CWSP. The original CWSP was approved by the Pierce County Council in 1988 and has been updated twice since that time.

South King County Coordinated Water System Plan (1989)

The South King County Coordinated Water System Plan (EES, 1989) consists of two parts:

- A regional supplement.
- Individual water system plans prepared by the utilities for their designated service areas. Those individual plans must be consistent with the policies and procedures of the regional supplement.

The responsibility for developing the South King County CWSP lies with King County and the South King County Regional Water Association (SKRWA). The SKRWA is a group of water purveyors who assumed the responsibility of obtaining grant funding from the DOH for preparation of the South King County CWSP. Tacoma Water's service are extends into the southern portion of King County and includes the southwestern portion of the City of Federal Way. For that reason, Tacoma Water's Plan has been prepared in conformance to the standards of the South King County CWSP.

The South King County CWSP recognizes surface water from the City of Tacoma's Pipeline No. 5 is integral to long-term supplies for South King County utilities. Additionally, the CWSP recognizes that conservation efforts are a necessary management tool which serves to delay the need for new source development.

However, the CWSP also recognizes that it is unlikely that conservation efforts will permanently eliminate the need for future sources of supply. The CWSP contains a recommended water

conservation program estimated to bring about an eight percent reduction in overall consumption. It is the intent of the CWSP that individual utilities would have a conservation plan in place by 1995 and would achieve reductions by the year 2000.

The South King County CWSP was approved by the King County Council in 1990.

2.5.4 Washington State Watershed Management Act

In 1998, the Washington State Legislature passed the Watershed Management Act to address increasing water demand, water quality issues and the loss of critical habitat for fish and wildlife. Participating in the planning process is optional, with grant funding available for those watersheds choosing to participate. Jurisdictions within the Chambers-Clover Creek Water Resource Inventory Area (WRIA) choose to participate in watershed planning under the Watershed Management Act. Watershed planning under the Watershed Management Act has not been implemented in the Puyallup-White or Green-Duwamish WRIAs.

Chambers-Clover Creek WRIA

The Chambers-Clover Watershed Management Plan Project began in 1998 with meetings of the Initiating Governments: The Puyallup Tribe of Indians, Pierce County, the City of Tacoma and the Lakewood Water District. The Planning Unit was formed in 1999 and met through September 2004. Under the guidance of the Planning Unit, a Chambers-Clover Watershed Technical Assessment was prepared, followed by the Chambers-Clover Creek Management Plan. At the September 2004 meeting, the governmental entities on the Planning Unit were unable to reach consensus on the draft Watershed Management Plan and the planning process halted. One of the primary reasons the plan did not receive approval was due to concerns regarding the inability of the Technical Assessment to provide key data.

The Initiating Governments, including the City of Tacoma, have continued to meet following the halting of the planning process to try and move forward with development of a locally driven water management plan. Discussions have focused on identifying and addressing the key data gaps that were identified through the Technical Assessment and subsequent meetings of the Planning Unit.

2.5.5 Clover-Chambers Creek Basin Groundwater Management Program

In 1991, the Clover-Chambers Creek Basin Groundwater Management Program was developed and completed as a result of the Washington State Department of Ecology (Ecology) declaring the Clover-Chambers Creek Basin a Ground Water Management Area under authority of Washington Administrative Code (WAC 173-11). The program was prepared for the Clover-Chambers Creek Basin Ground Water Advisory Committee with the Tacoma-Pierce County Health Department (TPCHD) serving as the lead agency. The ruling was made because of the concern over the increasing water quality deterioration of the Clover-Chambers Creek aquifer, which serves as the drinking water supply for large portions of Pierce County.

Members of the Ground Water Advisory Committee were selected to represent a broad spectrum of interests within the basin. Existing systems of protecting and managing the Clover-Chambers Creek Basin groundwater resources were analyzed to identify any deficiencies. Alternatives for rectifying each deficiency were developed, and, ultimately, a recommended set of alternatives was combined to form the Preferred Program. The intent of the Preferred Program is to prevent potential groundwater quality and quanity problems by investing in prevention measures, rather than cleaning up later. The Preferred Program contained the following three goals:

- Protect the Clover-Chambers Creek Basin aquifer from the impacts of all significant sources of contamination.

- Ensure safe and sustained supplies of drinking water for the residents of the Clover-Chambers Creek Basin.
- Increase the public recognition of the importance and vulnerability of the Clover-Chambers Creek Basin aquifer.

In October 1991, Ecology certified the program under WAC 173-100, thereby requiring affected local governments to adopt or amend policies, regulations, ordinances, and/or programs necessary for implementation of the provisions of the Groundwater Management Program within their respective jurisdictional authorities.

Since 1991, Tacoma Water has drafted a Wellhead Protection Plan and adopted an ordinance to protect the South Tacoma Aquifer area, a region of the Clover-Chambers Creek Basin. Please see Chapter 9 – Water Quality for additional information regarding the Tacoma Water Wellhead Protection Plan.

2.5.6 Endangered Species Act (ESA) Response Plans

In 1998 the federal government listed salmon, steelhead and bull trout across Washington State as threatened under the ESA. This listing creates a federal responsibility to restrict actions that harm these fish and to create a recovery plan. The 1998-1999 Legislature passed the Salmon Recovery Act (RCW 77.85) which created a local watershed planning process to identify both immediate and long-term salmon recovery actions. In this way, Washington has agreed to assist NOAA, one of two federal agencies responsible for implementing the ESA, in its efforts to write a salmon recovery plan for the state by developing regionally-based draft recovery plans for submittal to NOAA. Washington State created seven regions to respond to ESA listings. Five of these areas have regional groups established to prepare recovery plans, including the Puget Sound Shared Strategy responsible for coordinating planning activities for the Puget Sound area. Through the Puget Sound Shared Strategy, proposed habitat plans for 15 major watersheds are being combined to serve as the region's response to the listing of Chinook salmon under the ESA.

Salmon Habitat Plan for the Green/Duwamish and Central Puget Sound Watershed

A forum of local governments approved the *Salmon Habitat Plan for the Green/Duwamish and Central Puget Sound Watershed* (WRIA 9 Habitat Plan) to serve as a multi-jurisdictional ESA response for the Green/Duwamish and Central Puget Sound Watershed (WRIA 9). The WRIA 9 Forum of Local Governments includes all the local governments – 15 cities and King County – in the watershed. Tacoma Water participated as a partner to the process due to the use of the Green River as Tacoma Water's primary water resource. Implementation of the plan will occur in 2006 and beyond.

The WRIA 9 Habitat Plan establishes long-term population targets for summer/fall Chinook salmon. Additionally, the recommendations in the WRIA 9 Habitat Plan are intended to improve the three other viable salmonid population parameters by:

- Increasing productivity (growth rate) of the population;
- Improving diversity in terms of genetic makeup and behavioral traits; and
- Improving the spatial structure of the population to better distribute fish to take advantage of good habitat and to lower risk from catastrophic events.

For the Upper Green River subwatershed – the location of the Tacoma Water diversion dam – the WRIA 9 Habitat Plan focuses on the actions and policies that address the following key salmon habitat needs:

- Facilitate Chinook salmon and bull trout access above Howard Hanson Dam and the Tacoma Headworks by providing passage upstream for adults and downstream for the young fish;
- Protect and restore riparian habitat along the Upper Green River mainstem and major tributary streams; and
- Protect and restore natural sediment movement by reducing road failures.

Beginning in 2007, adult salmon migrating upstream will be collected at the Tacoma Water diversion dam. The fish will be released into the Upper Green River to spawn, opening up the upper watershed to salmon for the first time since 1911.

CHAPTER 3

POLICIES AND DESIGN CRITERIA

CHAPTER 3

POLICIES AND DESIGN CRITERIA

3.1 Introduction

This chapter presents Tacoma Water's policies and design criteria. Other chapters in this 2006 Update discuss the federal, state and local laws, regulations and policies that influence the development of the Tacoma Water policies and design criteria. Taken together, the Tacoma Water policies and design criteria, along with federal, state and local laws and regulations, guide the operation and maintenance of the Tacoma Water system on a daily basis and guide the planning for growth and improvements to the water system.

3.2 Policies

The activities of Tacoma Water are guided by a number of policy documents. Among these documents are:

- Water Rate Ordinance and Customer Service Policies
- City of Tacoma Comprehensive Plan
- Tacoma Water Satellite System Management Program
- Tacoma Water Rate Policy
- Tacoma Water Comprehensive Water System Plan

The above listed documents contain policies which help guide legislative decisions, administrative actions and the development of Tacoma Water programs, activities and budgets. In simplistic terms, the policies serve as the "rule-book" for Tacoma Water management and staff as well as existing and future Tacoma Water customers. Each of the listed policy documents are covered in some detail in the following section, with particular emphasis placed on the "Water System Plan".

Taken together, the overall objective of Tacoma Water policies is to ensure the implementation of the following Tacoma Water mission:

Protect the public health of the people of Tacoma and our service area by providing high quality water service. Make home life more enjoyable and economic development possible with the quality and reliability of the service we provide. Act in a socially and environmentally responsible manner. Make Tacoma a better place in which to live.

3.3 Water Rate Ordinance and Customer Service Policies

The primary purpose of the Water Rate Ordinance and Customer Service Policies is twofold: to assist potential customers in obtaining water service and to guide Tacoma Water employees in providing such service to customers. The following major subject areas are addressed:

- Service within and outside the present service area
- Service inside and outside city limits
- Services and meters
- Direct service from supply and transmission pipelines

- Interties
- Cross connections
- New service connections
- Water service construction charges
- Fire hydrant use
- New main extensions

Please see section 8.3 for additional information.

3.4 City of Tacoma Comprehensive Plan

The City of Tacoma Comprehensive Plan (Comprehensive Plan) guides decisions concerning land use regulations, programs, capital improvements and services. As a City of Tacoma department, Tacoma Water operations must be consistent with the Comprehensive Plan.

The Comprehensive Plan does recognize, however, that policies specific to each City-owned utility are developed outside the comprehensive plan process and are contained in utility specific plans. Instead, the Comprehensive Plan contains general service provision policies which are broad in nature and address basic utility needs throughout the community. In this regard, the Comprehensive Plan states: "*In addition to the general service provision policies, each City-owned utility adheres to their respective service directives and policies outlined in their resource and business plans*".

The general service provision policies contained in the Utilities Element address the following subjects:

- Growth and Development
- Planning Coordination
- System Location and Design
- Utility Corridors
- Urban Growth Areas

In order to implement policies as contained in the capital facilities and utilities elements of the Tacoma Comprehensive Plan, the City has adopted level of service standards for essential capital facilities. The adopted level of service standard for water is 442 gallons per day per equivalent residential unit (ERU).

Please see Chapter 4 – Growth and Land Use for a discussion of the growth and development trends expected as a result of the implementation of the Tacoma Comprehensive Plan.

3.5 Satellite System Management Program

Tacoma Water is approved as a Satellite System Management Agency (SSMA) to own and/or operate more than one public water system without the necessity for physical connection between the systems. As such, Tacoma Water offers various services as deemed prudent and feasible to new and existing water systems in Pierce County east of Puget Sound or to water systems owned by other City of Tacoma departments. Appendix A contains the Tacoma Water SSMA Program, including direct service and contract service policies and procedures.

3.6 Water Rate Policy

The purpose of Tacoma Water's Rate Policy, as adopted by the Public Utility Board, is as follows:

The Water Rate Policy gives direction to planning decisions and helps ensure that the Department of Public Utilities provides an adequate supply of safe, clean water to all customers efficiently, reliably and at the lowest possible cost consistent with prudent utility management.

Individual policies forming the Water Rate Policy are organized around the following 5 guiding principles for water rate decisions:

- Water Rates Should Ensure Adequate Supply
- Water Rates Should Be as Low as is Responsible
- Water Rates Shall be Fair
- Water Rates Should be Stable and Understandable
- Water Rates Should be the Product of Customer Involvement

3.7 Water System Plan Policies

A water system plan provides the justification to the DOH – and local land use authorities - of a water utility's ability to provide water service to its identified service area currently for the future. Therefore, Tacoma Water's Water System Plan Policies guide the planning and development of the Tacoma Water system.

DOH has established a list of policies which should be addressed in a water system plan. Additionally, the Municipal Water Law of 2003 establishes a "duty to serve" requirement for water utilities within the utility's retail service area. In order to address this requirement, water system plans are expected to contain a description of how a utility responds to requests for new water service. Tacoma Water's response to the DOH policy list and the Municipal Water Law follow.

3.7.1. DOH Service Area Policies

For ease of review, Table 3-1 provides a list of the DOH water system plan policies and a description of the policy and associated Tacoma Water policies and citation of the source document containing the policy.

Table 3-1
DOH Service Area Policies

DOH POLICY NAME	POLICY DESCRIPTION	TACOMA WATER POLICY	SOURCE
WHOLESALING OF WATER	Conditions which must be met to obtain a wholesale agreement, including the conditions of service for wholesaling water.	Wholesale service may be made available to all water purveyors operating in compliance with DOH regulations and in accordance to resource availability. Wholesale service is subject to the City's conservation and curtailment plan and system development charge. Wholesale customers may elect to take service under a short-term contract or with firm long-term supply assurance.	Customer Service Policy 15 Tacoma Municipal Code 12.10.400.F
WHEELING OF WATER	Conditions met for water to another system, i.e., compatible water quality, engineering, etc.	Tacoma Water does not wheel water through its water system at this time. In the event Tacoma Water is requested to wheel water through its water system, Tacoma Water will negotiate a case-specific wheeling agreement with the applicable water system(s).	n/a
ANNEXATION POLICY	How city annexation relates to the provision of water service.	Availability of service within the established annexation area and the Division's service area will depend on a potential customer's willingness to sign a petition agreeing to support future annexation.	Customer Service Policy 5.
DIRECT CONNECTION AND REMOTE SYSTEM POLICY	New developments directly connect to existing water system, or whether satellite systems will be allowed.	Tacoma Water is approved to provide SMA direct service within its retail service area. In general, Tacoma Water will require extension of water mains to any proposed development. For any proposed residential development under 20 lots in size, and where the shortest route from the proposed development and connection to the water system is greater than 1,000 feet, Tacoma Water will consider other options to serve including main extension or SMA operation until main extension occurs.	Satellite System Management Plan

DOH POLICY NAME	POLICY DESCRIPTION	TACOMA WATER POLICY	SOURCE
DESIGN AND PERFORMANCE STANDARDS POLICY	Minimum design and performance standards for new development.	Construction of the Tacoma Water system occurs in accordance with standards of the Washington State Department of Transportation/American Public Works Association (APWA) Standard Specifications for Road, Bridge and Municipal Construction, including APWA Amendments and State Amendments, the American Water Works Association (AWWA) Standard Specifications, the most current State of Washington, Department of Ecology "Criteria for Sewage Works Design" and applicable local jurisdiction regulations.	Construction Project Specifications
SURCHARGE FOR OUTSIDE CUSTOMERS	City's surcharge for customers outside corporate limits.	Rates for retail and wholesale customers located outside the corporate boundaries of the City of Tacoma will be 20 percent higher than rates for inside City Limits. Tacoma Water maintains utility service reliability and rates such that they are an inducement for future annexation.	Water Rate Policy – C.8. City of Tacoma Comprehensive Plan, Utilities Element, U-GD-2
URBAN GROWTH AREAS	Responsibility of service provided in the UGA, how provided and how financed.	The City of Tacoma should be the primary provider of services within its designated urban growth area. The same level of service should be applied throughout the service area of City-owned utilities. Tacoma Water provides water service to most of the City's UGA.	City of Tacoma Comprehensive Plan, Utilities Element, U-UGA-1, U-GD-7
OVERSIZING POLICY	City provides funds to install larger than needed facilities to allow for future development, if needed.	Tacoma Water will consider providing funds to install larger than currently needed facilities, including system extensions, in cases where such oversizing will result in an overall benefit to the distribution grid.	Customer Service Policy 27
CROSS CONNECTION CONTROL PROGRAM	Policy on regulation of cross-connections, including steps taken if a cross-connection is discovered.	The control or elimination of cross connections shall be accordance with Washington Administrative Code and City Code Section 12.10.220. Furnishing of service shall be contingent upon the customer providing cross connection control. If an immediate hazard to health is caused by the cross connection, water service to the premises shall be discontinued until the cross connection has been eliminated or protected.	Customer Service Policy 16. Tacoma Municipal Code Section 12.10.220
EXTENSION POLICY	Policies regarding extension of the system, including identification of responsible party.	Extensions of permanent main are paid for by development via the private contract process. The developer shall select a contractor experienced in ductile iron water main construction and enter	Customer Service Policy 25. Customer Service Policy

DOH POLICY NAME	POLICY DESCRIPTION	TACOMA WATER POLICY	SOURCE
	Design standards and payment included in conditions of service.	into an agreement with the contractor and Tacoma Water for construction of the extension. Tacoma Water is responsible for the design, planning and specifications as well as the inspecting of all work completed via a private contract. Upon completion of construction and satisfactory pressure testing and sampling occurs by Tacoma Water, the ownership of the newly constructed main will be turned over to Tacoma Water. The developer is responsible for all costs incurred by Tacoma Water for preparation of plans and specifications, construction inspection, pressure testing, flushing and other work necessary to complete the new water main to Tacoma Water standards and specifications.	28. Tacoma Municipal Code Section 12.10.170; 12.10.200
LATE-COMER AGREEMENTS	Policy on allowing late-comer agreements for those who propose to extend the water system and provisions of pay back.	In the event a premise(s) requiring water service does not abut a permanent water main, a water main charge is collected prio to service main construction. When a permanent main is constructed in the abutting right-of-way, the originally collected water main charge(s) is provided to the developer of the new main.	Customer Service Policy 19. Tacoma Municipal Code Section 12.10.350

3.7.2. Municipal Water Law

Tacoma Water is committed to providing timely and reasonable water service within its designated retail service area. For ease of review, the following section describes how Tacoma Water responds to requests for new water service as detailed in the DOH document *Interim Planning Guidance for Water System Plan/Small Water System Management Program Approvals*, March 2004.

Tacoma Water's process for service requests, including time frames:

Following payment of required fees, requests for new water service are fulfilled within two weeks. In cases where new water mains are required, design work associated with the new main will begin within 30 days of receiving appropriate payment. Water availability requests have a 48-hour turn-around. (Please see Section 8.3.2 and Appendix L for additional information regarding Tacoma Water's Water Service Request Process.)

How Tacoma Water determines that system capacity is adequate to provide new water service:

Tacoma Water's hydraulic modeling work is the primary tool used to determine if system capacity is adequate to provide new water service. Water demand forecasting and water system plan development also serve a role in determining whether or not water system capacity is adequate, particularly on a system-wide scale. Review of zoning, level of service requirements and water quality constraints are also important in determining system capacity.

Tacoma Water's conditions of a non-technical nature that may affect the ability to provide new water service (i.e. annexation procedures):

As a condition of new water service for irrigation needs for new cemeteries, large parks and golf courses; and for retail and wholesale customers requiring a three inch or larger meter, the customer must demonstrate to Tacoma Water that they are committed to the use of exemplary water conservation measures. In the case of irrigation needs, the new customer will need to provide an evaluation of other potential sources of water. In the event that water service is provided by Tacoma Water, the service will be considered an "interruptible water supply." During water system emergencies and/or dry conditions, water service may be reduced in compliance with Tacoma Water's Shortage Response Plan. In the case of new wholesale water purchase, the purchasing utility must demonstrate that they have an ongoing program designed to achieve and maintain levels of unaccounted-for water consistent with industry standards. Proponents of new power plants will be strongly encouraged to utilize air cooling or other water efficient technology. If evaporative cooling is utilized Tacoma Water will require certain conditions be adhered to by the owners of the power plant, including a joint review every five years.

Tacoma Water's procedure for granting or requesting extensions of time during a water service related project:

Tacoma Water has adequate resources to respond to requests for water service within its water service area and has not, therefore, had a need to establish a procedure for granting extensions of time during a water service related project.

Tacoma Water's procedure for handling disputes and appeals when water service requests are denied:

In the event the local health authority declares a residence is unfit for human habitation and water service is shut-off as a result, the Tacoma Water customer may request a hearing with the water superintendent to request restoration of water service.

3.8 Performance and Design Criteria

Performance and design criteria apply to the following items related to the water system:

- Water supply
- Storage reservoirs
- Transmission system
- Distribution system
- Water system losses
- Fire flow requirements
- Pressure zones
- Pump stations

Minimum performance and design specifications are provided by the Pierce County Coordinated Water System Plan (CWSP) and the Sizing Guidelines for Public Water Systems (DOH, 1983). DOH sizing guidelines were actually updated in 1999; however, the water system analyses were complete by that time. As Tacoma initiates changes or additions to the water system, the latest DOH standards will be used. Appendix C also includes a list of applicable regulations and guidelines. A utility may choose to adopt more stringent standards than those presented in the previously named documents; however, as a minimum, Tacoma Water complies with the aforementioned specific actions and guidelines.

3.8.1 Water Supply

Water supplies are regulated by Ecology and DOH. As stated in the Pierce County CWSP, sources of water must meet Ecology and DOH regulations and guidelines, including WAC 173-160, WAC 246-290, and WAC 246-293. Water rights must be obtained in accordance with Ecology regulations and procedures (RCW 90.03 and RCW 90.44).

The water sources must be able to reliably provide sufficient water to meet average day demands and specific peaking demands. For example, if sources are not designed to meet short-term, peak-hour demands, then equalizing storage will be necessary. Sources must also meet minimum aquifer/source reliability (safe yield), water rights reliability (adequacy assessment), and facilities reliability (back up power and/or multiple sources) as defined by DOH.

3.8.2 Storage Requirements

Storage requirements are based on four volume components:

- Operational volume
- Equalizing volume
- Standby volume
- Fireflow volume

The following sections present the design criteria for the storage components. The criteria defined here are used in Chapter 10 – System Analysis.

Operational Volume

Operational storage volume is that amount of water used to ensure that pumps do not cycle too often and may also be used to make-up for the lack of sensitivity in level sensing equipment. Operational volumes are additive to other components of storage.

Equalizing Volume

Equalizing volume is required to supplement production from water sources during high demand periods. It is the total volume needed to satisfy peak system demands in excess of the hydraulic capacity of the supply system. Equalizing volume requirements are greatest on or around the day of maximum system demand. They are most often analyzed over a 24-hour demand cycle, although a longer cycle can be used. The water system is hydraulically balanced when supply facilities and connecting pipelines can replenish the equalizing volume at a rate sufficient to fill the reservoir during the late evening/early morning replenishment hour on the day of maximum demand. Sufficient equalizing storage must be provided in combination with the supply pumping system to ensure that maximum instantaneous flow demand be met when it occurs and for its duration.

In accordance with the DOH Water System Design Manual (WSDM), the required equalizing volume for a zone is calculated by subtracting the sum of all installed and active sources in a zone from the peak hourly demand that the zone could experience, and multiplying by 150.

Standby Volume

Standby volume is required to supply reasonable system demands during an interruption to normal supply or an emergency, such as a pipeline failure, power-outage, or other system interruption. A key concept of standby volume is that establishment of reserve storage volume involves planning for reasonable system outages. When the largest source is assumed to be out of service, major system emergencies, such as those created by an earthquake, are generally considered to be too extreme to design storage facilities to meet all needs throughout such a rare event. Major customer curtailments are generally assumed during these major emergencies. The required emergency and reserve storage volumes depend on the system demand, the duration of the system outage, and the available remaining supply capacity to the system at the time of the emergency.

DOH has published design guidelines that quantify target storage volumes on the basis of number of equivalent residential units. For systems that have a single source of supply, the guidelines recommend a standby storage volume of twice the average daily demand per equivalent residential unit (ERU). As stated in the sizing guidelines, this target volume may be reduced for systems that have multiple sources of supply and/or redundant supply facilities with adequate standby power; however, total standby volume may not be less than 200 gallons per day per ERU. Siting of storage facilities should also be considered in a location that provides gravity flow.

Reduction in the standby storage volume because of multiple sources is permissible only if adequate standby power is available or the power supply is shown to be reliable by meeting both of the following criteria:

Frequency. Outages shall average three or less per year based on data for the previous three years with no more than six outages in a single year. Power must be lost for a minimum of 30 minutes in order to qualify as an "outage", for purposes of this policy.

Duration. Outages shall average less than four hours based on data for the previous three years. Not more than one outage during the previous three-year period shall have exceeded eight hours.

Fire Flow Volume

Fire flow volume is required in order to deliver the level of fire flow service as identified in a utility's approved water system plan or the level of service requirements of the Pierce County CWSP for the required duration. WAC 246-290-230 and DOH design criteria require that new or expanding water systems have capacity to provide design fire flows during peak instantaneous demand conditions, namely, during the maximum-day demand. Storage facilities must provide sufficient reserve storage needed for fighting fires.

Recommended fire flows are presented for determination of the fire flow volume in Table 3-2. Minimum fire flows are discussed in Section 3.8.4.

Table 3-2
Recommended Fire Flows

	Rate (gpm)	Duration
Single-Family Residential	1,500	2 hours
Multi-Family Residential	3,500	4 hours
Commercial / Industrial	5,000	5 hours

3.8.3 Transmission and Distribution System

The function of the distribution system is to convey water to customers at adequate service pressures and to provide fire flows. Performance and design standards for distribution and transmission systems are outlined in the Pierce County CWSP, and in both the DOH publications, Water Works Standards and Sizing Guidelines for Public Water Supplies.

To conform to DOH criteria, the capacity of the distribution system during the peak-hour demand should meet demands with a residual pressure of no less than 30 pounds per square inch (psi). Fire flow shall be provided during maximum-day demand conditions for new systems. During maximum-day demand and fire flow conditions, the residual system pressure should be no less than 20 psi at all points throughout the distribution system. This pressure prevents backflow from a customer service into the system, even under fire flow conditions.

Water mains shall be sized using the current edition of the DOH's Sizing Guidelines. Design flow for hydraulic analysis is to be the maximum instantaneous flow. Typically, distribution lines are not to be less than four inches in diameter, depending on the area served. For sizes six inches and above, the minimum main size must be established by a licensed engineer using recognized hydraulic analysis techniques. Water main size shall be adequate to deliver fire f low, if required, and to maintain the pressure requirement defined above.

Water mains serving fire hydrants, either as part of new construction or planned phased improvements shall be not less than eight inches in diameter for a dead end line not less than six inches in diameter if looped.

3.8.4 Fire Flow Requirements

Pierce County service area

New facilities installed by a water utility shall be designed to provide a level of service assigned to designated land uses in Pierce County. Requirements may be higher at specific development sites as determined by the Pierce County fire marshal or city fire chief.

Minimum fire flows and duration requirements for utility-based fire flows are presented in Table 3-3. The fire flow rates presented below are minimum requirements allowed by the Pierce County fire marshall to meet DOH's criteria for fire flows during peak-day demands. The rates presented in Table 3-2 are the recommended flows and were used as a conservative estimate in the determination of required storage volumes. Refer to Chapter 10 – System Analysis.

Table 3-3
Minimum Fire Flows

	Location/Area	Rate (gpm)	Duration (minutes)
Single-Family Residential	Urban and Rural	750	45
Multi-Family Residential	Urban	1,500	60
Multi-Family Residential	Rural	750	45
Commercial	Urban	1,500	60
Commercial	Rural	750	45
Industrial	Urban and Rural	2,000	120

Source: Pierce County Code 17C.60.165

King County service area

For utilities in a Critical Water Supply Service Area such as South King County, absolute minimum fire flows are established by DOH under WAC 246-293-640, Minimum Standards for Fire Flow. These standards are, however, superseded by the requirements put forth in the CWSP in effect for the area.

The South King County CWSP outlines that all water systems providing fire flow must be planned and designed to deliver a minimum rated flow of 1,000 gpm for a duration specified by the fire marshal. Actual fire flow requirements for specific buildings are determined on a case by case basis by the fire marshal at the time of building permit application. Water utilities must establish planning criteria for providing fire flows which will be sufficient to meet the existing and projected needs of the population.

Fire Sprinkling

In recent years, Tacoma Water has seen a growth in service requests for fire sprinkling in single-family residences. With the Growth Management Act requirements for greater densification of housing and with improved fire regulations, fire flow requirements are being enhanced with structure fire sprinkling systems. Traditionally, fire sprinkling systems have been required to be served by a meter approved for that purpose to avoid the liability of a meter plug not functioning in the event of an emergency. Commercial establishments requesting a fire service typically require a two inch or larger meter. In those situations, a standard approved meter for fire

protection is available and can be sold to the customer. However, responding to a residential fire sprinkler request is difficult because no water meters approved for fire protection smaller than two inches are available. For single-family residential purposes, the cost to install a separate 2 inch fire sprinkler service is expensive and the meter is oversized for the application. Recently, Tacoma Water worked in partnership with the local fire agencies to adopt a solution to this issue. For single-family residences, it was agreed that flow through fire sprinkler systems can be installed by connection to the domestic water meter serving the residence. In those situations Tacoma Water requires that the service and meter by upsized to a one inch service with a ¾-inch meter. By having the fire sprinkler system a part of the house plumbing, any issues with water supply to the house would be evident. Additionally, there has been a push to retrofit existing multi-family housing, often in lower income areas. In these circumstances, to promote life safety and to reduce the expense to install the improvement, Tacoma Water has agreed to allow the fire meter to be teed off the domestic water service, provided the domestic service is adequately sized. This avoids the expense of cutting the adjacent street. At a later date, when the domestic service is renewed by Tacoma Water, the fire meter and domestic water service are separated and the installs standardized. In situations where fire sprinkling is attached to the domestic water service, the customer account is flagged which enables notification to the local fire agency when water service is shut off or a shutdown of water service occurs in the area.

3.8.5 Pressure Zones

Pressure zones are determined by evaluating ground elevation as it relates to available hydraulic gradient. The static pressure at the lowest elevation should, generally, not be greater than 100 psi. The static pressure at the highest elevation of the zone should be sufficient to ensure that at peak demand conditions the pressure is not less than 30 psi per DOH. For water systems with fire flow capability, a positive pressure must be maintained throughout the system under fire flow conditions, with a 20 psi residual pressure in mains at all points in the distribution system. Ideally, a minimum of two supply sources should serve each pressure zone. The number of pressure zones should be kept to a minimum. Wherever pressure zones are created, the system becomes fragmented, and the water conveyance capacity can be affected because distribution mains cannot be interconnected at pressure zone boundaries. Tacoma Water installs check valves, multiple feeds to each pressure zone in order to provide highly reliable water service to all customers. Additionally, valves for system isolation of zones are checked on a regular basis.

3.8.6 Pump Station Design

The design of pump stations will conform to the DOH's Water Works Standards. A minimum of two pumps will be installed at each pump station to provide flexibility and system redundancy. The pumps in supply pump stations will be sized so that the station can meet peak day design conditions when the largest pump is out of service. Pumps serving pressure systems will consider available storage so that the storage and pump capacity of the pumps will be 25 to 50 percent greater than the required capacity of the pump station in order to provide storage replenishment.

To increase emergency reliability, at least one pump in each pump station will generally be supplied with onsite power or have the capability to connect to a portable power supply. Where no direct storage is available to an area with a single supply source, onsite generation will be installed.

CHAPTER 4

POPULATION AND LAND USE

CHAPTER 4

POPULATION AND LAND USE

4.1 Introduction

This chapter describes future population and development scenarios Tacoma Water must consider when planning for the provision of water service. Development patterns expected as a result of the implementation of comprehensive land use plans are described, and current and forecasted population trends are summarized. The growth trend assumptions behind the 2003 Tacoma Water Demand Forecasts are also presented.

4.2 Population and Growth Trends

Tacoma Water is the major regional water supplier for Pierce County through direct retail and wholesale service. Tacoma Water also provides retail water service to portions of King County and wholesale water supplies to municipal water utilities serving King County residents. Additional utilities have the potential to become wholesale water customers in the future, but have not requested service at this time, depending upon growth in system demands and resulting need for new resources. The following section highlights both regional growth trends and specific Tacoma Water service area growth trends which must be considered in order to effectively plan for growth in retail and wholesale demands thereby successfully continuing the role of providing regional water supply services within Pierce County and to portions of King County.

The Puget Sound Regional Council (PSRC) coordinates regional transportation, economic and growth planning for the central Puget Sound region, including Pierce and King counties. As such, the PSRC provides demographic data to the region, including growth forecasts. The PSRC forecasts are small area forecasts of population, households and employment prepared to meet the requirements of federal legislation and data needs for land use and transportation modeling. Member organizations, including Pierce and King counties and the City of Tacoma, are consulted as the forecasts are developed. PSRC small area forecasts developed in 2002 were used in the development of the Tacoma Water 2003 Water Demand Forecast (see Chapter 5 – Water Demands). In addition to PSRC small area forecasts, the following section also presents population projections developed by the State of Washington Office of Financial Management (OFM). The OFM growth management projections are county-wide projections required to be used by jurisdictions planning under the Washington State Growth Management Act (GMA).

The section begins with a discussion of current connections and population served by Tacoma Water and then describes general growth trends and future growth considerations for the central Puget Sound region, the City of Tacoma and Pierce and King counties. The section ends by describing the growth trends applied in the Tacoma Water 2003 Water Demand Forecast.

4.2.1 Current Connections and Population Served

At year end, 2005, Tacoma Water provided direct (or retail) water service to a total customer base of 94,013 connections of which 87,612 are residential connections. Total population served in 2005 is estimated at 302,392.

4.2.2 The Central Puget Sound Region

Population growth in the central Puget Sound region, which had slowed significantly in the last few years as a result of the 2001 recession, picked up speed during 2004-05. The region grew by

TABLE 4-1
Population of Central Puget Sound Counties

County	Census 2000	OFM 2003	OFM 2004	OFM 2005	% Change 2004-05	% Change 2003-04	Estimated Population 2022/2025*	% Annual Growth
King	1,737,046	1,779,300	1,788,300	1,808,300	1.1	0.5	2,048,500	0.8
Kitsap	231,569	237,000	239,500	240,400	0.4	1.1	331,571	1.4
Pierce	700,818	733,700	744,000	755,900	1.6	1.4	912,700	1.2
Snohomish	606,024	637,500	644,800	655,800	1.7	1.1	914,249	1.6
Region	3,275,857	3,387,500	3,416,600	3,460,400	1.3	0.9	4,207,020	1.1

Note: *King and Pierce counties use 2022 as a horizon year. Kitsap and Snohomish counties use 2025.
Source: Puget Sound Trends, Puget Sound Regional Council, September 2005
Growth Management by the Numbers. Population, Household and Employment Growth Targets in the Central Puget Sound Region, Puget Sound Regional Council, July 2005

1.3 percent during 2004-05, up from 0.9 percent during 2003-04. Taken together, the region is home to a total population of 3,460,400.

The OFM 2002 growth management population projections call for a slightly lower rate of growth for the region during the next 25 years than was seen in the past 25 years. Overall, the average annual growth rate for the central Puget Sound region between 1975 and 2000 was 2.1 percent; the new regional target represents a regional average annual growth rate of about 1.1 percent.

4.2.2 City of Tacoma

With 198,100 residents, the City of Tacoma is the third largest city in the state and the largest in Pierce County. As such, Tacoma will continue to be the major city and focal point of growth for the Tacoma/Pierce County metropolitan area. It is expected that the City will accommodate a greater share of regional population and employment growth than in the past. For example, Pierce County is targeted to grow by roughly 1.2 percent per year through 2022. Approximately 30 percent of this growth target has been allocated to the City of Tacoma, representing an increase of 61,676 people from the 2000 census population of 193,564; an average annual growth rate of 1.3%.

4.2.3 Pierce County

With 755,900 residents, Pierce County is the second most populated county in the state, behind King County. During 2004-05, Pierce County experienced a year of healthy growth, increasing by 11,900 persons or 1.6 percent to a total population of 755,900. From 2000 to 2005, Pierce County experienced an increase in population of 55,082; second only to King County in the number of new residents during this five year time period. Tacoma Water provides retail or wholesale water service to several Pierce County municipalities within entire city limits or to a small area. Table 4-2 contains population information from 2000-2005 for these municipalities.

TABLE 4-2
Municipal Populations

Municipality	2000	2001	2002	2003	2004	2005	% Change
Tacoma	193,556	194,500	194,900	196,300	196,800	198,100	2.3
Bonney Lake	9,687	9,980	12,360	12,950	13,740	14,370	48.3
Fife	4,784	4,820	4,815	4,905	4,885	4,885	1.5
Puyallup	33,014	33,900	34,920	35,490	35,690	35,830	8.5
Ruston	738	740	740	745	745	745	0.9
University Place	29,933	30,190	30,350	30,720	30,800	30,980	3.5
Lakewood	58,293	58,272	58,662	58,940	59,010	58,850	1.0
Orting	3,931	4,186	4,060	4,295	4,440	4,820	22.6
Fircrest	5,868	5,890	5,925	5,935	5,995	6,080	3.6

Source: Puget Sound Trends, Puget Sound Regional Council, September 2005

Table 4-3 contains the 2022 population allocations adopted by the Pierce County Council on March 20, 2004 for Pierce County and its cities and towns to which Tacoma Water provides direct retail (within entire city limits or to a small area) or wholesale water service. The total county 2022 population allocation represents the medium OFM population range. Pierce County as a whole is targeted to grow roughly 1.2 percent per year through 2022.

TABLE 4-3
2022 Urban Population Allocation for Pierce County

	Municipal*		**Unincorporated Pierce County UGA**		**Average Annual Growth Rate 2002-2022**	
Municipality	2000 Census Population Estimate	2022 Population Allocation	2000 Census Population Estimate	2022 Population Allocation	Municipal	UGA
Bonney Lake	10,874	18,830	860	3,180	2.5%	6.1%
Fife	4,784	8,900	445	680	2.9%	1.9%
Puyallup	33,014	38,600	7,082	11,500	0.7%	2.2%
Ruston	738	1,760	n/a	n/a	4.0%	n/a
Tacoma	193,564	255,240	56,638	67,100	1.3%	0.8%
University Place	29,938	34,000	n/a	n/a	0.6%	n/a
Lakewood	58,211	72,000	23,473	24,900	1.0%	0.3%
Orting	3,760	7,900	n/a	n/a	3.4%	n/a
Fircrest	5,868	6,800	37	40	0.7%	0.4%
	2000 Census Population Estimate		**2020 Population Allocation**		**Average Annual Growth Rate 2002-2022**	
Municipal Allocation	386,865		522,920		1.6 %	
Unincorporated UGA Allocation	169,864		230,380		1.6%	
Rural Allocation	144,082		159,400		0.5%	
County Total	700,811		912,700		1.2%	

* The 2000 estimate and the 2022 allocation are for the 2002 municipal boundaries.
Source: Pierce County Code 19A.20.100

The 2000-2022 Pierce County growth targets represent a major shift in past development trends (1995-2002 time period) of nearly one third of development occurring in the rural area. Instead, the 2000-2022 population allocations target the rural area increasing by seven percent, with 64

percent of growth to occur within cities and 29 percent to occur within the urban unincorporated area.

With a targeted annual growth rate of 1.6 percent per year, Pierce County's Urban Growth Area (UGA) is targeted to add nearly 32,000 new residents during the next twenty-year planning period. This gives Pierce County the highest number of residents targeted to an unaffiliated unincorporated urban area in the central Puget Sound region and includes allocations for master-planned developments that are already underway, including Cascadia and Sunrise, served by Tacoma Water and Silver Creek, not served by Tacoma Water.

4.2.4 King County

King County allocates growth to its jurisdictions as required by the GMA by households rather than the more standard allocation by population. The King County selected OFM population target reflects the addition of 311,500 new people between 2000 and 2022 and the addition of 157,932 new households. The population target reflects an annual population growth rate of 0.75 percent while the household target reflects a 0.92 percent annual household growth rate over the planning horizon. The King County growth projections represent a slowing of growth over that which has occurred over the past 25 years, which had averaged a 1.64 percent annual population growth rate.

Tacoma Water provides retail water service to a small area within the City of Federal Way and in the Cumberland area of unincorporated rural King County. The City of Federal Way is allocated to grow by 0.8% annually to a 2022 household count of 37,625 from a 2000 household count of 31,437. Rural unincorporated King County is allocated to increase in households by 0.5% annually between 2000 and 2022.

Actual (retail) customer connections within the City of Federal Way in 2005 equaled 3,250 while 2005 actual (retail) customer connections in Cumberland equaled 94.

4.2.5 Tacoma Water, Water Demand Forecast Study, December 2003

In 2003, Tacoma Water hired Integrated Utilities Group, Inc. (IUG) and Economic and Engineering Services, Inc. (EES) to conduct a water demand study and to forecast water use to the year 2040. The 2003 Water Demand Study forecasts the number of future accounts by customer class (single-family, multi-family, commercial etc.) in order to predict future water demands. Two different growth scenarios were used to forecast future accounts: 2002 PSRC growth forecasts by small area (known as Traffic Analysis Zones or TAZs), termed the "High Growth Scenario", and historical growth in Tacoma Water's customer accounts adjusted for regional trends in population density and development patterns (termed the "Expected Growth Scenario").

Tables 4-4, 4-5 and 4-6 present the annual growth rates and forecasted growth in residential customer accounts for both the PSRC growth derived forecast (the High Growth Scenario) and the historical growth adjusted forecast (the Expected Growth Scenario). As can be seen, the PSRC forecasts for inside-city customers well exceeded recent historical growth rates. However, the PSRC forecasts for the outside-city customers were significantly below those observed by Tacoma Water from 1997 to 2002. The demand forecast based on Tacoma Water's historical growth rates was considered to be a more likely scenario than the PSRC forecast, therefore it is referred to as the "expected" demand forecast. The PSRC forecast represents the "high" scenario. Please see Chapter 5 – Water Demands for additional information.

Table 4-4
Tacoma Water 2003 Demand Forecast
Puget Sound Regional Council Growth Derived Forecast (High Demand Scenario)

Population	2000 Actual	2004	2005	2006	2007	2008	2009	2010	2020	2030
Inside City	190,185	202,655	205,931	209,274	212,685	216,165	219,718	223,344	252,948	275,931
Outside City	100,511	106,113	107,584	109,085	110,617	112,179	113,775	115,403	131,932	145,637
Total	290,695	308,768	313,515	318,359	323,301	328,345	333,493	338,747	384,879	421,568
Annual Population Growth Rate										
Inside City			1.62%	1.62%	1.63%	1.64%	1.64%	1.65%	1.25%	0.87%
Outside City			1.39%	1.40%	1.40%	1.41%	1.42%	1.43%	1.35%	0.99%
Total			1.54%	1.54%	1.55%	1.56%	1.57%	1.58%	1.28%	0.91%

Table 4-4
Tacoma Water 2003 Demand Forecast-PSRC (cont)
Puget Sound Regional Council Growth Derived Forecast (High Demand Scenario)

Forecast of Accounts	2000 Actual	2004	2005	2006	2007	2008	2009	2010	2020	2030
Single-Family: Inside City		54,432	55,552	56,701	57,879	59,086	60,324	61,594	75,467	87,752
Single-Family: Outside City		28,741	29,243	29,755	30,279	30,815	31,363	31,925	38,054	44,460
Total		83,173	84,795	86,456	88,158	89,901	91,687	93,519	113,521	132,212
Multi-Family: Inside City		3,586	3,660	3,736	3,813	3,893	3,975	4,058	4,972	5,782
Multi-Family: Outside City		1,710	1,739	1,770	1,801	1,833	1,865	1,899	2,264	2,645
Total		5,296	5,399	5,506	5,614	5,726	5,840	5,957	7,236	8,427

TABLE 4-5
Tacoma Water 2003 Demand Forecast
Forecast of Accounts: Historical Growth Rate Derived (Expected Demand Scenario)

Single-Family	2004	2005	2006	2007	2008	2009	2010	2020	2030
Inside City	53,084	53,490	53,900	54,312	54,728	55,147	55,569	59,857	63,247
Outside City	29,304	30,099	30,916	31,755	32,617	33,501	34,378	42,209	49,106
Total	82,388	83,589	84,816	86,067	87,345	88,648	89,947	102,066	112,353
Multi-Family									
Inside City	3,498	3,524	3,551	3,578	3,606	3,633	3,661	3,944	4,167
Outside City	1,743	1,791	1,839	1,889	1,940	1,993	2,045	2,510	2,921
Total	5,241	5,315	5,390	5,467	5,546	5,626	5,706	6,454	7,088

TABLE 4-6
Tacoma Water 2003 Demand Forecast – Actual Annual Growth Rate: Residential Accounts

Residential Accounts	1997	1998	1999	2000	2001	2002
Inside City	0.69%	0.89%	0.67%	0.56%	0.94%	0.63%
Outside City	2.66%	2.59%	3.43%	3.86%	0.49%	5.29%
Total	1.26%	1.39%	1.49%	1.56%	0.80%	2.07%

*Based on water statistics (Adjusted for acquisitions)

The current Tacoma water service area is divided into six Primary Service zones. To ensure each zone meets storage capacity requirements currently, and into the future, the 2006 Update contains a storage analysis (see Chapter 10). To complete the storage analysis, water demands were allocated to each of the zones based on the population and employment forecasts contained in the 2003 Water Demand Forecast. Please see Chapter 10 – Water System Analysis for additional information.

4.3 Land Use

4.3.1 Introduction

Tacoma Water is expected to provide water service to new development within its service area as such development occurs in accordance with applicable jurisdictions' comprehensive land use plans and development regulations. In 2003, the legislature recognized the importance of water utilities considering local land use plans when developing water systems plans by requiring the signing of a "consistency statement" by the local land use authority for inclusion in water system plans. Such a requirement stresses the benefits that can be obtained by both the local land use authority and the water utility by coordinating the development of an essential public service with expected growth and development. The following section describes the general development patterns expected as a result of the implementation of the comprehensive land use plans for the areas to which Tacoma Water provides water service. Emphasis is given to the growth plans of municipalities to which Tacoma Water is the sole water purveyor (i.e, the cities of Tacoma, University Place and Ruston). Individual jurisdictions' future land use maps and/or zoning maps can be found in Appendix J.

Tacoma Water provides retail water service to a large and diverse service area including portions of two counties and eight municipalities. Taken together, approximately 80 percent of Tacoma Water's service area is within an urban land use designation, with the remaining 20 percent within a rural designation. A high level of water service is available in the urban areas, consistent with service levels expected within cities.

In nearly all areas, water service is nearby and available flow capacity is more than adequate for meeting customer needs. Fire protection is provided from fire hydrants or special fire line connections and water mains are generally close for all water service connections.

The level of water service in rural areas varies greatly depending on the proximity of the customer's property to existing water mains. Those properties adjacent to the water mains typically have fire hydrants for fire protection and short water service lines to their premises or irrigated areas. Properties more remote to the water mains may receive limited benefit from fire hydrants when needed and may have long "shoestring" water service pipes from their property to the nearest water main.

4.3.2 Washington State Growth Management Act

In 1990, in response to mounting citizen concerns over the problems associated with rapid population growth and development, the Washington State Legislature enacted the GMA. Under the GMA all urban counties and their cities and towns are required to develop comprehensive plans and regulations to implement those plans. Included are chapters on land use, housing, capital facilities, utilities, shorelines and rural areas (for counties). The comprehensive plans are intended to guide growth and development and accommodate population growth forecasts over a 20-year period. The plans are carried out by development regulations, such as zoning and land division codes, developed to be consistent with the comprehensive plan.

The GMA includes 14 planning goals to provide guidance for the development of comprehensive plans and development regulations:

- Focus urban growth in urban areas
- Reduce sprawl
- Provide efficient transportation
- Encourage affordable housing
- Encourage sustainable economic development
- Protect property rights
- Process permits in a timely and fair manner
- Maintain and enhance natural resource-based industries
- Retain open space and habitat areas and develop recreation opportunities
- Protect the environment
- Encourage citizen participation and regional coordination
- Ensure adequate public facilities and services
- Preserve important historic resources
- Manage shorelines wisely.

The GMA requires counties to coordinate with cities and towns to develop and adopt a set of mutually agreed upon planning policies. These policies guide the development of comprehensive plans and ensure consistency on issues that cross jurisdictional boundaries.

Working through the county, the GMA also requires cities and towns to establish UGAs; areas designated for urban development and anticipated for annexation into a city or town in the future. UGAs are to be sized to accommodate the projected urban population growth for a 20-year period. The basis for the county urban population projection is a county-wide projection range generated by the OFM. The counties, and associated cities and towns, are challenged to identify a 20-year county-wide population forecast within the OFM range and then disaggregate the total to individual urban growth areas and the rural area. The OFM released its latest 20-year growth management planning population projections in March 2002.

The GMA directly affects planning for utilities by requiring that city and county comprehensive plans include a "utilities element" that identifies the general location, proposed location, and capacity of all existing and proposed utilities. A comprehensive plan is also to include a "capital facilities plan element" that consists of an inventory of existing facilities, a forecast of future

needs, the proposed location and capacities of expanded or new capital facilities, and a six-year (minimum) plan to finance needed capital facilities.

In accordance with the requirements of the GMA, a building permit cannot be issued until water is available to serve the proposed development. Water availability for all growth and development in the City of Tacoma is guaranteed. A "Certificate of Water Availability" is issued by Tacoma Water for development occurring outside Tacoma city limits and within its service area if there is sufficient water supply to meet the domestic water service and fire flow requirements of the applicant's proposed project. The requirement for providing evidence of an adequate water supply was codified in 1990 under Title 19.27.097 of the Revised Code of Washington (RCW) in the Building Code Section.

4.3.3 Tacoma City Limits

The City of Tacoma Comprehensive Plan addresses managed desirable growth and development and, as such, can be considered a major force for shaping and reshaping the city's urban form. Tacoma's growth and development concept is derived from consideration of state goals, regional policies, factors affecting land use, certain assumptions about future trends and public opinion. Tacoma's growth and development concept is entitled "Concentrations and Corridors – Designated Centers" which directs future development to specified areas of the City. New development is directed to occur in three types of areas: (1) mixed-use and manufacturing/industrial centers, (2) in concentrations of similar uses, or (3) in concentrated nodes along major transportation corridors. By encouraging growth into concentrations and designated centers where development already exists, sprawl and environmental impacts will be limited and land and infrastructure will be used more efficiently.

Under the City's Comprehensive Land Use Plan, Tacoma will continue to be the focal point of growth for the greater Tacoma area and a growth center for the region and the state. It is intended that growth and development will occur in an orderly and desirable manner in accordance with citizen needs and desires, the physical characteristics of the land, and the City's ability to provide the necessary services. Medium and high intensity land uses will be encouraged to develop in concentrated areas in order to better use the land, limit the spread of higher intensity development, protect low intensity residential neighborhoods and enable the economical provision of public facilities and services within the City's UGA.

The underlying development pattern for the city has been established. Past development will continue to influence, and to some extent determine, the pattern of future development. Future development and redevelopment will further shape the city's form. A mix of uses and higher densities concentrated in mixed-use centers will encourage more overall urbanization of the city while retaining the residential character of established neighborhoods. Some areas will experience population and density increase that will increase demand for the improvement and expansion of public facilities and services.

Emphasis will be placed on concentrating growth and development rather than expansion. Growth will be directed toward compact mixed-use centers and in nodes along major transportation corridors including primary transit routes.

The single-family detached house will continue to be the preferred type of housing structure. Nevertheless, the demand for multi-family residential development will increase. As a result of the City's ten-year tax abatement program for multi-family housing, significant increases in multi-family housing development in the downtown core and the Tacoma Mall area has and will continue to occur.

The downtown area will continue to be a major office, financial, governmental, educational, cultural, retail and residential center. The Tacoma Mall urban center will remain as the city's

major retail center and pressure for expansion is likely. Tacoma will continue to grow as an economic center. Much of this growth can be attributed to steadily increasing activity in the Port of Tacoma as it pursues a greater share of the national and international trade market. The Port manufacturing/industrial center will remain as one of the city's and region's major employment centers.

The Port of Tacoma has extensive plans for redevelopment within the Tideflats area. As a result, water mains and related appurtenances may be required to be replaced or abandoned The current demands in the Port area are no longer for the large heavy industrial uses of the past as the Port's focus has moved towards the development of container loading/unloading facilities. Many of the old large diameter supply lines in the Tideflats area only serve a distribution function and could, therefore, be downsized. The Port's interests also lie with the expansion of rail service within the area. Current coordination of projects such as the Lincoln Avenue grade separation is required. Funding for these projects is anticipated to come from the Port.

Continued coordination will be needed with Burlington Northern Santa Fe Railroad (BNSF) and Sound Transit as they expand and add track service for the Port of Tacoma and the surrounding area. Grade separations, track expansion and commuter rail are all under current consideration along rail right-of-way and may impact both distribution and supply systems where they cross. Work to mitigate affects of Sound Transit's rail service extension form downtown Tacoma to Lakewood is under design and anticipated to be constructed in 2007.

4.3.4 Unincorporated Pierce County Service Area

The growth and development strategy for Pierce County directs future development to occur primarily within UGAs. A UGA is defined as an area that can accommodate projected growth over the next 20 year period. Each city and town within Pierce County is located within an UGA. Growth outside of UGAs is appropriate only if it is not urban in nature. The growth and development strategy further directs major concentrations of development to occur in urban centers, mixed-use districts, and high-density residential districts. Moderate-density single-family residential areas are to serve as the principal land use for the remaining areas within the UGAs. Areas designated as Employment Centers, as is the Frederickson area, are to be the location of the majority of industrial development to occur in unincorporated Pierce County. Tacoma Water is the designated water provider to the Frederickson Employment Center.

Due to past development trends and pre-GMA zoning, Pierce County does contain pockets of urban level development in areas now located outside the UGA. As the remaining pre-GMA developments are built-out, new development is expected to be at rural level densities outside the UGA.

Tacoma Water has five areas of service located within the rural designation. They are Woodland Avenue, Vickery Avenue, Orting Valley/Fennel Creek, Prairie Ridge and east of Werren Road to Buckley. Vickery Avenue is located in an area designated as Rural Separator by the Pierce County Comprehensive Land Use Plan.

Large portions of the four rural service areas in Pierce County already have urban density residential development with urban level water services. However, each area also has large undeveloped parcels and rural, farm-like settings with widely scattered water mains.

Tacoma Water is the designated service provider for the Cascadia development to be built south of Bonney Lake in eastern unincorporated Pierce County. This 5,000 acre development has recently received the necessary permits from Pierce County to begin construction. The development plan calls for more than 6,000 homes and 16,700 residents over two decades, as well as businesses, schools and recreational uses. Tacoma Water's participation with the project has necessitated creative solutions to construction of the infrastructure, processes for expediting the

work and procedures to assure adequate operations both for the limited initial build-out and at full build-out.

4.3.5 King County Service Area (City of Federal Way and unincorporated King County)

Tacoma Water provides water service to a small portion of the city of Federal Way. The majority of this service area is designated as Single Family- High Density. Other land use designations include Parks and Open Space, Multi-Family, Single Family-Medium Density and Single Family-Low Density.

The Cumberland service area in southeast King County is remote and has low-density residential homes and small farms. Water service is provided through an eight and 12-inch diameter water main down the middle of the one mile wide, three mile long service area. Customers install long "shoestring" water service pipes to their properties from the meter near the water main. Fire protection is provided by fire hydrants for those properties close to the water main and by fire district tanker truck for more remote properties. This area is located outside an UGA with the majority of the area designated as Rural Residential, 1 dwelling unit / 2.5-10 acre by the King County Comprehensive Plan.

4.3.6 City of University Place Service Area

The City of University Place, incorporated in 1995, encompasses approximately 8.4 square miles. At incorporation, University Place was built out at urban density; therefore, its growth potential is through infill development. Because it is an almost fully built out city, the plan for its future development is based primarily on existing land use patterns. For example, the University Place Comprehensive Plan designates mixed use zones in areas where there currently is a mix of residential and commercial uses. The City's Comprehensive Plan contains eight land use designations: Low-Density Residential, Moderate Density Residential, Mixed Use-Office, Mixed Use, Town Center, Neighborhood Commercial, Commercial and Light Industrial-Business Park.

The community vision, goals and policies in the Comprehensive Plan promote University Place supporting a vibrant regional retail and office center while preserving existing single-family residential areas. Due to constraints such as wetlands and lack of vacant property, there is no significant opportunity to expand industrial areas without affecting adjoining residential uses. Zoning additional areas of commercial development would continue a strip pattern of development; therefore, the Comprehensive Plan does not add significant new acreage for commercial uses.

Bridgeport Way between 35th Street and 44th Street is designated "town center". Higher residential densities are expected in this area. Currently the City is working toward the development of a Town Center development consisting of a mixed use lifestyle retail center with high-end condos and townhouses surrounded by the City Hall, Public Safety Building and Library. Up to 420 residential units are expected within the Town Center.

4.3.7 Town of Ruston Service Area

The Town of Ruston is located in the north end of Tacoma. Incorporated in 1906, the Town covers approximately 0.3 square miles (170 acres). Currently Ruston is largely developed with limited infill opportunities. With the reclamation of the large Asarco Smelter site, Ruston will have substantial area available for development. Ruston's Comprehensive Plan contains three land use designations: Single Family Residential, Commercial and Master Planned Development.

The Master Planned Development land use designation encourages the development of the Asarco site as a mixed-use master-planned district to restore the tax base to the Town of Ruston. The designation allows for a variety of residential, commercial, industrial and recreational uses

and requires that any light industrial or commercial use include public access along the shoreline and pedestrian access corridors from the town to Commencement Bay.

4.3.8 Other Pierce County Municipalities (Puyallup, Bonney Lake, Orting, Fircrest and Lakewood) Service Area

Tacoma Water provides water service to portions of the cities of Puyallup, Bonney Lake, Orting, Fircrest and Lakewood. For the majority of these areas, service is occuring within city limits due to the annexation of previously unincorporated areas and/or are a result of a mutual agreement between the jurisdiction and Tacoma Water. Additionally, the majority of these areas are fully built-out and are not, therefore, expected to result in additional customers. Actual customer counts, year 2005, follow:

- Puyallup: 71 Accounts
- Bonney Lake: 12 Accounts
- Orting: 6 Accounts
- Fircrest: 74 Accounts
- Lakewood: 35 Accounts

All municipalities within Pierce County prepare Comprehensive Plans to guide growth and development within city limits as required by GMA. Tacoma Water will continue to provide water service within other jurisdictions' city limits consistent with individual comprehensive plans and development regulations.

4.4 Consistency With Land Use Plans

The 2003 Municipal Water Law requires that water system plans be consistent with local plans and regulations. The signed Consistency Statement Checklists included in Appendix E document the determination of those jurisdictions that this 2006 Update is consistent with their plans and development regulations.

CHAPTER 5

WATER DEMANDS

CHAPTER 5

WATER DEMANDS

5.1 Introduction

This chapter describes how Tacoma Water customers use water by summarizing current and historical use trends and future use forecasts calculated based upon past use and the growth trends presented in Chapter 4 – Population and Land Use. The information presented in this chapter will be used in subsequent chapters to assess the ability of Tacoma Water to serve future water supply needs. The chapter ends with a discussion of water use data collection requirements, including Tacoma Water's compliance status.

5.2 Current Water Use And Historical Trends

5.2.1 Introduction

Tacoma Water meters its water supply sources, water that is exported through interties to wholesale customers and customer service connections. Supply source metering provides a record of water production. Service connection metering indicates the amount of water consumed by each customer and provides the basis for collecting revenues. In an ideal water system, consumption records would be nearly equal to production records. In other words, nearly all water produced would be purchased for consumption. However, it is inevitable that a portion of production will never be billed, whether it is due to system leakage, flushing and cleaning, mainline breaks, fire fighting or meter errors. Accordingly, this "unaccounted-for water" represents the difference between water produced and water consumed.

The following section summarizes Tacoma Water consumption records between 1985 and 2005, with a special focus on the time period 2000-2005. Production information is provided in Chapter 6- Water Resources. Unless otherwise noted, the water use information presented below does not include "unaccounted-for water", but rather only includes water use as measured at customers' meters.

5.2.2 Historical Trends

In 1985, Tacoma Water's average daily consumption was 76.08 million gallons a day (MGD) (47.59 MGD excluding use by the Simpson Tacoma Kraft Mill). Average daily consumption increased slightly to 79.4 MGD (47.9 MGD excluding Simpson use) in 1990. By 1995, the total average daily consumption dropped to 59.35 MGD mainly due to conservation efforts on the part of Simpson, which decreased Simpson's overall demand by ten MGD beginning in 1992. The Simpson Paper Mill is Tacoma Water's largest industrial water customer. The average daily consumption without Simpson was 39.35 MGD in 1995.

Table 5.1 shows average daily consumption by customer class for the years 2001 – 2005. The total average daily consumption in 2005 (51.1 MGD) is lower than 1995 average day consumption (59.35 MGD) despite the passage of ten years and an increase in customer connections of approximately 18 percent. Average day water use at Simpson was 20 MG in 1995. By 2005, average day water use has been reduced by 5.1 million gallons (MG) at Simpson, to 14.9 MG.

The 2000 Tacoma Water System Plan projected Tacoma Water average day demand would increase to 76.0 MGD by the year 2000. This includes 20.0 MGD use at Simpson. As can be seen in Table 5.1, average day consumption in the year 2001 was actually 53.4 MGD; 22.6 MGD less than what was projected. The projected future water demands contained in the 2000 Water

System Plan are from the 1995 Water Demand Forecast (*EES and CH2MHILL, Water Demand Forecasts, 1995*) and were based upon year 1995 population and employment forecasts from the Puget Sound Regional Council.

Figure 5-1 breaks the 2005 customer connections into customer classes and includes the percentage of each of total system connections. As can be seen in Figure 5-2, although single-family residential connections account for 89 percent of total connections, single-family residential use accounts for 34 percent of consumption. On the other hand, Simpson, with only one connection, accounts for 29 percent of total system consumption.

Figure 5-1

2005 Connections by Customer Class

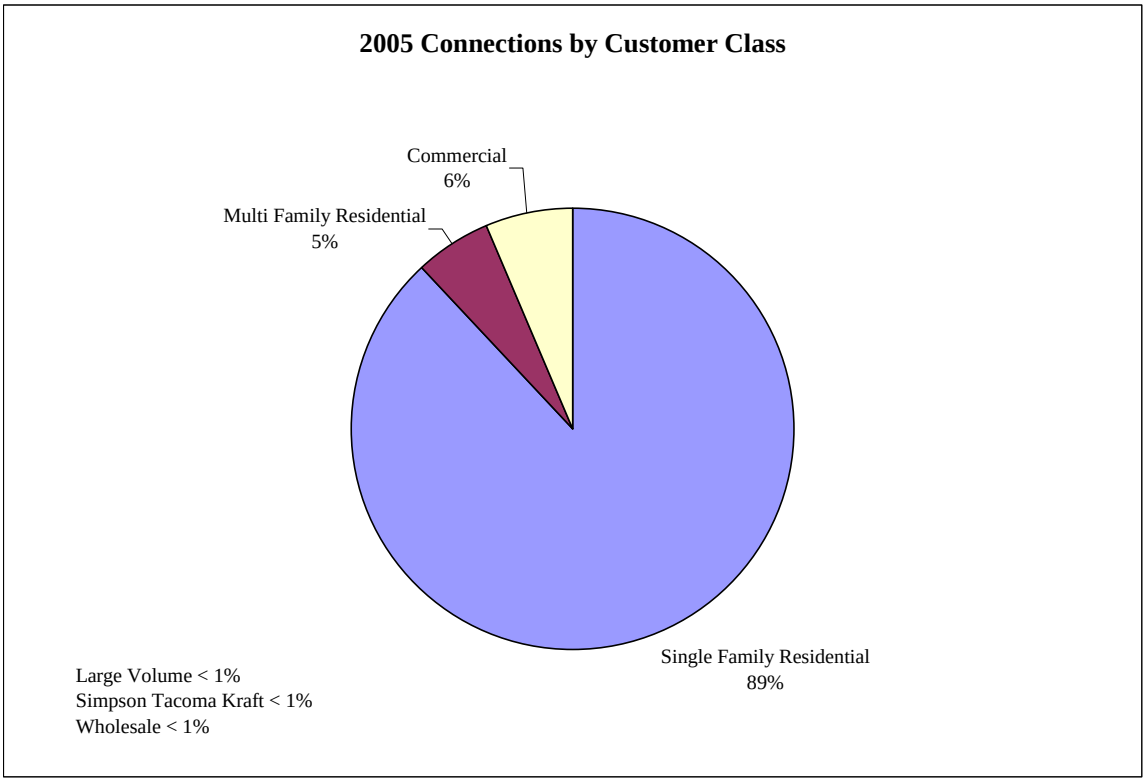


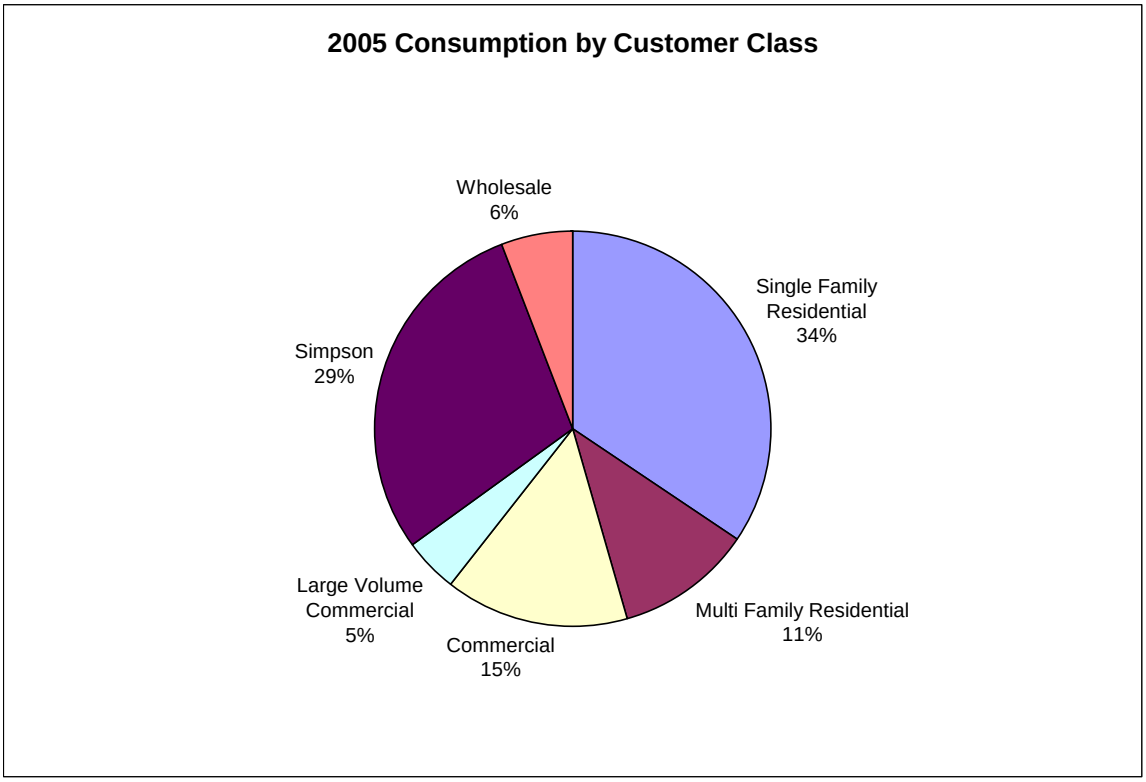
TABLE 5-1
Historical Water Use and Service Connections

Year	Customer Class Consumption (MGD)						
	Single-Family Residential	Multi-Family Residential	Commercial	Large Volume Commercial	Simpson	Wholesale	Totals
2001	18.7	3.8	7.7	3.5	17.9	1.8	53.4
2002	20.4	4.0	8.0	2.4	15.6	2.1	52.5
2003	22.4	3.9	8.0	2.0	15.6	3.4	55.2
2004	21.6	3.9	8.1	2.2	16.5	3.3	55.8
2005	17.6	5.7	7.6	2.3	14.9	3.0	51.1

Year	Customer Class Average Service Connections						
	Single-Family Residential	Multi-Family Residential	Commercial	Large Volume Commercial	Simpson	Wholesale	Totals
2001	80,215	3,588	5,714	16	1	16	89,550
2002	81,888	3,601	5,855	13	1	17	91,375
2003	83,345	3,580	5,785	12	1	17	92,740
2004	84,196	3,623	6,053	15	1	18	93,906
2005	82,753	5,107	6,016	15	1	20	93,912

Note: Reporting discrepancies may have occurred in 2004-2005 due to the implementation of a new City-wide billing system.

FIGURE 5-2
2005 Consumption by Customer Class



Tacoma Water's residential per capita water use is shown in Table 5-2. The residential per capita water use is calculated based upon Tacoma Water's estimates of population served and total residential (single-family and multi-family customer classes) water consumption. As can be seen, Tacoma Water's residential per capita was use has consistently dropped since 1990. Year 2005 residential per capita water use is significantly lower than year 2004 The lower year 2005 residential per capita water use can be explained, in part, due to the implementation of Stage One of the four-stage Tacoma Water, Water Shortage Response Plan, which began in March and ended in July. Year 2010 per capita water use is forecasted to be 79 gallons per day, slightly higher than what occurred in year 2005.

TABLE 5-2
Residential Per Capita Water Use

Year	Residential Per Capita Water Use – gallons per day
1990	92
1995	90
2000	86
2004	83
2005	76

5.2.3 Large Water Users

Table 5-3 shows Tacoma Water's largest water users for 2005 and each user's total amount of metered consumption for the year. The total water consumption of these fifteen water accounts represents approximately 42 percent of Tacoma Water customers' total water consumption in 2005. The list of accounts in the table primarily consists of schools, industrial businesses, hospitals and wholesale water customers.

TABLE 5-3
Tacoma Water 2005 Largest Customers

Customer Name	Business	Annual Consumption (MGD)
Simpson Tacoma Kraft	Paper Mill	14.91
City of Fife	Municipality, Water Distribution	1.21
Covington Water District	Water Distribution	0.94
U S Oil & Refining Co.	Petroleum Refinery	0.61
Nalleys Fine Foods	Food Processing	0.59
Firgrove Mutual Water Co.	Water Distribution	0.57
Frederickson Power	Electricity Generation	0.46
Graymont Western US Inc.	Lime Kiln	0.39
Tacoma School District	Education	0.38
Tacoma Metro Parks	Recreation	0.36
James Hardie Building Products	Construction Materials	0.20
Multicare Health Systems	Hospital	0.19
St. Joseph Medical	Hospital	0.18
Curran Rd Mutual Water Co.	Water Distribution	0.17
G.P. Gypsum	Wallboard Manufacturer	0.16
Largest Customers Total		**21.3**
Water System Total		**51.1**
Percent of Total		**41.7%**

Table 5-4 further breaks down water use by Simpson. Because of extensive conservation efforts, the amount of water used per ton of pulp slush produced has steadily decreased from year 2000 to year 2005.

TABLE 5-4
Simpson Water Consumption

Year	Pulp Slush Production (tons)*	Billed Water Consumption (gallons)	Gallons of Water per ton
2000	428,630	7,060,996,580	16,473
2001	440,110	6,444,984,172	14,644
2002	468,970	5,795,224,248	12,657
2003	472,450	5,616,157,036	11,887
2004	510,740	6,019,200,000	11,785
2005	486,440	5,440,950,000	11,185

* As provided by Simpson Tacoma Kraft Co.

5.2.4 Peak Demands

Peak day demand (PDD) is the maximum amount of water used throughout the system during a 24-hour time period of a given year as measured at the source. Peak day demand typically occurs on a hot summer day when lawn watering is occurring throughout most of the system. Supply facilities (i.e., supply stations, booster pump stations, interties) are typically designed to supply water at a rate that is equal to or greater than the system's PDD.

Table 5-5 shows the average and maximum daily production and the ratio of maximum daily to average daily production for 2000 through 2005. Average Day Demand (ADD) is the total amount of water delivered to the system in a year divided by the number of days in a year.

Table 5-5
Production History - MGD

	2000	2001	2002	2003	2004	2005
Average Day Demand (ADD)	65.03	59.04	59.76	62.63	62.90	58.92
Peak Day Demand (PDD)	99.39	86.86	93.07	110.67	109.26	93.61
Peaking Factor (PDD/ADD)	1.53	1.47	1.56	1.77	1.74	1.59

Source: Annual Consumption Report

5.2.5 Equivalent Residential Units

Use of equivalent residential units (ERUs) is a method to express water use by non-residential customers as an equivalent number of residential customers. The water consumption ERU value is calculated by dividing the total volume of water utilized in the single-family residential customer class by the total number of active single-family residential connections. The volume of water used by other customer classes can then be divided by the average single-family residential water use to determine the number of equivalent residential units consumed by other customer classes.

Tacoma developed an ERU value of 279 gallons per day (gpd) which was used in the 1998 System Development Charge Report. This value was derived as average day residential (single-family and multi-family) customer class billed consumption divided by the number of equivalent 5/8-inch residential (unadjusted for multi-family customer) meters to obtain an ERU value of 279 gpd.

The average day residential use for Tacoma Water for 2000 to 2005 ranges from 241 gpd per ERU to 220 gpd per ERU, respectively. These values represent water used in the single-family residential customer class by active single-family residential connections. Using the 220 gpd per ERU figure, Tacoma Water served a total of 267,833 ERUs in 2005. When needed for calculating storage requirements as contained in Chapter 10 – Water System Analysis, the 2005 value of 220 gpd per ERU was used.

The City of Tacoma Growth Management Act required Capital Facilities Plan adopts a level of service standard for water service of 442 gpd per ERU. This represents a 4-day peak period demand, with a peak factor of 2.01 times the actual average daily residential water consumption of 220 gpd per ERU.

5.2.6 Unaccounted- for Water

Unaccounted-for water (also known as unmetered water) is defined as the difference between metered source production and metered customer consumption. A portion of such unaccounted for water includes water used for purposes such as flushing water mains and sewers, and firefighting and a portion of unmetered water is lost due to leaks or unauthorized uses such as illegal service connections.

As shown in Table 5-6, unaccounted for water has fluctuated from a high of 10 percent in 2003 down to a low of 7.4 percent in 2001. The average volume of unaccounted-for water in the five-year period is nine percent. This is considered to be a relatively low percentage, particularly for a utility of this size. The interim water conservation requirements resulting from the 2003 Municipal Water Law require water systems to provide a plan for reducing unaccounted for water in cases where the unaccounted for water rate is 20 percent or higher. This requirement does not apply to Tacoma Water.

The amount of identified non-revenue water consumed in 2005 is further broken down by purpose in Table 5-7.

TABLE 5-6
Unaccounted-for Water

Year	Total Production (MG)	Metered Consumption (MG)	Authorized Non-revenue Consumption (MG)	Lost Water Percentage
2001	21,550	19,497	457	7.4%
2002	21,811	19,222	480	9.7%
2003	22,861	20,090	486	10.0%
2004	23,166	20,335	947	8.1%
2005	21,507	18,678	745	9.7%
			Average Losses 2001 – 2005	**9%**

TABLE 5-7
2005 Identified Non-Revenue Consumption

Adjustment Types	Adjustments (MG)
Reservoir Cleaning	459.5
Public Works Hydrant Use	15.1
Water Main Flushing	47.1
Transmission Main Disinfection (SSP)	103.9
Fire Flow Testing	2.2
Well Maintenance Projects	8.6
Transmission Main Leak	10.2
Additional Water Sales (SSP)	90.1
Self Consumed (metered)	7.9
Total Adjustments	**744.9**

5.3 Future Water Demands

5.3.1 Introduction

Planning for future water supply needs requires projections of demand for both short-term and long-term periods. The short-term period is necessary to define needed capital improvements. Such improvements require lead time for financing, design and construction. Longer term

forecasts are necessary to quantify probable water resource requirements. Such forecasts guide the management, reservation and protection of water resources necessary to meet future demands.

In 2003, Tacoma Water engaged Integrated Utilities Group, Inc. (IUG) and Economic and Engineering Services, Inc. (EES) to conduct a water demand study and to forecast water use to the year 2040. The following section provides a summary of the *Tacoma Water, Water Demand Forecast Study, December 2003.*

5.3.2 Methodology

Two demand forecasts were developed as part of the study: A retail demand forecast and a qualitative demand forecast for Tacoma Water's wholesale customers and large customers. Tacoma Water's total demands were assumed to consist of the following components:

- Retail demand forecasts (retail demands of residential, government, commercial and small industrial customers adjusted for the impact of price)
- Additional potential retail demands (a component of the qualitative demand forecast)
- Wholesale and large industrial demands
- An adjustment for conservation
- An allowance for unaccounted-for water
- An adjustment for the potential impact of climate change (included in the high forecast only)

Retail Demand Forecast

Using historical growth in number of accounts and Puget Sound Regional Council (PSRC) small area forecast data, IUG employed a requirements model that included a risk assessment to forecast customer water demands. The study used a statistical approach called Monte Carlo Stimulation to model the uncertainty related to developing Tacoma Water's long-term demand forecasts.

Average-day, peak-season and peak-day water demand forecasts were developed by class for the following classes:

- Residential – Single-Family
- Residential – Multi-family
- Commercial/Governmental
- Parks and Irrigation

These classes were further separated into inside-city (or inside City of Tacoma) and outside-city. Annual short-term forecasts were developed for years 2004 through 2010. Mid to long range forecasts were completed in ten-year increments for the period of 2010 to 2040.

The requirements model was used to develop the forecasts of future water demand assuming increases in customer accounts based upon PSRC derived growth assumptions and historical growth rates observed by Tacoma Water. The demand forecast based on Tacoma Water's historical growth rates was considered to be a more likely scenario than the PSRC forecast, therefore it is referred to as the "expected" demand scenario. The PSRC forecast represents the "high" scenario and is, therefore, referred to as the "high" demand scenario. Average daily consumption by account, and peak-season and peak-day factors, were estimated based on Tacoma Water consumption records from 1993-2002.

Qualitative Demand Forecast

In addition to the retail demand forecast, demands were projected for Tacoma Water's wholesale customers (currently contracted and potential future) and large customers (primarily industrial) as described below.

Wholesale Customers

Demands for the following two types of wholesale customers were developed:

- Currently Contracted or Served Wholesale Customers: Water systems that currently, as of the date of the study, purchase water from Tacoma Water on a wholesale basis as well as those water systems which have entered into contractual agreements for future wholesale purchases.
- Potential Future Wholesale Customers: Water systems located adjacent to Tacoma Water's current service area which may also need additional supply in the future but, have not yet requested purchases from Tacoma Water.

To account for the uncertainty in the magnitude of additional supply requirements for existing and potential wholesale customers, high and low estimates were developed. For the purpose of combining the retail demand estimate with the results from the qualitative demand forecast, the high forecast was assumed to correspond to the high retail demand forecast and the low forecast was assumed to correspond to the expected retail demand forecast. Additionally, the wholesale demand forecast assumes that the entire supply shortfall associated with current and potential future wholesale customers may be met by Tacoma Water as wholesale purchases.

Large Customers (Primarily Industrial)

Large customers represent those water users with historical levels of consumption significantly greater than other customers. Future demand for Tacoma Water's existing or known large customers are based upon information provided by the customer. For planning purposes, additional growth in demand has been accommodated as a "reserve" for new large industrial customers.

Adjustments Made to Forecasts

Conservation

Conservation savings from quantifiable programs such as plumbing code changes, Tacoma Water's washer rebate programs and conservation savings by wholesale customers were estimated and incorporated into the demand forecasts. Taking such estimates into account, additional unspecified conservation savings were calculated to identify the additional savings required to reach a reduction in water use by ten percent over a ten-year period beginning January 1, 2000 as contained in a Memorandum of Agreement (MOA) with Ecology, DOH, Tacoma Water and its Second Supply Partners. (See Section 6.6.4 for additional information regarding the MOA.)

Climate Change Adjustment

To account for potential changes in water demands caused by climate change, a climate change adjustment was made. Average annual demand caused by climate change is expected to increase by four percent by 2040. The peak-season demand is expected to increase by eight percent by 2040. The high case demand scenario reflects the climate change adjustments.

Allowance for Unaccounted-for Water

The estimates for unaccounted-for water used in the demand forecast are based on data provided by Tacoma Water. The average amount of water attributed to unaccounted-for water was 10.6 percent between 1998 and 2002. This is comparable to industry standards.

Price Effect Adjustment

To account for the impact of the price of water on Tacoma Water's existing retail customers a price effect adjustment was calculated. The price effect adjustment quantifies customers' change in demand for water based on the change in the price of water. Generally, an increase in price results in a decrease in demand.

5.3.3 Future Demands

Expected Demand (Historical) Forecast

Table 5-8 contains ADD by customer class for the Expected Demand scenario and total system PDDs. The system ADD are expected to increase from 65.46 MGD in 2006 to 88.06 MGD in 2020 and to 94.28 in 2030. System PDDs are projected to increase from 90.54 MGD in 2006 to 124.21 MGD in 2020 and to 133.07 in 2030. Figure 5-3 displays ADDs for the Expected Demand scenario, with and without estimated conservation savings.

See Chapter 6 – Water Resources, for a comparison of demands to system production and available water rights.

Figure 5-3

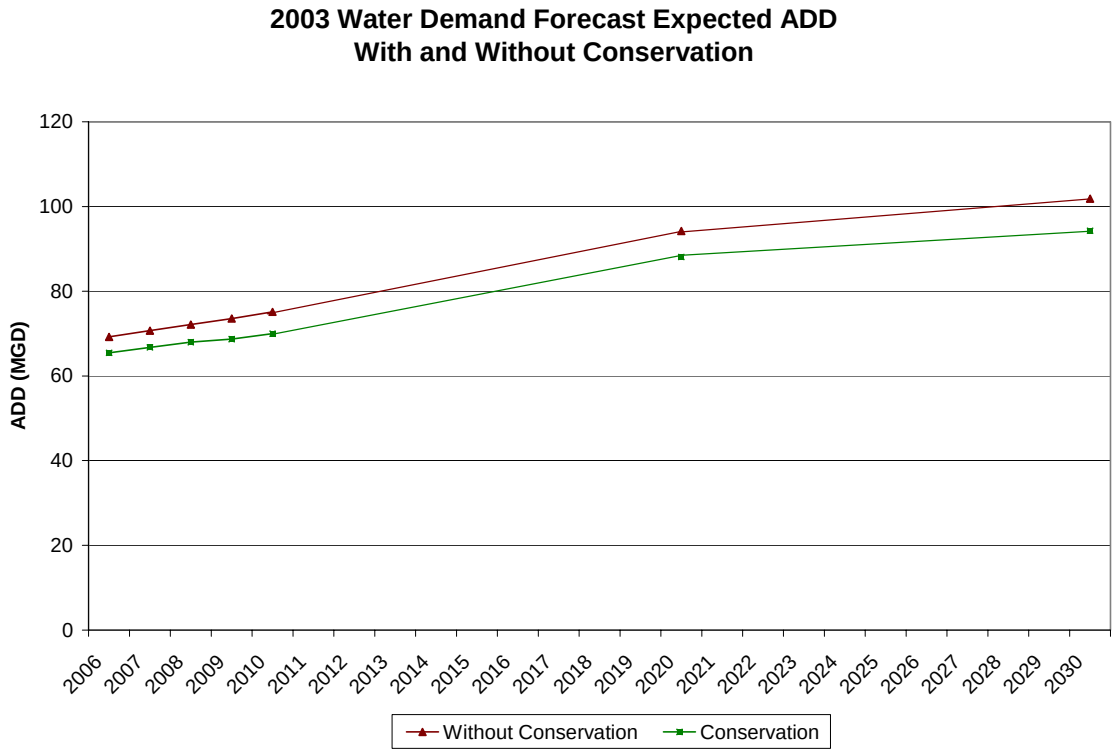


TABLE 5-8
Water Demand Forecast
Expected Demand Scenario (Historical Growth Rate Derived Forecast)

Water Requirements (MGD)	**2006**	**2007**	**2008**	**2009**	**2010**	**2020**
Single-Family Residential	22.73	23.09	23.54	23.91	24.41	28.34
Multi-Family Residential	7.8	7.91	8.06	8.19	8.33	9.64
Commercial/Industrial	8.74	8.84	8.9	8.99	9.12	9.91
Irrigation	1.35	1.37	1.38	1.41	1.43	1.59
Large Volume Commercial/Industrial	4.05	4.46	4.88	5.3	5.71	9.88
Simpson	15.6	15.6	15.6	15.6	15.6	15.6
Wholesale Customers	2.68	2.89	3.12	3.36	3.62	10.23
Losses/Unaccounted for Water	6.94	7.07	7.21	7.28	7.42	9.33
Conservation Savings	(4.43)	(4.51)	(4.71)	(5.33)	(5.64)	(7.37)
Average Day Demand	**65.46**	**66.73**	**67.98**	**68.7**	**69.99**	**88.06**
Peak Day Demand	**90.54**	**91.15**	**92.01**	**92.75**	**94.57**	**124.21**

Note:
1) Wholesale customers' demands include estimated conservation savings
2) Conservation savings include plumbing code savings, unspecified savings and a price effect adjustment
Source: Tacoma Water Demand Forecast study, Integrated Utilities Group, Inc and EES, December 2003

TABLE 5-9
Water Demand Forecast
High Demand Scenario (Puget Sound Regional Council Growth Derived Scenario)

Water Requirements (MGD)	**2006**	**2007**	**2008**	**2009**	**2010**	**2020**
Single-Family Residential	23.05	23.56	24.14	24.66	25.26	31.33
Multi-Family Residential	7.91	8.07	8.26	8.44	8.64	10.67
Commercial/Industrial	8.63	8.7	8.74	8.85	8.9	9.65
Irrigation	1.38	1.4	1.42	1.45	1.47	1.74
Large Volume Commercial/Industrial	4.05	4.46	4.88	5.3	5.71	9.88
Simpson	15.6	15.6	15.6	15.6	15.6	15.6
Wholesale Customers	2.68	2.89	3.12	3.36	3.62	10.23
Losses/Unaccounted for Water	6.98	7.13	7.27	7.43	7.58	9.69
Conservation Savings	(4.41)	(4.57)	(4.81)	(5.0)	(5.24)	(6.46)
Average Day Demand	**65.86**	**67.24**	**68.61**	**70.09**	**71.55**	**91.42**
Peak Day Demand	**91.65**	**93.6**	**95.04**	**96.25**	**98.74**	**129.45**

Note:
3) Wholesale customers' demands include estimated conservation savings
4) Conservation savings include plumbing code savings, unspecified savings and a price effect adjustment
Source: Tacoma Water Demand Forecast study, Integrated Utilities Group, Inc and EES, December 2003

High Demand (PSRC) Forecast

Table 5-9 contains average-day demands by customer class for the High Demand scenario and total system peak day demands. Under the High Demand scenario, the system ADDs are expected to increase from 65.86 MGD in 2005 to 91.42 MGD in 2020 and to 100.33 MGD in 2030. System PDDs are projected to increase from 91.65 MGD in 2006 to 129.45 MGD in 2020 and to 145.51 MGD in 2030.

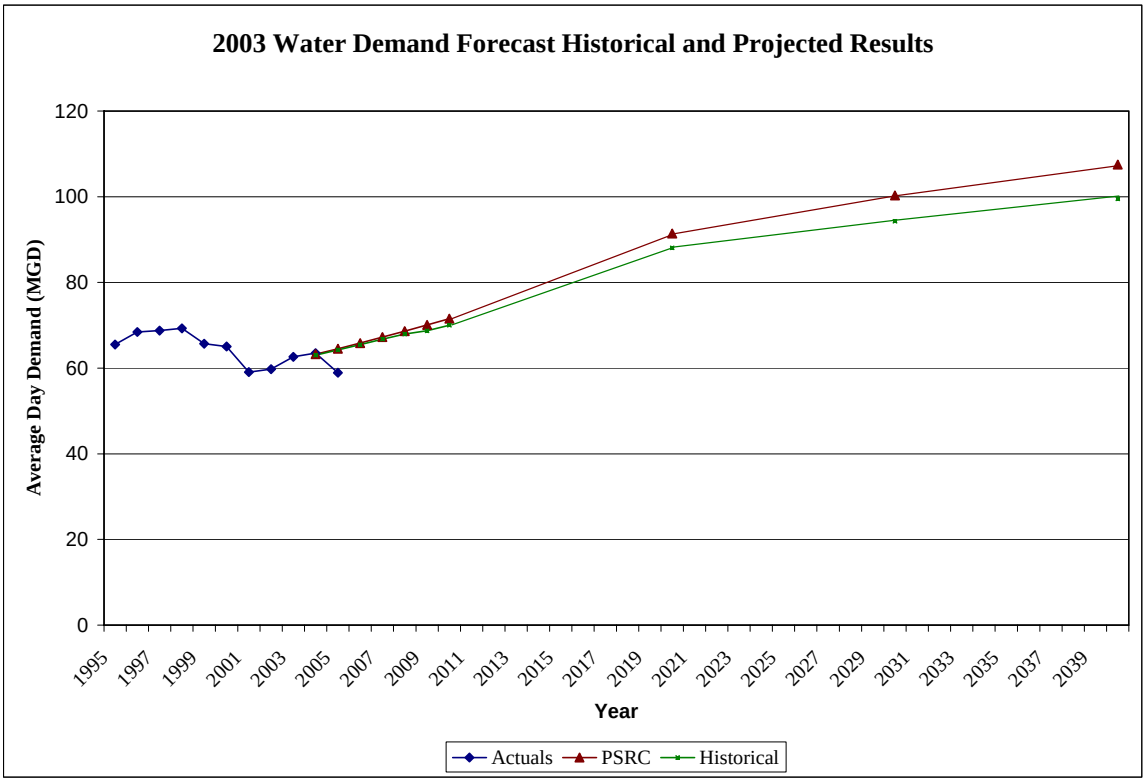
See Chapter 6 – Water Resources, for a comparison of demands to system production and available water rights.

5.4 2003 Water Demand Forecast to Actual Use

Figure 5-4 compares the 2003 Water Demand Forecast to actual use for the year 2005. As can be seen, 2005 actual ADD is less than that projected in either the Expected Demand (Historical) or the High Demand (PSRC) scenarios. The 2005 ADD value was low due to the implementation of a Stage One conservation message and subsequent wet weather. Tacoma Water will continue to monitor actual water consumption versus forecasted demands. Additionally, Tacoma Water is committed to updating its water demand forecast on a more frequent basis than is required under water system plan development requirements.

Figure 5-4

2003 Demand Forecast to Actual 2005 Average Day Demand



5.5 Water Use Data Collection

The water use data collection requirements for public water systems are established in the *Conservation Planning Requirements*, March 1994. This document establishes the minimum acceptable level of data collection for public water systems. The water use data collection requirements vary, depending upon system size, with at least five years of continuous water use data required. The water use data for Tacoma Water is presented in various tables through out the 2006 Update. The following identifies the water use data requirements for Tacoma Water and Tacoma Water's status of compliance in meeting the requirements, including the location of the information in the 2006 Update.

Based upon the information provided below, Tacoma Water is in compliance with the water use data collection requirements.

Source of Supply Metering

Requirement: Read meters daily. Record monthly and annual totals.

Compliance Status: Tacoma Water's supplies are a combination of ground and surface water sources. Each water source is metered, and instantaneous flow rates are displayed through the telemetry system. Meters also have totalizers, and daily production records are maintained for each source. Total annual production from each source is contained in Chapter 6 – Water Resources.

Peak Day / Peak Month

Requirement: Record each year's peak day and peak month totals.

Compliance Status: Tacoma Water maintains monthly and annual production and consumption reports. These reports record peak day and peak month data based on daily source production records and changes in internal system storage. The system's peak day and peak month information from the time period 2000 to 2005 is presented in Chapter 5 – Water Demands.

Non-Revenue Unaccounted-for Water

Requirement: Record annual totals.

Compliance Status: Non-revenue unaccounted-for water is determined from the annual supply, consumption and non-revenue accounted-for water data. Tacoma Water calculates non-revenue unaccounted-for water annually. The system's non-revenue unaccounted-for water for the time period 2000 to 2005 is presented in Chapter 5 – Water Demands.

Non-Revenue Accounted-for Water

Requirement: Record annual totals.

Compliance Status: Non-revenue accounted-for water is metered water that is used for construction projects, water main flushing and various other purposes. Tacoma Water calculates non-revenue accounted-for water annually. The system's non-revenue accounted-for water for the time period 2000 to 2005 is presented in Chapter 5 – Water Demands.

Customer Service Meters

Requirement: Record monthly totals for the following customer classes: single-family, multi-family, commercial/governmental/industrial and agricultural. Monthly totals may be estimated if water usage is billed less frequently.

Compliance Status: Tacoma Water customer use is reported in the Tacoma Water Financial Report prepared on a monthly basis.

Emergency Interties

Requirement: Record monthly totals of water exported through each intertie.

Compliance Status: Tacoma Water records monthly wholesale water consumption.

Wholesale Customers

Requirement: Record monthly totals provided to each wholesale customer.

Compliance Status: Tacoma Water wholesale customer use is reported in the Tacoma Water Financial Report prepared on a monthly basis. Meter reading is done by AMR (automatic meter read) for wholesale water customers.

Population Served

Requirement: Record annually the estimated number of customers and connections served in the residential classes and the number of connections served in each of the other classes.

Compliance Status: Tacoma Water records the total number of connections in each customer class and population estimates on an annual basis. Such information is presented in Chapter 5 – Water Demands.

Economic Data

Requirement: Record existing water rates for each customer class.

Compliance Status: The Tacoma Municipal Code contains water rates for each customer class. The current water rates are presented in Chapter 12 – Financial Evaluation / Program.

Conservation Data

Requirement: Record annually the type of measure, the level of implementation, the duration of the measure and the date at which the measure began.

Compliance Status: Tacoma Water reports conservation data annually in a Water Conservation Summary report.

CHAPTER 6

WATER RESOURCES

CHAPTER 6

WATER RESOURCES

6.1 Introduction

This chapter describes Tacoma Water's existing sources of supply by characterizing each source, including providing water right documentation, detailing the limitations on use of each source and providing annual source production data. This chapter also describes potential new sources of supply available to Tacoma Water, including how such new sources could be implemented over time to meet the system's projected demands as outlined in Chapter 5. Due to the role water savings resulting from conservation efforts plays in off-setting the need to develop new sources, the Tacoma Water – Water Conservation Program is included in the supply alternatives discussion.

6.2 Existing Supplies

The Green River, the North Fork Wellfield, the South Tacoma Wellfield, gravity wells and other local wells currently supply enough water to meet the Tacoma Water service area demand and Tacoma Water wholesale water commitments. Each source of supply is described below.

6.2.1 Green River Supply – First Diversion Water Right

Tacoma Water's First Diversion Green River water right claim consists of a senior water right claim of 73 million gallons per day (MGD) or 113 cubic feet per second (cfs). This water right is senior to State established Green River in-stream flow requirements. (Chapter 173-509 WAC – Instream Resources Protection Program – Green-Duwamish River Basin, Water Resource Inventory Area.) However, limitations of this diversion to protect instream flows were subsequently agreed to during negotiations with the Muckleshoot Indian Tribe (MIT) and in the development of the Tacoma Water Habitat Conservation Plan.

6.2.2 Green River Supply – Second Diversion Water Right

Tacoma Water has a Second Diversion Green River water right permit (SDWR) for up to 65 MGD, that was granted in 1986 and is subject to State established Green River in-stream flow requirements. This water right is also conditioned by the 1995 Muckleshoot Indian Tribe Agreement, Section 2.9, Future Diversions. In general, the instream flow requirements make this water unavailable during the drier parts of the year. With the development of municipal and industrial water supply storage at Eagle Gorge Reservoir, water available in the spring under the SDWR can be put into storage for use during the summer and fall. The SDWR provides the authority for the use of the Green River for the Second Supply Project.

6.2.3 North Fork Wellfield

The North Fork Wellfield, located approximately six miles upstream from the surface water diversion headworks and operations control building on the Green River, was developed in 1975 and consists of seven wells. (See Sections 6.4.2. and 7.2.4 for additional information.) The wells withdraw water at depths ranging from 65 to 118 feet from a highly permeable aquifer. Water balance studies on the river and aquifer system indicate that this aquifer has a firm sustained yield of at least 25 to 30 MGD during the wet season, with an instantaneous yield of 84 MGD. Because this flow is an alternative supply to the surface source, it does not provide an additional net yield to the Green River system. However, the North Fork Wellfield does provide water quality backup to the surface supply during turbidity events.

6.2.4 Service Area Wells

Service area wells consist of wells that augment the Green River supply. These include the South Tacoma Wellfield, the Gravity wells, Southeast Tacoma Wellfield, and several other wells located in the Tacoma Water service area. Taken together, 24 wells are currently used within Tacoma Water's service area. These "in-city" wells, together with the wells in adjacent outlying areas, supply approximately 15 percent of the total annual water requirements. The total groundwater capacity of the service area wells is approximately 60 MGD. (See Figure 7-2 for the location of the service area wells.)

6.2.5 Source Production Data Collection

Production data is collected from Tacoma Water's sources on a daily basis. The total annual production for each of Tacoma Water's sources for 2000 through 2005 is shown in Table 6-1.

TABLE 6-1
Annual Source Production (MG)

	2000	2001	2002	2003	2004	2005
Service Area Wells	1,498	766	2,475	4,224	2,506	1,526
Green River Supply	22,238	20,783	19,336	18,637	20,661	19,981
Total	**23,736**	**21,549**	**21,811**	**22,861**	**23,167**	**21,507**
Peak Day (MGD)	99.39	86.86	93.07	110.67	109.26	93.61

6.3 Inventory of Existing Water Rights

Tables 6-2 and 6-3 present an inventory of Tacoma Water's existing water rights on both the groundwater and surface water sources.

TABLE 6-2
Water Right Information – Groundwater Rights

		Water Right Record									
South Tacoma Wells (f)		Permit or Certification					Developed Capacity(g)				Current Sustained Withdrawal Rate
Well Number	Location of Withdrawal		GPM	MGD	AF/YR		GPM		MGD	AF/YR	MGD
1B	S. 63rd & Clement	C216D	3,075	4.4	603		3,075		4.4	1,631	4.0
		C783A			1,028						
2A	S. 35th & Windom	C217D	2,025	2.9	393		2,025		2.9	393	
		C784A			681						
2B	S. 35th & Windom	C1207A	3,600	5.2	2,122		3,600		5.2	959	2.0
3A	S. 73rd & Warner	C218D	3,820	5.5	749		3,850		5.5	1,817	4.1
		C783A			1,277						
4A	38th & S. Tacoma Way	C219D	1,572	2.3	322		1,572		2.3	535	0.8
		C784A			512						
5A	S. 56th & Flume	C220D	5,900	8.5	1,154		5,900		8.5	3,129	6.5
		C783A			1,975						
6B	42nd & S. Tacoma Way	C221D	3,210	4.6	629		4,200		6.1	1,694	6.1
		C784A			1,073						
		C1207A(o)	(3,600)	(5.2)	(2,122)						
		C783A			375						

TABLE 6-2 (Cont.)
Water Right Information – Groundwater Rights

		Water Right Record									
South Tacoma Wells (f)		**Permit or Certification**					**Developed Capacity(g)**				**Current Sustained Withdrawal Rate**
Well Number	**Location of Withdrawal**		**GPM**	**MGD**	**AF/YR**		**GPM**		**MGD**	**AF/YR**	**MGD**
7B	S. 74th & Cedar	C222DC	1,126	1.6	221		1,126		1.6	595	1.4
		C783A				375					
8B	S. 67th & Clement	C223D	4,337	6.2	853		4,337		6.2	2,297	4.2
		C783A			1,447						
9A	S. 36th & Lawrence	C1566A	5,500	7.9	3,730		5,500		7.9	1,894	4.5
10C	S. 74th & Alder	C2665AC	600	0.9	968		550		0.8	672	0.8
10B	S. 74th & Alder	C2665BC	600	0.9	952		600		0.9	267	
11A	43rd & S. Tacoma Way	C513A	6,000	8.7	3,100		9,500		13.7	5,100	8.3
			3,500	5.0	2,000						
12A	S. 36th & Pine	C2873A	6,000	8.6	4,242		5,000		7.2	3,605	4.3
13A	S. 74th & Alder	G2-27860C	750	1.1	890		750		1.1	890	1.1
14A	S. 74th & Tyler	G2-27861P	2,700	3.9	3,000	(b)					
Total - South Tacoma Wells			**54,201**	**78.1**	**31,296**		**51,555**		**74.3**	**25,478**	**48.1**

TABLE 6-2 (Cont.)
Water Right Information – Groundwater Rights

		Water Right Record									
University Place		Permit or Certification					Developed Capacity(g)				Current Sustained Withdrawal Rate
Well Number	Location of Withdrawal		GPM	MGD	AF/YR		GPM		MGD	AF/YR	MGD
UP-1	35th & Crestview	C715B	300	0.4	480	(h)	1,100		1.6	755	1.6
		C1053A	1,000	1.4	700	(b)					
UP-10	SE(4)SW(4) 16-20N-2E	C5858A	1,500	2.2	2,400	(b)	1,500		2.2	759(m)	1.0
4	37th & Orchard	590D	500	0.7	356		293		0.4	148(m)	
3	37th & Orchard	591D	300	0.4	214		169		0.2	85(m)	
8	35th & Bridgeport	2904A	750	1.1	528		534		0.8	270(m)	
					672	(b)					
9	27th & Glendale	4261A	1,200	1.7	1,920		620		0.9	314(m)	
11	37th & Orchard	G2-00097C	1,000	1.4	800	(b)	1,000	(m)	1.4	506(m)	
12	56th & 67th Ave SW	G2-00033C	1,400	2.0	143		1,400	(m)	2.0	708(m)	
					1,457	(b)					
Total - University Place			**7,950**	**11.3**	**3,641**		**6,616**		**9.5**	**3,545**	**2.6**

TABLE 6-2 (Cont.)
Water Right Information – Groundwater Rights

		Water Right Record								
Dash Point		Permit or Certification					Developed Capacity(g)			Current Sustained Withdrawal Rate
Well Number	Location of Withdrawal		GPM	MGD	AF/YR		GPM	MGD	AF/YR	MGD
Flowing #1	NW(4)SE(4) 15-21N-3E	C49D	25	0.0	33					
Flowing #3	NW(4)SE(4) 15-21N-3E	C50D	5	0.0	7					
Flowing #5	NW(4)SE(4) 15-21N-3E	C51D	100	0.1	115					
Flowing #6	NW(4)SE(4) 15-21N-3E	C52D	100	0.1	115					
DP#3	NW(4)SE(4) 15-21N-3E	Certificate of change, I-2-90	200	0.3	300	(i)				
	NW(4)SE(4) 15-21-3E	C5656A	250	0.4	313.6	(b)				
	NW(4)SE(4) 15-21-3E	Certificate of change, I-2-89					350	0.5	139	
DP#1	NW(4)SE(4) 15-21-3E	C5632A	250	0.4	313.6	(b)				
	NW(4)SE(4) 15-21-3E	Certificate of change, I-2-91					270	0.4	139	
DP#2	NW(4)SE(4) 15-21-3E	C159A	400	0.6	200					
	NW(4)SE(4) 15-21-3E	Certificate of change, I-2-92					350	0.5	139	
Total - Dash Point			**1,130**	**1.7**	**470**		**970**	**1.4**	**417**	**0**

TABLE 6-2 (Cont.)
Water Right Information – Groundwater Rights

		Water Right Record									
Southeast Tacoma		Permit or Certification					Developed Capacity(g)				Current Sustained Withdrawal Rate
Well Number	Location of Withdrawal		GPM	MGD	AF/YR		GPM		MGD	AF/YR	MGD
SE-2	1151 90th St. E	C131A	350	0.5	526		465		0.7	327	0.6
		C1036A	250	0.36	146						
SE-6	1151 90th St E.	C5686A	750	1.08	1210	(b)	700		1.0	442	0.6
		C5687A	50	0.07	80	(b)					
SE-7	1607 108th St S.	C6490A	800	1.15	466	(n,b)	600		0.9	186	
		C3374A	230	0.33	370	(b)	230		0.3	23	
SE-8	1614 99th St E.	C7085A	500	0.72	400	(b)	500		0.7	251	0.7
SE-10	3200 120th St E.	G2-20021C	1000	1.44	800	(b)	325		0.5	218	
SE-11	1119 103rd St E.	G2-26094C	1000	1.44	800	(b)	1,000		1.4	467	1.2
SE-11A	1119 103rd St E.	C130A	500	0.72	811		625		0.9	352	0.8
		C2872A	260	0.37	416						
Total - South East Tacoma Wells			**5,690**	**8.2**	**1,899**		**4,445**		**6.4**	**2,266**	**3.9**

TABLE 6-2 (Cont.)
Water Right Information – Groundwater Rights

		Water Right Record									
Other Wells		Permit or Certification					Developed Capacity(g)				Current Sustained Withdrawal Rate
Well Number	**Location of Withdrawal**		**GPM**	**MGD**	**AF/YR**		**GPM**		**MGD**	**AF/YR**	**MGD**
North Fork Well Field (k)	15 & 16 21N-8E	G1-00469C	58,300	84.0	30,244	(b)	50,000		72.0	22,746	72.0
Tideflats #1	E. 11th & Taylor Way	G2-27023C	1,050	1.5	740		750		1.1	358	1.0
					100	(b)					
		C215D	1,050	1.5	100						
Tideflats #2	2600 East West Road	G2-28279P	1,300	1.9	1400	(b)					
Gravity Wells #1 and #2	NE(4)E(4) 8-19-4E	C7318A	6,400	9.2	5,120	(b)	6,200		8.9	3,380	7.5
Fred 1	4417 192nd St E	G2-28977P	1,000	1.4	1,075	(b,l)					
Portland Avenue	SE(4)NW(4) 15-20-3E	G2-23895C	1,200	1.7	1,130	(j)	1,200		1.7	1126	1.7
Total – Other Wells*			**11,000**	**15.9**	**1,970**		**8,150**		**11.7**	**4,864**	**10.2**

*Excluding North Fork

TABLE 6-3
Water Right Information – Surface Water Rights

	Water Right Record								
Source	**Claim, Permit or Certification**					**Developed Capacity(g)**			
Location of Withdrawal		**CFS**	**GPM**	**MGD**	**AF/YR**	**CFS**	**GPM**	**MGD**	**AF/YR**
Green River	WRC 2298	113	50,700	73	81,800	113	50,700	73	80,053
Prairie Ridge Springs	C10616	1.26	565	0.8	450 (b)	1.2	530	0.8	195
Green River	Permit S1-00726P	100	44,880	65	72,397 (c)				
Total		**214.26**	**96,145**	**138.8**	**154,197**				
Total (e)		**214.26**	**96,145**	**138.5**	**124,800**	**114.2**	**51,260**	**73.8**	**80,248**

Footnotes:

(a) Although the claim was recorded for 400 cfs (258 MGD), maximum pipeline capacity is 113 cfs (73 MGD). Tacoma capped the claim at 113 cfs per HCM-1, 01, 2001 Habitat Conservation Plan.

(b) Supplemental water right. Annual quantity not additive to primary rights.

(c) Annual quantity is based on diversion of 100 cfs, 365 days/year. Instream flow constraints as described on the permit will limit the annual average diversion to approximately 70 percent of the amount listed. Additional constraints in tribal agreements reduce the yield to approximately 60 percent. The water available from this source would therefore be about 43,000 acre feet in an average year.

(d) Application status only. Not included in totals.

(e) Limits the 400 cfs water right claim at 113 cfs and assumes that the 100 cfs permit provides an annual yield averaging 43,000 AF/YR.

(f) Two certificates issued for each of wells 1B through 8B. In each instance the second certificate was only for additional annual use (AF/YR).

(g) Maximum historic instantaneous flow rate and annual production which has occurred under the water right or declamation of claim. Instantaneous flow rate is obtained within one hour of well startup; production flow rate is generally lower. In cases where instantaneous flow rate data is not available, rated pump capacity is indicated.

(h) Maximum of 755 AF/YR under both rights.

(i) Certificate of change issued to add fifth well and allow pumping from all five wells in amount of 200 gpm and 300 AF/YR. This is not consistent with total of four flowing well certificates.

(j) Total annual use under all rights shall not exceed 111,000 AF or 0.5 AF/capita, whichever is greater.

(k) The North Fork water right is only to be used in place of Green River surface water diversions, so it does not add to the total rate or quantity of water rights.

(l) Fred 1 is supplemental to Gravity Wells (C7318A) for instantaneous rate and for annual quantity.

(m) Estimated, pending review of historical records.

(n) Seasonal, April-October 15.

(o) Well 6B is an additional point of withdrawal on C1207A.

6.4 Limitations on the Use of Existing Supplies

This section highlights the unique characteristics of each of Tacoma Water's existing sources of supply, including constraints on use and interdependencies and includes a brief discussion of potential impacts facing Tacoma Water resulting from climate change.

6.4.1 Green River, First Diversion Water Right

Tacoma has a claimed right to 73 MGD or natural inflow, whichever is less, from the Green River. The right is considered a claim rather than a certificated right because it predates the establishment of state water right law. Natural river flows are determined by measuring the flow into Eagle Gorge Reservoir and adjusting the flow upward by about two percent to account for additional inflow between the Reservoir and the Tacoma Water diversion dam. If this number falls below 73 MGD (equivalent to 113 cfs) the diversion must be reduced. Approximately once in every five years relatively small reductions in the amount of FDWR water diverted in late summer or fall due to natural river flows dropping below 113 cfs occurs. Summer and fall natural flows are supplemented by water supplies stored by Howard Hanson Dam. Tacoma Water has not had rights to divert any of this stored water, however. While, theoretically, the claimed right allows Tacoma Water to divert all the river flow during periods when river flow is less than 113 cfs, in practice the diversion has been reduced to help support river flows when needed. For example, the diversion has been reduced to as low as 25 MGD during the rare situation when

Howard Hanson Dam has been depleted of its stored water. More commonly, Tacoma Water has voluntarily curtailed the use of the FDWR in the fall in order to leave additional water in the river for fish. This voluntary curtailment due to fish needs has reduced Pipeline No. 1 flows to as low as 36 MGD for over a month time period.

As a result of the Second Supply Project beginning operation, the voluntary program of supporting stream flows has been replaced with a more formal approach as called out in the Muckleshoot Indian Tribe Agreement of 1995. The MIT Agreement requires Tacoma Water to guarantee minimum river flows at the Auburn gage thus requiring that Tacoma Water either reduce use of the FDWR or use water stored at Howard Hanson Dam, once the Howard Hanson Dam Additional Storage Project is completed, for streamflow support. Modeling efforts thus far indicate that the FDWR may be reduced by approximately half for a one month period in order to meet this guarantee in dry years, with more severe reductions in the worst case years.

6.4.2 North Fork Wellfield

The North Fork Wells are located in the Green River Watershed and have a certificated water right for 84 MGD. The wells can only be used in place of river water at times the river is turbid (other than during special cases such as during construction of the river intake works). Although highly productive, the wells are located over a relatively small aquifer and, therefore, productivity is directly dependent on recent precipitation amounts. Since the precipitation dependent wells are used as a replacement source while the river is turbid, and the river gets turbid because of high rainfall, this is generally not a problem, other than in the fall. The earliest storms in the fall are likely to cause river turbidity, but since they occur at the start of the wet season, the wells are not recharged and cannot be used at full capacity. On average, wellfield capacity is 24 MGD prior to November 1; 36 MGD between November 1 and November 20; 48 MGD from November 20 to December 1, and 60 to 72 MGD after December 1. In the spring as rainfall decreases, capacities ramp back down, although at a slower rate. In February, capacity is 60 to 72 MGD, in March it is about 48 MGD, in April, about 36 MGD, and 24 MGD thereafter. The wells are normally not used in the summer, but if they were, capacity would probably be 12 to 24 MGD. These numbers are all averages, and individual years can vary significantly from the averages, particularly in the fall. North Fork capacity has been as low as 24 MGD in early December, and as high as 60 MGD in early November. Capacities are based on a one-week run, which is typical for a turbidity event.

6.4.3 Green River, Second Diversion Water Right

The SDWR is the water right associated with the Second Supply Project. It provides up to 65 MGD, of which Tacoma's share is 15/36; equaling 27 MGD. The remainder is shared between the Project Partners: the Lakehaven Utility District, the City of Kent, and the Covington Water District. The water right is limited by minimum river flow levels established by the State of Washington, and by minimum and guaranteed river flow levels set by the MIT Agreement. The limitations are such that SDWR water will generally not be available during summer and early fall except during wet years. One significant benefit of the SDWR is that it allows water to be stored in the spring for summer use. In this case, the diversion of the spring-time water occurs under the flow limitations in effect at the time of storage. Once diverted into storage, use of the stored water is no longer subject to river flow limitations.

6.4.4 Howard Hanson Dam Additional Storage

Under the Howard Hanson Dam Additional Storage Project, Tacoma and its Second Supply Project Partners will have the ability to store up to 20,000 acre-feet (AF) of water behind Howard Hanson Dam during the spring. Tacoma Water's share of the stored water is 15/36, or up to 8,333 AF, which equates to 30 MGD if used at a uniform rate over a 90-day period.

If water is diverted to storage during the spring, it will not be available for consumption during the spring. Each year Tacoma Water, the Lakehaven Utility District, the City of Kent and the Covington Water District will each need to decide if they want to divert water to storage during the spring and meet spring demands using other sources of water, or consume Second Supply Project water during the spring and rely more heavily on other sources during the summer. In either case, the Additional Storage Project does provide flexibility in how sources are used and allows for the movement of less valuable spring-time water into the summer where it is more valuable given increased summer demand.

Water stored may also be used if needed to support Tacoma Water's MIT flow commitments in the late summer and early fall. Particularly in the early years of the project when excess storage is available, this will provide flexibility to cover any shortfalls which otherwise would need to be made up by reducing use of the FDWR or by running numerous wells in South Tacoma or elsewhere in-town.

Water can be stored behind Howard Hanson Dam until as late as December 7 or until storage is released in anticipation of heavy fall storms, whichever comes first. Storage may begin to be accumulated as early as February 15, depending on spring snowpack and weather conditions.

The stored water can be used as needed by Tacoma Water and its Second Supply Project Partners. Since the water, once stored, is no longer subject to water right and instream flow restrictions, it can be used at any rate needed, consistent with the capacity of the transmission system. The total capacity of Pipeline No.1 and the Second Supply Project Pipeline (also known as Pipeline No. 5) together is 165 MGD. Of this capacity, Tacoma Water has usage rights to 72 MGD in Pipeline No. 1, and 15/36 of the 93 MGD capacity of the Second Supply Project Pipeline, for a total of 111 MGD.

6.4.5 South Tacoma Wellfield

The South Tacoma Wellfield is the primary groundwater source in the city. The wellfield draws water from three aquifers; approximately 60 percent from the Shallow, 40 percent from the Sea-level, and a small percentage from the Deep Aquifer. The wells have water rights totaling 78 MGD, with nominal installed capacity of 66 MGD, and an approximate sustained rate of 45 MGD, an estimate based on a month's run time. For planning purposes, the wellfield's capacity for the 4-day peak is considered to be 49 MGD. The South Tacoma wells are typically used for peaking during the summer, so they are rarely all run simultaneously. If run for long periods in the summer, peaking capacity would be reduced. Annual capacity of the wellfield is estimated at 20,000AF, which equates to 72 MGD over 90 days (which is far above current installed capacity), or 54 MGD over 120 days, or 36 MGD over 180 days. The maximum historic annual usage of the wells was 20,700AF, which occurred in 1961. Prior to construction of the North Fork Wellfield in 1977, the South Tacoma wells were used to provide water during Green River turbidity events. The 1961 pumping occurred throughout the year.

Typical South Tacoma Wellfield usage has been in the range of about 12,000AF/yr, with usage below that point for much of the past decade. Although the wellfield has been pumped at over 20,000AF in the past, the maximum rate that can be sustained year after year is currently unknown. Particularly with the Shallow Aquifer, heavy and sustained usage may draw pollution plumes from several points toward the wells. Further study would be required prior to assuming full annual capacity use of the wells on an annual basis. Because water resulting from the Howard Hanson Dam Additional Storage Project will be available at the time of year that the South Tacoma Wellfield otherwise sees increasing demands, a large increase in wellfield usage in the immediate future is not anticipated to be required at this time.

6.4.6 Other Wellfields

Tacoma Water has several smaller wellfields, including the Southeast Tacoma wells, Gravity Pipeline wells, University Place wells, Tideflats wells, Prairie Ridge Springs, and Portland Avenue well. Taken together, these wells have water rights totaling 23 MGD, although many of these rights are 'supplemental', meaning that the quantity of water provided by the right is not additive to other rights. Installed capacity is 18 MGD, which includes approximately four MGD from wells designated as emergency sources. For planning purposes, a total sustained capacity of 12 MGD from these smaller wellfields, not including emergency sources, is assumed.

6.4.7 Additional Water Rights

Depending on the particular water right, undeveloped water rights held by Tacoma Water may include an additional instantaneous rate, additional annual quantity, or both. For example, the South Tacoma wells have a developed capacity of approximately 66 MGD, but have water rights for up to 78 MGD instantaneous flow. As a result of the acquisition of the University Place Water Company in the late 1970s, about seven MGD of unused rights in University Place may be available for development. Finally, at the Southeast Tacoma wells, approximately three MGD of water rights are presently not used. At this time, approximately half of the additional three MGD of water rights at the Southeast Tacoma wells are currently undergoing development.

6.4.8 Climate Change

The main implication for Tacoma Water of temperature increases predicted as a result of climate change will be seen in the rising snowline and reduced snowpack. This, in turn, will change the runoff hydrograph of the Green River Watershed. Snowpack functions as a means of storing winter precipitation and of gradually releasing it in the spring. Given its low elevation, the Green River Watershed is particularly susceptible to reduced snowpack because of warmer winters A warming climate would mean higher winter flows in the Green River (more rain, less snow) and less carryover flow from the wet to the dry season. Consequently, for the Green River, low flow problems in the fall can be expected to be more frequent and more severe because natural base flows will be smaller going into the start of the dry season.

Tacoma Water's operations have several advantages that will help the system to adapt to warming temperatures. At present the only storage at the Green River Watershed is in the form of natural snowpack. However, the Howard Hanson Dam Additional Storage Project will, for the first time, allow for the storage of Green River water for municipal supply purposes. The Additional Storage Project also will allow for the storage of water for use in supporting instream resources. The addition of this man-made storage will help to partially offset the loss of natural snowpack. Additionally, the Second Supply Project greatly improves the operational flexibility for Tacoma Water and its Project Partners. Second Supply Project features such as regional interties and the capability of pursuing aquifer recharge projects as is occurring with the Lakehaven Utility District's OASIS project can help Tacoma Water, our Second Supply Project Partners and others in the region adapt to climate changes. Tacoma Water is also fortunate to have a substantial source of groundwater available to it. The atmospheric models predict that, along with increasing temperatures, annual precipitation will also increase. This works in favor of groundwater since yield is, in part, dependent on annual precipitation amounts.

The Tacoma Water system operates such that the natural variation in weather is a factor that is dealt with every year. It is thought that this experience will be helpful in itself as Tacoma Water deals with evolving changes in climate. The Tacoma Water system is designed with the redundancy and flexibility that is needed to cope with years where snowpack may be low or where the fall may be unusually dry or where high winter flows may cause extended periods of

turbidity. Tacoma Water recognizes that as the climate changes, operations will need to change to adapt to it.

To account for potential changes in water demands caused by climate change, a "climate change adjustment" was incorporated into the 2003 Water Demand Forecast. The High Growth Demand scenario reflects the following climate change adjustment:

- Average annual demand caused by climate change is expected to increase by four percent by 2040.
- The peak-season demand is expected to increase by eight percent by 2040.

The Expected Growth Demand scenario was not adjusted for climate change impacts.

6.5 Tacoma Water Supply Status

With the October 20, 2005 start up of the Second Supply Project Pipeline, Tacoma Water relies on four basic sources of supply. These include the FDWR from the Green River, the SDWR from the Green River, the North Fork well system and the system of 25 groundwater sources located in and near the City of Tacoma. As is described earlier in this chapter, each of Tacoma Water's four basic sources of supply have unique constraints and conditions associated with their use. Given the complexity of the supply system, Tacoma Water utilizes a resource model in order to determine the most efficient means of meeting demands.

In the 1990s, the resource model was first used to model Green River flow data to determine how much water was available from the Green River. The model evolved over several years and was used to negotiate Tacoma Water's 1995 agreement with the MIT. The resource model has since been used to evaluate the availability of water to meet future demands, including wholesale demands associated with the Cascade Water Alliance. The most recent version of this resource model, titled Water Availability Study, is described below.

6.5.1 Water Availability Study, July 2007, CH2MHILL

The resource model takes into account the unique constraints associated with the four Tacoma Water sources of supply. To that end, the following general assumptions in regards to how future demands will be met have gone into model development:

- Demands are supplied by Tacoma Water's FDWR and SDWR Green River water rights, the Howard Hanson Dam Additional Storage Project and Tacoma Water's North Fork and South Tacoma Wellfield groundwater supplies.
- Use of the SDWR is restricted to Tacoma Water's proportional share as established in the Second Supply Project Agreement.
- When turbidity in the Green River exceeds a predetermined value, second diversion use is restricted and demands are met using North Fork groundwater. Turbid water is either stored in the dam if municipal storage is available or released downstream.
- The North Fork Wellfield has unique constraints due to the supplemental nature of the FDWR and aquifer limitations.
- South Tacoma Wellfield and other in-town wells provide 57 MGD.

The water demands incorporated into the July 2007 Water Availability Study include the 2003 Water Demand Forecast Expected Growth Demand scenario and High Growth Demand scenario demands as presented in Chapter 5 – Water Demands. Additionally, the Water Availability Study also takes into account water demands associated with the Cascade Water Alliance and includes additional average day wholesale demands of 1.67 MGD, across all years, not contained in the

2003 Demand Forecast. Such wholesale demands were contracted for after the 2003 demand forecast was prepared.

The July 2007 Water Availability Study evaluates the amount of water available in years 2020, 2025 and 2030 given projected water demands and model water supply constraint assumptions described above. The Water Availability Study concludes that year 2025 will be the most difficult time period to meet demands. By 2030, the Cascade Water Alliance term-limited supply will drop from 6 MGD to 1 MGD, making year 2030 demands less than year 2025. For the Expected Growth Demand scenario, all demands will be met through 2030. In 2025 and 2030 there is an additional 2.2 MGD and 4.1 MGD available supply, respectively. For the High Growth Demand scenario, the years 2025 and 2030 experience shortfalls, with the 2025 shortfall expected to be 2.5 MGD.

6.6 Supply Alternatives

6.6.1 2000 Water System Plan Recommendations

The 2000 Water System Plan presents three service scenarios, including the mix of existing and new water resources or conveyance systems that would be required to implement each scenario. These service scenarios include: a Local Reliance scenario, a Full Regionalization scenario and a Full Regionalization (Phased) scenario. The Full Regionalization (Phased) scenario was chosen for implementation. A brief discussion of each required new water resource or conveyance system included in the Full Regionalization (Phased) scenario and the current status of each follow.

Second Supply Pipeline, Second Diversion, Phase I: The 2000 Plan anticipated the construction of a pipeline to transport the second Green River water right to Tacoma Water. The pipeline was also anticipated to form the basis for an intertie with the City of Seattle (Seattle Public Utilities). The Second Supply Project Pipeline began full operation on October 20, 2005, delivering water to Tacoma Water and its Project Partners (The City of Kent, the Lakehaven Utility District and the Covington Water District).

Second Supply Pipeline, Second Diversion, Phase II: The 2000 Plan anticipated the construction of a Tacoma-Seattle Intertie by the year 2010. This project is no longer required since Seattle Public Utilities ultimately did not become a participant in the Second Supply Project.

Howard Hanson Dam, Additional Storage, Phase I. Under Phase I of the Howard Hanson Dam Additional Storage Project, Tacoma Water's SDWR water will be stored between February 15 and June 30 (approximately 20,000 acre-feet) for municipal use during the summer by Tacoma Water and its Second Supply Partners. Phase I is anticipated to be in operation in 2007.

Howard Hanson Dam, Additional Storage, Phase II. Under Phase II of the Howard Hanson Dam Additional Storage Project, the conservation pool behind Howard Hanson Dam will be expanded to provide additional storage of existing spring runoff of up to 12,050 MG of water (37,000 acre-feet). The implementation of Phase II is dependent on the evaluation of Phase I success and consensus of the resource agencies, the MIT, Tacoma Water and the USACE.

Tideflats Groundwater. The Plan anticipated the development of two new wells of approximately 2.5 MGD each at the tideflats at an undefined time in the future. The development of new wells within the Tideflats area is planned to occur prior to 2020.

Chambers Creek Properties Groundwater. The 2000 Plan listed Pierce County's Chambers Creek Properties water rights as a potential new groundwater source at an undefined period in the future. Pierce County has successfully transferred approximately 2.5 MGD of formerly industrial water rights to municipal water rights and intends to make the water rights available to retail water

purveyors. A July 2006 development schedule was included in the Report of Examination for the transfer.

South Tacoma Groundwater. The 2000 Plan anticipated the development of new wells at the South Tacoma Wellfield totaling 29 MGD during the time period 1999-2006. This was a necessary part of an agreement between Tacoma and Seattle regarding use of Second Diversion water. With Seattle no longer a partner in the project, rapid development of the South Tacoma capacity was no longer required and did not, therefore proceed as anticipated. The development of additional South Tacoma wells is planned to begin in 2007.

Industrial Conservation and Reuse. The 2000 Plan anticipated conservation and/or reuse savings at two industrial facilities (Simpson Pulp and Paper Mill and the West Tacoma Mill) at an undefined time in the future. The West Tacoma Mill has since closed. Average day water use at Simpson was 20 MG in 1995. By 2005, average day water use has been reduced by 5.1 MG at Simpson, to 14.9 MG. See Chapter 5 – Water Demands for additional information regarding water use at Simpson.

Demand-Side Management (Conservation). The 2000 Plan anticipated the implementation of a conservation program. Activities in this regard have included industrial audits, a clothes washer rebate program, an on-going public information program and participation in regional public awareness radio campaigns, among other water conservation activities. Please see Section 6.6.5 for additional details.

6.6.3 Water Reuse

The Municipal Water Law amended RCW 90.46 to require public water systems serving 1,000 or more connections to evaluate opportunities for reclaimed water when completing water system plans. With three wastewater treatment plants located in the Tacoma Water service area, Tacoma Water, in 1994, recognized water reuse as a supply alternative that merited consideration. At that time, Tacoma Water undertook a water reuse feasibility study.

The water reuse feasibility study considers two categories of uses for reclaimed water: landscape irrigation and industrial processes. Potential irrigation sites (parks, schools and golf courses) are identified in the vicinity of each wastewater treatment plant. Ten industries, representing five industrial segments, are identified as potential candidates for reclaimed water use. The study concludes that alternatives using reclaimed water for industrial processes appeared to be more attractive than those alternatives using reclaimed water for landscape irrigation, primarily because of the cost to install distribution facilities for a seasonal demand. Additional study is recommended to further define the feasibility of industrial reuse in the Tacoma area.

In 1997, an industrial conservation and water reuse assessment for the Simpson Mill and for the Stone Consolidated paper mill (later known as Abitibi) studied the potential for reducing water consumption in each facility. Since that time, the Stone/Abitibi paper mill has closed.

In June 2000, the Pierce County Sewer Utility prepared a *Wastewater Reclamation & Reuse Report, Pierce County Wastewater Utility Unified Sewer Plan*. This report, included as Appendix B to the *Pierce County Unified Sewer Plan, 2001*, describes existing studies and provides rationale for postponing a more detailed reuse analysis until after the Unified Sewer Plan has been adopted and several prerequisite studies have been completed. The uses of reclaimed water as identified in the Tacoma Water 1994 Water Reuse Feasibility Study and 1997 Industrial Conservation and Water Reuse Assessments are described as potential uses of reclaimed water as produced at the Pierce County Chambers Creek Regional Wastewater Treatment Plant. The current use of reclaimed water for existing treatment plant process water is described. Additionally, the reclaimed water uses identified in the *Chambers Creek Properties Master Site Plan, 1997*, to occur at the County-owned Chambers Creek Properties, are identified.

The Wastewater Reclamation & Reuse Report concludes:

Until the instream flow requirements have been established for streams in the Chambers Creek – Clover Creek Drainage Basin and the ESHB 2514 Technical Assessment has been completed, a detailed assessment of water reuse is impractical. However, when the volume of wastewater has been identified and water supply analyses are complete, Pierce County Wastewater Utility expects to collaborate with adjoining and nearby water purveyors to investigate reuse potential at the Chambers Creek Regional WWTP.

The *Chambers Creek Properties Master Site Plan Update, December 2005*, defines a framework for continued uses and development of the County-owned Chambers Creek Properties. The Chambers Creek Regional WWTP is located on a portion of the Chambers Creek Properties. In regards to on-site uses and operations related to water reclamation, the Master Site Plan Update states the following:

In the long-term, a portion of the wastewater treated on the site will be reclaimed and reused for irrigation, wetland and aquatic habitat, groundwater recharge, industrial, municipal and commercial uses. Irrigation facilities using reclaimed water will be integrated throughout the Chambers Creek Properties. Design of these facilities will include signage and/or barriers as necessary to allow safe public access in accordance with local, state and federal health standards.

At this time, Pierce County is pursuing the necessary permits and treatment plant improvements to allow for the use of reclaimed water as a source of irrigation water for the golf course currently being developed at Chambers Creek Properties.

King County's Wastewater Treatment Division has the potential, through its regional collection and treatment facilities, to provide reclaimed water either centrally treated or treated with satellite facilities at the treatment plants along major effluent conveyance lines and at certain pump stations. It is King County's intention to work with water utilities in the region in the next several years to widen the distribution of reclaimed water to potential irrigation and industrial customers. Work in this regard started in 2005 with the establishment, by the King County Executive, of a group of interested stakeholders formed to explore what might be included in updated King County coordinated water system plans. Tacoma Water was represented on this "Scoping Committee".

Currently, the Lakehaven Utility District is preparing an Environmental Impact Statement for its proposed Reclaimed Water System Project. The EIS will focus on alternatives for the siting and construction of a reclaimed water system to include treatment plant upgrades, a conveyance system and reclaimed water infiltration. The District's proposed OASIS (Optimization of Aquifer Storage for Increased Supply) project is an aquifer storage and recovery project to use excess water usually available during the wet weather months and store it underground for later high demand summer use. To implement the OASIS project, the District is proposing to design and construct a reclaimed water system to achieve the following objectives:

- Provide a mitigation strategy for the OASIS project, which is an innovative ASR system that has the potential to store significant volumes of water available to the District from the Tacoma Second Supply Project Pipeline;
- Plan for the future eventuality of eliminating marine discharge of wastewater to Puget Sound; and,
- Realize the benefits of managing reclaimed water in the District's watersheds.

At this time no reclaimed water is available as a potential source of water to off-set the use of existing Tacoma Water sources. Tacoma Water will continue to monitor reclaimed water projects

and/or reclaimed water planning activities of local wastewater facilities, such as those described above, and will participate in planning activities as they may occur in the future.

Please see Appendix B *Attachment 9: Water Reclamation Checklist for Systems with 1,000 or more Connections* for additional information.

6.6.4 Conservation

As the Puget Sound region explores ways to more efficiently use existing water resources to meet existing and growing water demands, conservation has become a standard element in every utility's repertoire of water management techniques. Water conservation plans are developed to provide a systematic and coordinated approach to conservation that will ensure the wise use of available water resources. Tacoma Water's Conservation Plan can be found in Appendix N.

Conservation Requirements

In the 1980s, a growing awareness of the limited resources in the state led the Washington State legislature to pass the Water Use Efficiency Act (Chapter 40.70.230 RCW), which directed the Department of Health (DOH) to develop procedures and guidelines relating to water use efficiency. In addition, per RCW 90.54.180: "*increased water use efficiency should receive consideration as a potential source of water in state and local water resource planning processes."*

In 1994, the Washington Water Utilities Council (WUCC), DOH and the Washington State Department of Ecology (Ecology) co-authored a document entitled *Conservation Planning Requirements, Guidelines and Requirements for Public Water Systems Regarding Water Use Reporting, Demand Forecasting Methodology and Conservation Programs* (Conservation Planning Requirements). The Conservation Planning Requirements document outlines the basic requirements of conservation plans that must be included as an integral component of a utility's water system plan.

The *Pierce County Coordinated Water System Plan, 2001* (CWSP) recognizes the Conservation Planning Requirements and, therefore, requires public water systems to include a water conservation plan consistent with the Conservation Planning Requirements.

While the majority of Tacoma Water's service areas are located in Pierce County, a portion of the northern service area is within King County. The *1989 South King County Coordinated Water System Plan* (CWSP) acknowledges that conservation is a management tool to be used in conjunction with the development of future water resources. The conservation goal in the South King County CWSP is to initiate implementation of a conservation program by 1995, achieve a 6.5 percent reduction by 1995 and achieve an eight percent reduction in water usage by the year 2000. Conservation savings are to be measured with 1990 per capita consumption as the base water use. Water use by Tacoma Water customers has consistency declined since 1990. Please see Section 5.2.2 for historical trends in water use information, including Tacoma Water's residential per capita water use trends.

In 2001, Tacoma Water and its Second Supply Partners entered into a Memorandum of Agreement (MOA) with Ecology and DOH which requires a reduction in water use by ten percent over a ten-year period beginning January 1, 2000.

In 2003, the state legislature passed the Municipal Water Supply Efficiency Requirements Act. One of the main requirements of the Act is for DOH to adopt a water use efficiency rule. Currently, DOH is completing a proposed draft rule for public hearings, with an adoption date of September, 2006. The proposed draft rule covers the following three elements: water use efficiency planning requirements; a state distribution system leakage standard, and; water use efficiency goal-setting and performance reporting.

Attachment 4: Current Conservation Planning Requirements for Water System Plans (WSPs), contained in Appendix B, provides a summary of Tacoma Water's response to current water conservation requirements.

Conservation Goals and Objectives

The goal of Tacoma Water's conservation program is to protect and preserve present and future water resources and to maintain or reduce present per capita water usage levels in all customer classes. Specifically, Tacoma Water's conservation goal is to reduce per capita water use by ten percent over the ten year time period 2000 to 2010. Following are several objectives that Tacoma Water has formulated to accomplish this:

- To develop a conservation program that meets or exceeds state requirements for public water systems;
- To develop a conservation program that ensures the efficient use of water;
- To coordinate and integrate water conservation programs with other Tacoma Water and Public Utilities programs;
- To research water reuse opportunities for irrigation and/or industrial processing for future implementation;
- To achieve a consistent reduction in the peak 4-day demand.

Past Program Activities

Since the 1980s, Tacoma Water has been committed to an effective conservation plan as an element of their overall water resource plan. The focus has been on developing long-term sustained conservation activities in a balanced program with both effective supply management and demand management measures. The conservation measures have been designed to increase customer awareness of conservation issues, provide incentives for reduced consumption, and reduce water losses within the system.

The main accomplishments during 2000 through 2005 are summarized below. Additional detail regarding past conservation accomplishments beginning in the1980s, including estimated savings, is contained in Appendix H.

Public Outreach. Numerous measures have been implemented by Tacoma Water staff to achieve a high degree of continual public outreach. Utility bill inserts with various topics relating to water conservation have been consistently used to reach customers. Advertisements in newspapers, magazines, radio, movie screen ads, bus ads, *CityLine* presentations, and TV 12 *CityScape* Public Service Announcements are additional ways Tacoma has spread the water conservation message. Tacoma Water has collaborated with the Water Conservation Coalition of Puget Sound to promote various regional messages. Currently, Tacoma Water staff chairs the Technical Advisory Group of the Partnership for Water Conservation, another regional effort. Tacoma Water also participated with other utilities in regional campaigns such as the *NW Natural Yard Day*s program.

Tacoma Water continues to maintain relationships with educational organizations such as the Washington State University Cooperative Extension, Metropolitan Parks Nature Center and the Washington Organics Recycling Council. These organizations provide water conservation related presentations to landscape professionals and to the public in our region and elsewhere.

Information and product offerings remained available to Tacoma Water customers via the conservation page, which is an element of the Tacoma Public Utilities website.

Tacoma Water participated in the first annual Tacoma Flower & Garden Show held at Point Defiance Park as well as other numerous neighborhood events.

Youth Education. Tacoma Water budgeted funding to coordinate with the Tacoma Public Utilities Community Media Services staff to develop and implement conservation education and related programs that reach Tacoma youth. Tacoma Water also teamed with local sport teams to reach a younger audience. Tacoma Water also served as a lead partner in the Tacoma Rainiers Kids Club with the Rainiers Baseball team. In addition, Tacoma Water participated in AquaQuest classes that were conducted for elementary schools and middle schools.

Residential Customers. Tacoma Water promoted conservation to its residential (and business) customers with the introduction of four tip sheets that address conservation indoors, outdoors, leaks and an additional tip sheet for business customers.

As in the past, high-use customers were notified by letter of their consumption patterns and provided a postcard with which to request free information and devices, including the tip sheets addressed above, an irrigation system rain sensor, a soil probe, rain gauges, plus toilet displacement devices and leak detection tablets.

For several consecutive years Tacoma Water coordinated with Tacoma Power to host a high-efficiency clothes washer rebate program for residential customers.

In support of the first ever Native Plant Appreciation Week, Tacoma Water produced and distributed 5,000 native plants posters along with over 1,500 books on native plants to customers and Master Gardeners responding to an offering in their utility bill insert. Additional events distributed more posters and books

Two water-efficient seminar series were co-sponsored by Tacoma Water and the Tacoma Public Library in 2002.

A Master Resource Conservation training program was initiated in collaboration with the City of Tacoma's Solid Waste division and implemented in June of 2002.

Commercial customers. In order to achieve greater water savings for large industrial and commercial customers Tacoma Water and consultants completed several technical audits. These included Pioneer Chlor-Alkali, US Oil Refining, GP Gypsum, Continental Lime (now known as Graymont Western, US), Nalley's (also known as Agrilink), Tacoma's Steam Plant, Kaiser Aluminum, Point Defiance Park, Tacoma General Hospital, St. Joseph's Hospital, two elementary schools, Tacoma Lutheran Home, and Pierce County detention.

Tacoma Water, United Pipe & Supply and Rainbird International hosted a seminar at the utility which targeted commercial and residential landscape irrigation contractors.

Wholesale Customers. Tacoma Water continues to provide water conservation information and technical support to its wholesale customers. A response plan was also initiated should wholesale customers request the support of Tacoma Water's water conservation program to fulfill their DOE and DOH water conservation guidelines requirements.

Current Water Conservation Program Emphasis

Tacoma Water continues to strive to achieve water efficiency. In 2006, a program to replace Pre-Rinse Spray Nozzles with new efficient models began. Tacoma Water has partnered with Tacoma Power and Puget Sound Energy on this effort. Through direct installs, and at no cost to the customer, the Pre-Rinse Spray Nozzle program will achieve both water and energy savings.

Tacoma Water remains an active participant in regional conservation campaigns and educational efforts. The 'resource-efficient gardens' at the new Tacoma police substations and the City's

EnviroHouse are examples. Tacoma Water also continues to provide customers with water saving devices and conservation literature.

The focus of the Tacoma Water conservation program is currently on the next four-year time period – through 2010 – in order to meet or exceed the ten percent water use reduction requirement established in the Second Supply Project Memorandum of Agreement with DOE and DOH.

Evaluation of Conservation Measures

Conservation Planning Requirements, Guidelines and Requirements for Public Water Systems Regarding Water Use Reporting, Demand Forecasting Methodology and Conservation Programs, Washington State Department of Ecology and Washington State Department of Health, March 1994 (Conservation Planning Requirements)

The Conservation Planning Requirements require water utilities to evaluate alternative conservation measures. For each size of water system, specific conservation measures are recommended for implementation and are, therefore, required to be evaluated. Such conservation measures are grouped into the following four categories.

- Public Education
- Technical Assistance
- System Measures
- Incentives/other measures

Tacoma Water's evaluation of the recommended conservation measures is presented below. Specific recommended conservation measures under each of the four broad categories appear in *italics*.

<u>Public Education</u>
Past Tacoma Water conservation activities have included school-based education programs (*school outreach*), presentations to community groups (*speakers bureau*) and participation in community events such as the Pierce County Livable Communities Fair (*theme shows and fairs*). Tacoma Water promotes (*program promotion and seasonal demand management*) its conservation program with bill inserts, participation in regional conservation campaigns, the use of its website and the like. Public education activities will continue to play an important part in Tacoma Water's conservation program.

<u>Technical Assistance</u>
Tacoma Water distributes conservation information through brochures, the world wide web, bill inserts (*customer assistance*) and provides conservation support for its wholesale water customers (*purveyor assistance*). Tacoma Water customer bills currently include a consumption chart to allow customers to compare recent water use to past use (*bill showing consumption history*). Tacoma Water has prepared water reuse and reclamation studies, has implemented a large industrial audit program and has recently completed a conservation program assessment (*technical studies*). The conservation program assessment contains up-to-date information on new water efficient technologies and measures with which Tacoma Water can augment its existing conservation program.

System Measures

Tacoma Water meters all of its sources of supply as required by the Conservation Planning Requirements (*source meters*). All services have been metered since 1954 (*service meters*). Tacoma Water reviews the leakage and main break history of pipelines now in service and installs corrosion protection and lining material where indicated (*unaccounted water/leak detection*). Such system measures activities will continue into the future.

Incentives/Other Measures

Past Tacoma Water conservation activities have included distribution of showerhead and faucet aerators and toilet retrofit kits, (*single-family/multi-family kits*). In 1992, Tacoma Water revised its residential and wholesale rate structure to include 25 percent summer rate to encourage water conservation (*conservation pricing*). Tacoma Water has partnered with Tacoma Power to offer clothes washer rebates (*utility financed retrofit*). Tacoma Water makes available moisture sensors and weather-based irrigation controls (*nurseries/agriculture and landscape management*) to its customers. Please see Section 6.5.3 for details regarding Tacoma Water water reuse activities (*water recycling/reuse).*

2006 Conservation Program Assessment

In 2006, Tacoma Water undertook a conservation program assessment to evaluate the existing water conservation program – which is based upon a 1997 conservation program assessment – and to recommend elements to strengthen the program. The objectives of the 2006 Conservation Program Assessment include:

- To instill a long-term conservation ethic among customers (retail, wholesale and in regional supply area).

- To establish a 2000 base year on water use. This will enable the utility to measure the effectiveness of the conservation program in accordance with State guidelines.

- To establish criteria to assess the effectiveness of the conservation program including methods to establish savings, effectiveness of public information programs and measurements of economic benefits received.

- To identify conservation program activities which, if implemented by Tacoma Water, will result in water savings necessary to meet Tacoma Water's ten percent reduction goal.

A summary of the tasks completed during the conservation program assessment process can be found in Appendix N (Tacoma Water Conservation Plan). The conservation program packages resulting from the conservation program assessment which Tacoma Water will consider implementing during the next four years are listed below. (Please see the Tacoma Water Conservation Plan - Appendix N – for a detailed description of each conservation program package.)

The water conservation program packages that may be implemented by Tacoma Water include:

- Faucet Aerators & Low Flow Showerheads for Residential Customers
- High-Efficiency Toilets for Residential Customers
- Pre-Rinse Spray Valves for Commercial Customers
- High-Efficiency Clotheswashers for Residential Customers

- High-Efficiency Urinals for Commercial Customers
- High-Efficiency Commercial Kitchen Equipment
- Public Education
- Water Efficient Product and Service Promotion
- Intergovernmental & Regional Cooperation

6.6.6 Additional Supply Alternatives

As previously described, the Lakehaven Utility District is currently pursuing its OASIS project. The District's proposed OASIS (Optimization of Aquifer Storage for Increased Supply) project is an aquifer storage and recovery project proposed to use excess water usually available during the wet weather months and store it underground for later high demand summer use. In December 1995, Tacoma Water provided a written expression of interest to further discuss a partnership approach to pursuing the OASIS project (Correspondence to Roger Brown, General Manager, Lakehaven Utility District from Kenneth J. Merry, Superintendent, Tacoma Water, December 6, 1995).

On June 30, 2003 Ecology approved the use of the Lake Tapps Reservoir as a public water supply in the amount of up to approximately 65 MGD. The Cascade Water Alliance, a coalition of water utilities including the cities of Bellevue, Issaquah, Kirkland, Redmond and Tukwila and the Covington, Sammamish Plateau and Skyway water districts, and Puget Sound Energy, owner of the Lake Tapps water right, have entered into a Memorandum of Understanding under which Cascade has the exclusive right to negotiate acquisition of the Lake Tapps water rights. Cascade intends to develop the Lake Tapps water rights to meet members' future needs and also intends to consider how the supply may meet a portion of other regional water supply needs.

6.7 Summary / Recommendations

6.7.1 Summary

Under the Tacoma Water Expected Demand (Historical) scenario, including additional demands associated with the Cascade Water Alliance, the July 2007 Water Availability Study projects a surplus of available water through the year 2030. However, should a higher level of demand occur as projected in the High Demand (PSRC) scenario, the water availability study projects demands will not be met in years 2025 and 2030. It is important to note that under both water demand scenarios, the underlying water model used in the water availability study incorporates well development at the South Tacoma Wellfield as an "existing" supply source available to meet demands.

Given the assumed use of additional water resources at the South Tacoma Wellfield to meet future demands, the following project is recommended for implementation:

South Tacoma Aquifer Additional Wells

The South Tacoma Wellfield currently contains 13 production wells, drawing water from three aquifers. The wells have water rights totaling 78 MGD, with nominal installed capacity of 66 MGD and an approximate sustained rate of 48 MGD. Tacoma Water believes the aquifer could sustain an additional withdrawal of 29 MGD in the summer months.

6.7.2 Additional Recommendations

It is becoming increasingly difficult to obtain new water rights. As a result, water purveyors are finding it necessary to find alternatives to new water rights in order to provide for increases in system demands. As a regional water system, Tacoma Water must be able to respond to new requests for wholesale service. While the March 2006 Water Availability Study does take into

account Tacoma Water's current contract commitments, the Water Availability Study does not account for increases in wholesale demands outside existing contracts. Under the Expected Growth Demand scenario, it is projected that an additional 2.2 MGD of supply will be available in 2025 and an additional 4.1 MGD of supply will be available in 2030. No additional supplies are available in 2025 or 2030 under the High Growth Demand scenario. It will be important for Tacoma Water to continue the practice of updating water demand forecasts and participating in regional water planning processes in order to ensure the ability to provide for new requests for wholesale service as such requests may occur in the future.

Tideflats Area

The addition of new wells and related facilities in the Tideflats area, consistent with existing water rights, should be implemented by Tacoma Water in the future as may be needed to meet new demands as follows:

Tacoma Water currently has two wells within the Tideflats area. Tideflats Well No. 1 was installed in 1927 and produces approximately one MGD. A second well has been developed, with a capacity of 1,250 gpm, but has not been tied into the water system. Based on a 1995 study, it is estimated that the aquifer below the Tideflats area is capable of producing an additional five MGD. Facilities to procure the additional water would include two wells and transmission piping to convey the water to Tacoma Water's distribution system in the Tideflats industrial area.

Cooperative Projects

Tacoma Water and the Lakehaven Utility District are currently partners in the Second Supply Project. As the Lakehaven Utility District pursues its OASIS project, Tacoma Water should continue to evaluate/consider how further partnering with the District could assist Tacoma to meet its long term water demand needs.

Currently, Tacoma Water is a participant in regional water supply planning activities through the Central Puget Sound Water Forum and other such venues. As the Cascade Water Alliance pursues necessary planning activities associated with the use of Lake Tapps, Tacoma Water should continue participation in such joint planning activities in an effort to determine how the Lake Tapps source could be incorporated into Tacoma Water future needs.

Reuse

At this time no reclaimed water is available within the Tacoma Water service area for off-setting the use of potable water sources. Tacoma Water will continue to monitor reclaimed water projects and/or reclaimed water planning activities of local wastewater facilities, such as those described above, and will participate in planning activities as they may occur in the future.

Conservation

Since the 1980s, Tacoma Water has been committed to an effective conservation plan as an element of their overall water resource plan. Tacoma Water will continue to be a leader in water conservation activities, including implementing the Tacoma Water Conservation Plan as contained in Appendix N.

Acquisition of Available Water Rights

As water rights may become available for purchase, it is recommended that Tacoma Water pursue such opportunities provided that it is determined such an acquisition is consistent with Tacoma Water business practices.

Chambers Creek Properties Water Resources

As previously identified, the 2000 Tacoma Water Comprehensive Water System Plan listed Pierce County's Chambers Creek Properties water rights as a potential new groundwater source for Tacoma Water at an undefined period in the future. Since the 2000 WSP was developed, Pierce County successfully transferred approximately 2.5 MGD of industrial water rights to municipal water rights and has applied to Ecology for additional groundwater rights, consistent with what was formerly "on-paper". Tacoma Water has been supportive of Pierce County's activities to develop the Chambers Creek Properties water resources by providing letters of support when requested and participating in discussions with Pierce County regarding purchase of water. Tacoma Water should continue discussions with Pierce County to determine how Tacoma Water and Pierce County could jointly pursue the development of the Chambers Creek Properties water resources for ultimate use by existing and future Tacoma Water retail or wholesale customers.

CHAPTER 7

SYSTEM INVENTORY

CHAPTER 7

SYSTEM INVENTORY

7.1 Introduction

This Chapter describes Tacoma Water's infrastructure by providing an overview of facilities that are either directly or indirectly involved in the storage, supply, conveyance or treatment of Green River water and/or Tacoma Water groundwater supplies. Recommendations for improvements to Tacoma Water's storage and transmission and distribution facilities are contained in Chapter 10 – Water System Analysis.

7.2 Green River Supply

Tacoma Water's system depends on the conjunctive use of surface and groundwater supplies, with the Green River being Tacoma Water's primary water source and the source of supply for the Second Supply Project. Figure 7-1 shows the main components of the Green River supply. These components are described below and consist of the following:

- Green River Watershed
- Howard Hanson Dam and Reservoir
- Green River Diversion
- North Fork Wellfield
- Green River Treatment Facilities

7.2.1 Green River Watershed

The Green River originates in the upper Cascade Mountain range. Flows in the upper reaches of the river result predominantly from snowmelt and rainfall runoff. Average annual precipitation in the Green River Watershed is approximately 85-inches per year.

The watershed above the diversion point consists of approximately 230 square miles of timbered and mountainous terrain. Most of the watershed is forested and several owners manage and harvest the timber. Tacoma Water owns 10.3 percent of the watershed. The Green River Watershed Management Plan (Volume II to this report) contains substantially more detailed information about the watershed, its characteristics, ownership, and management.

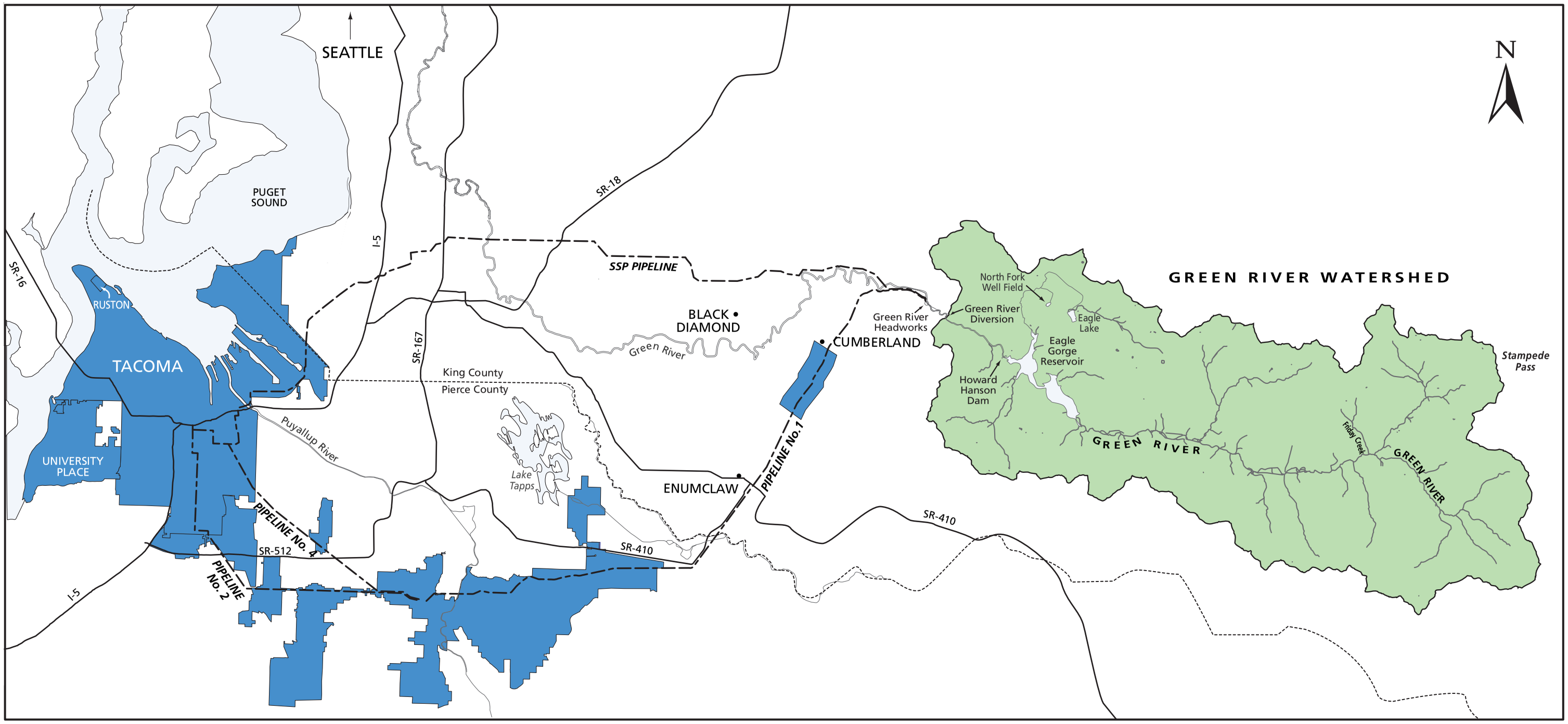
7.2.2 Howard Hanson Dam and Reservoir

The Howard Hanson Dam was built in 1961. The primary authorized use of the project is to provide flood control for the Green River Valley during the winter. The secondary authorized uses include augmentation of low summer flows downstream of the dam, irrigation and water supply. The dam impounds the Green River, forming the Eagle Gorge Reservoir.

The U.S. Army Corps of Engineers (USACE) operates the dam, controls water levels in the reservoir, and regulates flow in the Green River for flood control in the winter and flow-augmentation during low-flow periods (typically late summer through fall).

The dam and its operation have an impact on the quality of the Green River. Close coordination of operations between the Dam and Tacoma Water operators is consistently reinforced through active communication. This communication occurs at multiple levels.

Tacoma Water and the USACE are working in cooperation on the Howard Hanson Additional Water Storage Project. (See Section 6.4.4 for additional information.) This project will increase



TACOMA WATER
TACOMA PUBLIC UTILITIES

JULY 2007

LEGEND

- Retail Service Area
- River or Creek
- Pipeline
- County Line

NOTE: This is a graphic representation of Tacoma Water's service area only and is not intended to represent individual tax parcel location.

Figure 7-1 **Green River Supply Facilities**

the amount of water stored behind Howard Hanson Dam for use as municipal supply by increasing the surface elevation from 1147 feet (above sea level) to 1167 feet. This will increase the stored volume of water by approximately 75 percent. Concurrent with this increased storage volume, a new downstream Fish Passage Facility is being constructed to enhance survival and passage of out-migrating juvenile fish. This facility will predominantly take water off the top water elevations from the reservoir, rather than the deep elevations, as is currently the design. Storage plus downstream migration is expected to be in service by 2009, with some storage capability available in 2007.

7.2.3 Green River Diversion

Tacoma Water diverts water from the Green River 30 miles east of Tacoma near Palmer, in South King County. Diversion of water from the Green River began in 1913, at a rate of approximately 65 cubic feet per second (cfs). By 1955, Tacoma Water was diverting approximately 113 cfs from the Green River.

Surface water is diverted from the Green River by means of a concrete diversion structure (dam) that is 23.5 feet high and 152 feet long. The dam was raised 6.5 feet, and the intake was completely reconstructed between 2000 and 2003. The dam raise allows a total raw water hydraulic capacity from the river of 290 cfs (190 million gallons per day). As a result of the reconstruction project, the intake structure is now laterally fed (perpendicular to river flow) and submerged at the north end of the diversion. Flow passes from the intake through a short tunnel into a settling basin. Flow then passes through a fine screen specifically designed to preclude the passage of juvenile fish, and then enters an eight-foot diameter raw water conduit.

Approximately one-half mile of pipeline and tunnel carry the water from the settling basin to an open atmosphere, pressure head equalizing basin referred to as the Spill Chamber. Water flows out of the Spill Chamber and may flow into one or both of two pipelines known as Reactor 1 (supplying Pipeline No. 1) and Reactor 5 (supplying the Second Supply Project Pipeline). When the raw water flow rate into the Spill Chamber exceeds the supply needed, excess water is returned to the river.

7.2.4 North Fork Wellfield

The North Fork Wellfield is located along the North Fork of the Green River, approximately 6 miles upstream from the Green River diversion and treatment facility. The wellfield was developed in 1975 and consists of seven wells located approximately 250 to 300 feet apart. Each well adjoins a structure that contains valving, communications, and control equipment. Each well has a concrete slab and surface seal for sanitary protection.

Six of the seven existing wells are equipped with a submersible pump and one well is equipped with a vertical turbine pump. Each has pump control valving that prevents initial pressure surges by initially pumping to discharge and then gradually feeding into a pipeline that flows into a ten million gallon (MG) reservoir located near the Green River Headworks Control Building.

The North Fork Wellfield supplies approximately 14 percent of Tacoma Water's total supply; however, it does not add to the overall yield of the Green River source because of hydraulic interconnection between the aquifer and the Green River. The water pumped from the wellfield is supplemental to the surface diversion water rights and can only replace water from the surface source; it cannot add to it. The North Fork supply is considered groundwater under the influence of surface water.

Wellfield pump operation is controlled by automated and remote signals transmitted via radio from the Headworks Control Building. As the blending valves in this building open or close, the

reservoir water level changes and the wells are sequentially turned on and off. Table 7-1 lists the pumping capacity, elevation, and depth of each well.

Table 7-1
North Fork Well Inventory

Well Number	Year Drilled	Capacity. (MGD)	Elevation[1]	Depth (ft)
1	1975	12	1211	67
2	1975	12	1211	65
3	1975	12	1234	87
4	1975	12	1252	95
5	1975	12	1256	103
6	1975	12	1258	95
7	1970[2]	12	1246	118

Notes:
[1]All elevations are based on USGS datum.
[2]Well 7 was drilled in 1970 but the pump and piping were installed in 1996.

The North Fork Wellfield draws from a highly permeable aquifer ranging from 65 to 103 feet deep. The capacity of these wells is highly variable seasonally, as described in Section 6.4.2.

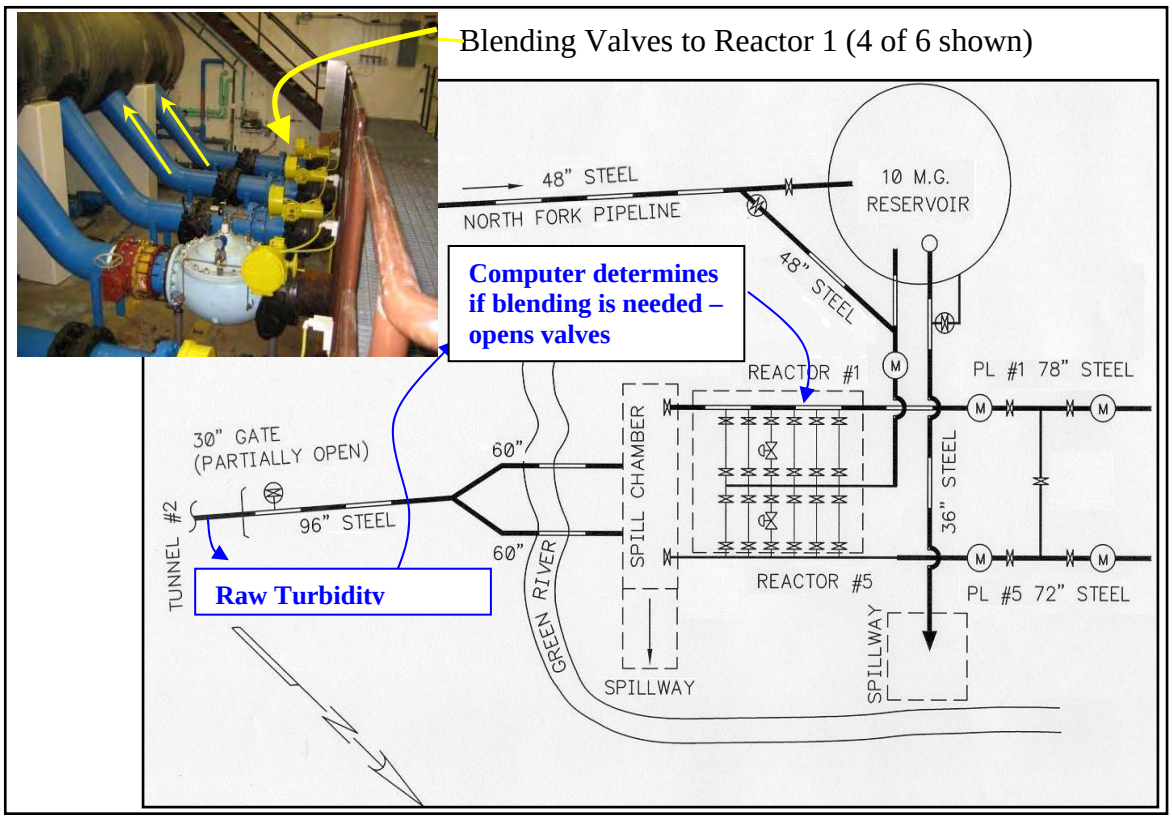
7.2.5 Green River Treatment Facilities

The current Green River treatment facilities consist of North Fork groundwater blending and chemical treatment with chlorination, fluoridation, and pH adjustment. The groundwater blending occurs within the Headworks Control Building, and chemical treatment occurs approximately 2,600 feet downstream of the Headworks Control Building at the newly constructed Green River Treatment Plant - Chemical Facilities. These systems are discussed in greater detail in the following sections. A new Ozone Treatment Facility is under construction and will be in service in mid-2007 for taste and odor control treatment. Although not yet in service, a discussion of the Ozone Treatment Facility is included in this 2006 Update.

Green River Blending System

Tacoma Water currently operates the Green River / North Fork Wellfield system as a surface water supply that meets the federal and state criteria to remain unfiltered. One key water quality criterion is the turbidity of the water prior to the point of primary disinfection, which must remain less than five NTU (Nephelometric Turbidity Unit) at all times. The Green River is subject to occasional episodes of elevated turbidity, normally the result of heavy rainfall or snow melt within the watershed. These events generally occur in the spring and late fall/winter months when water demands within the system are lowest. During those times, the river water is blended or replaced with low turbidity (0.2 – 0.5 NTU) water from the North Fork through an automated blending system. North Fork Wells can provide between 24 and 84 MGD, depending on the season, antecedent precipitation conditions, and duration of pumping. Figure 7-2 presents a schematic of the North Fork blending system, with an inset photograph of several of the blending valves.

FIGURE 7-2
North Fork Blending System – Green River Headworks



There are six blending valves to each Pipeline Reactor (Reactor 1 and Reactor 5) that can provide approximately 12 MGD each (144 MGD total instantaneous blending supply). They operate in a fully open or fully closed manner. Each side includes one adjustable Cal-Valve that may be used for a narrower control (3 MGD increments for example). The valves are controlled by river water turbidity sampled at a location approximately 20 minutes upstream of the Spill Chamber. As river turbidity rises, normally closed blending valves are sequentially opened in anticipation of the turbid water. Since the 10 MG tank is at a higher hydraulic grade than the river water, it replaces the river water in 12 MGD increments until all river water is hydraulically blocked (if river turbidity is high enough to require this). The "blocked" river water returns to the river via the Spill Chamber and Spillway. The blending valve system reacts rapidly enough such that the resultant blended water generally remains at or below 3.5 NTU. During prolonged turbidity events, Tacoma Water can completely shut off the surface water supply and rely entirely on groundwater, both from the North Fork and in-town wells.

Green River Treatment Plant - Chemical Facilities - General

The Green River Treatment Facility became operational in August 2005. The facility consists of four major chemical feed bays, mechanical, electrical, and fire protection systems, and process piping to bring carrier (or utility) water into the plant, and chemical injection feed back to the treatment reactors. Supplemental systems include an on-site domestic water supply, a 0.75 megawatt (MW) standby generator, a critical systems uninterruptible power supply system, and standby diesel supplies for both the power generator and the diesel powered, 2,500 gpm fire

pump. The building is continuously ventilated and maintains a minimum temperature to ensure that the 50 percent caustic soda does not freeze.

The three active, individual chemical feed systems are discussed below. The fourth location in the Chemical Facilities building will be used for sodium bisulfite as part of the new Ozonation Facilities.

For all chemical systems, carrier water is brought into the plant via twin 8-inch feed pipes that originate from Reactors 1 and 5. The 8-inch feed pipes can be operated in isolation or using a crossover, in a blended manner. When both reactors are in service, the two lines are operated in an isolated mode until reaching water quality sampling take-off points. This allows independent monitoring of water in both reactors. They then join and pass through a single 15 HP pump. When a single reactor is in service water is drawn only from that reactor, but a cross-over is opened, and water flows through both 8-inch pipes, rejoining just before the pump, as described above. This water then flows through the plant, and is split off to carry the injected chemical back to the pipeline reactors. This closed loop system results in no water loss, and effectively dilutes the neat chemical for easy transport.

Disinfection Facilities

Chlorine is added to the water approximately 2,600 feet downstream of the blending system at a dose of approximately 1.5 to 3.0 milligrams per liter (mg/L as Cl_2). Chlorine can be fed in a manual mode (fixed dose rate), flow paced, or using a residual trim compound loop system. The range in dose is due to the varying nature of the supply. North Fork groundwater and cold, winter Green River water exhibit significantly less chlorine demand and decay than warmer summer Green River water. The highest chlorine demands (and dose requirements) are typically in August and September.

The chlorination system was constructed in 2004-2005 and consists of fully redundant components, including four 12.5 percent sodium hypochlorite bulk storage tanks, redundant chemical feed pumps for each reactor, and redundant plant carrier water pumps. After chlorine injection, water flows by gravity through Pipeline No. 1 and the Second Supply Project Pipeline to the wholesale and direct service, and Second Supply Partners served by these transmission mains. The large transmission mains (Pipeline No. 1 and the Second Supply Project Pipeline) serve as plug-flow disinfection reactors, and provide the contact time for *Giardia lamblia* inactivation, with resulting inactivation ratios typically ranging between two and five (relative to three-log inactivation). Details of compliance points and methodology for determining compliance have been developed, and are used to prepare the monthly reports submitted to the State Department of Health (DOH).

Fluoridation Facilities

Tacoma Water has used fluosilicic acid to provide fluoridation of the Green River / North Fork supply for nearly ten years. This approach is continued with the new facilities, and chemical feed pumps are sized to provide a dose concentration of 0.7 – 1.3 mg/L, with an expected dose of one mg/L. Each treatment reactor has a feed pump designed to treat the full range of expected flow, with a redundant pump that can treat to either reactor.

Corrosion Control Facilities

Tacoma Water adds 50 percent sodium hydroxide (caustic soda) at both the new Green River Chemical Facility, and the 214th Corrosion Control Facility (CCF) (Pipeline No. 1 only). This allows differential caustic dose rates at the Green River plant when both treatment reactors are running. Final pH adjustment of Pipeline No. 1 water can then be completed at the 214th CCF. This allows maximum disinfection effectiveness, while meeting the goals of optimized corrosion

control. A modest pH adjustment will continue to be provided at the Headworks facility with a target Reactor 1 finished water pH of approximately 7.5. The Second Supply Project Pipeline receives all of its corrosion control treatment at the Headworks, with a target pH of approximately 7.5-7.8.

This system differs from the other new chemical feed systems in that a single chemical metering pump is not capable of meeting the entire range of flows and water quality for the Reactor 5. This is due to the large flow range (10-95 MGD) and the dramatically different dose requirements for Green River and North Fork water. Because final pH control for Reactor 1 is accomplished at the 214th CCF, there is no standby pump provided for Reactor 1. Reactor 5 has a total of 3 pumps: two duty and one standby. Additional points of caustic injection and metering pump capacity will be included with the construction of the Ozone plant to allow enhanced taste and odor removal and additional flexibility.

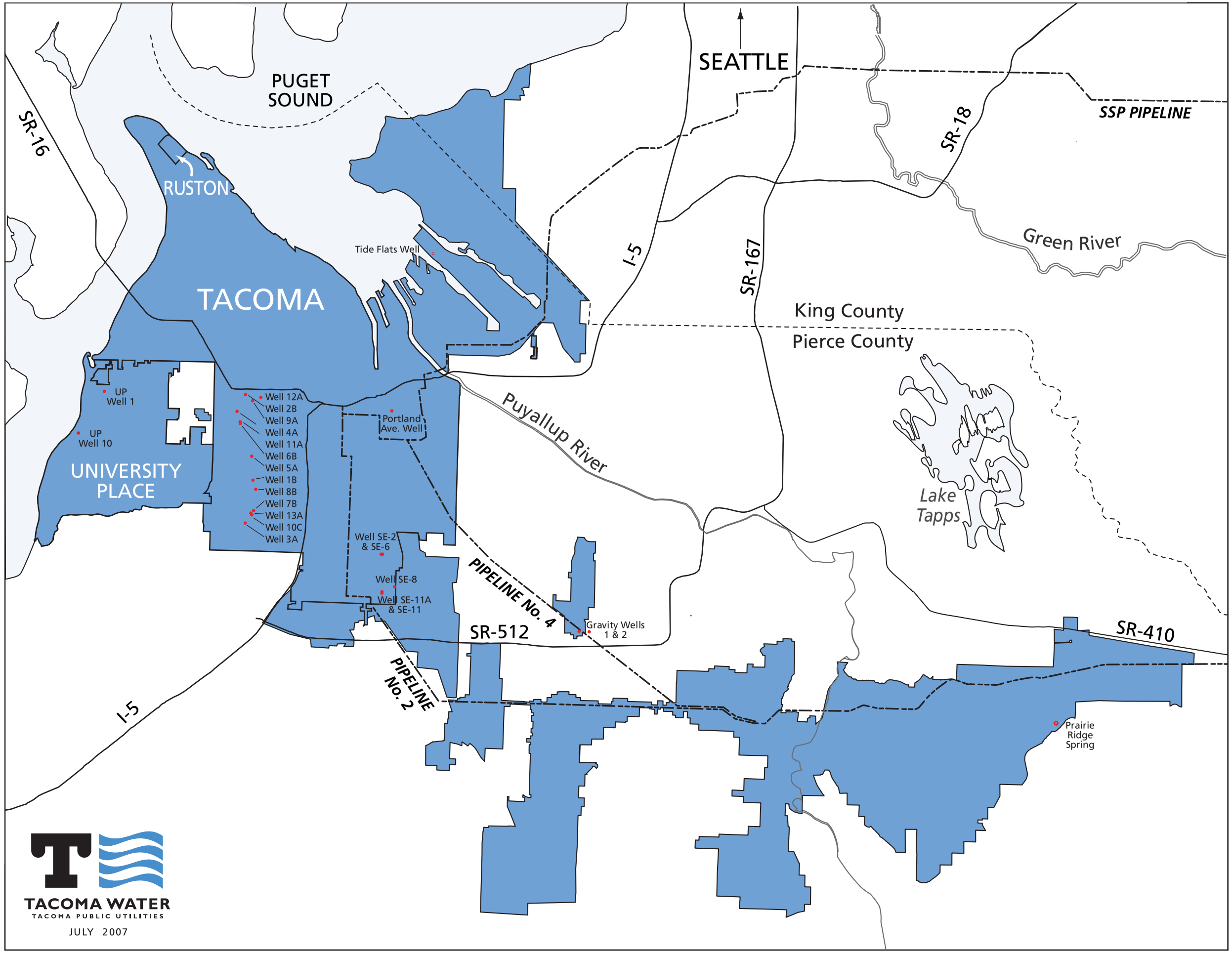
Ozone Treatment Facility

The Ozone Treatment facility consists of three buildings: (1) the Ozone Building; (2) the Headworks Control Building (aka Ozone Injection Building); and (3) the Ozone Destruct Building. The Ozone Building is located adjacent to the ten MG North Fork Wells Reservoir, and contains the Ozone generation equipment. The Liquid Oxygen (LOX) tanks are also located adjacent to this building. The Ozone generation equipment applies an electric current to the Oxygen (O_2) creating ozone (O_3) gas. The ozone gas is then piped across the road to the Headworks Control Building. In the Headworks Control Building the ozone gas is combined with carrier water and then pumped out of the building to a stainless steel injector spool on either Pipeline No. 1 or the Second Supply Project Pipeline. Just downstream of the pipeline injector spools, the off gas from the ozonated water is then captured and is destroyed in the Ozone Destruction Building.

Pipeline No. 1 and the Second Supply Project Pipeline serve as the ozone contact chambers, with the ozone residual measured at 4 sample stations along each pipeline. The portions of the pipelines where there is ozone present, are lined with cement mortar because of the corrosive nature of ozone. Although the primary purpose of the ozone treatment is for taste and odor control, ozone is also a very effective disinfectant. The ozone residuals measured at the four sample stations are used to calculate the decay rate, which allows for determination of the CT and inactivation credit that is being provided by ozonation. Ozone is highly unstable, and reverts to oxygen within a few minutes. Because ozone decay rates can vary with water chemistry and conditions, Sodium Bisulfite is provided for injection into the pipelines to quench any remaining ozone. The ozone must be quenched prior to the water reaching the non-cement lined portions of the pipeline where injection of the other treatment chemicals (Chlorine, Fluoride, and Sodium Hydroxide) is done. A backup generator is provided for the Ozonation Treatment, and can start up within a short time following a power outage.

7.3 Service Area Wells and Springs

Several different groups of wells and springs in the service area provide additional sources of supply for Tacoma Water. These sources include the Gravity Wells, the South Tacoma Wellfield, the Southeast Tacoma Wellfield, the University Place Wellfield, Tideflats Well TF-1 , the Portland Avenue well, and Prairie Ridge Spring. These sources are described below. Table 7-2 summarizes the source information. Figure 7-2 shows the location of the service area wells and Prairie Ridge Spring. Water right information for these sources is contained in Chapter 6 – Water Resources.



NOTE: This is a graphic representation of Tacoma Water's service area only and is not intended to represent individual tax parcel location.

LEGEND

- Retail Service Area
- River or Creek
- Pipeline
- County Line
- Wells

Figure 7-2 **Well Locations**

A total of 24 wells are currently available within the Tacoma Water service area. These wells supply approximately 15 percent of the annual water requirements. The wells are primarily used for peaking needs and for offsetting Green River supplies during periods of high demand or high turbidity. Tacoma Water can pump the wells collectively at a maximum rate of over 60 MGD.

TABLE 7-2
Service Area Groundwater Source Inventory

Source Designation	Year Drilled	Capacity (MGD)	Surface Elevation (ft)	Depth (ft)
Gravity Wells				
1	1964	4.2	348	315
2	1965	3.8	369	351
South Tacoma Wellfield				
1-B	1995	4.0	251	289
2-B(a)	1949	2.0	246	79
3-A	1931	4.1	272	312
4-A	1930	0.8	246	204
5-A	1930	6.5	268	352
6-B	2001	6.1	267	112
7-B	1988	1.4	251	280
8-B	1990	4.2	271	217
9-A(a)	1949	4.5	283	113
10-C	1990	0.8	258	111
11-A	1948	8.3	271	113
12-A	1957	4.3	313	167
13-A	1990	1.1	246	937
Southeast Tacoma Wellfield				
SE-2	1947	0.6	414	396
SE-6	1966	0.6	414	215
SE-8	1970	0.7	428	294
SE-11	1985	1.2	400	383
SE-11A	1993	0.8	403	371
University Place Wellfield				
1	1986	1.6	314	180

Source Designation	Year Drilled	Capacity (MGD)	Surface Elevation (ft)	Depth (ft)
10(a)	1967	1.0	320	342
Tideflats Well 1(a)	1927	1.0	12	775
Portland Avenue	1986	1.7	240	655
Prairie Ridge Spring	1968	0.8		
TOTAL		**65.6**		

' Capacity is average daily capacity.
" Elevation based on USGS datum.
(a) Emergency sources.
Notes:
The following wells have been converted to observation wells or are inactive: 1A, 2A, 6A, 7A, 8A, 10B, SETM-3, 5, 10.

7.3.1 Gravity Wells

Two wells, commonly called the Gravity wells, are located along Pipeline No. 4 in the Summit area. These wells are used to satisfy peak demands and are pumped directly into Pipeline No. 4. They have yields of 4.5 and 3.0 MGD. Because of their elevation and the operating pressure of Pipeline No. 4, operation of these wells requires a high level of energy. Because of the high pumping costs associated with their operation, the Gravity wells are used primarily for peaking purposes and to provide an alternative source during periods of water quality problems or as repairs to Pipeline No. 2 or sections of Pipeline No. 4 occur.

7.3.2 South Tacoma Wellfield

The South Tacoma Wellfield currently has 13 active wells in three aquifers. The wells were constructed between 1929 and 2001. The wellfield is generally located along a 3-mile area extending north to south along South Tacoma Way. Wells 2B and 3A roughly represent the northerly and southerly border, respectively, of the South Tacoma Aquifer.

7.3.3 Southeast Tacoma Wellfield

The Southeast Tacoma Wellfield consists of five active wells which were acquired from Southeast Tacoma Mutual Water Company. Although relatively small, the wells are useful as an additional source during peak demand times. The wells pump directly to the local distribution grid. An additional well will be returned to service in 2007.

Production records have been kept since 1950 for the wells. Typically, the static water level is highest in late winter and lowest following long, dry periods and extended pumping.

Studies have shown that the South Tacoma Aquifer is lowered as increased pumping demands are placed on it and that some annual withdrawals have exceeded groundwater recharge. Water levels have also been observed to be affected by variations in annual precipitation. Water levels in the South Tacoma aquifers generally declined after storm sewers were constructed in the 1950s. Historically, pumping records were interpreted with an annual recharge limit of approximately 12,000 acre-feet/year (af/yr), or 4,000 MG/yr. However, the results published in a study (AGI, 1995), indicated that the annual recharge of the aquifer is approximately 22,000 acre-feet. The estimated volume available from the South Tacoma aquifers is 33,000 acre-feet with a natural recharge estimated to be 22,000 acre-feet annually. The 11,000 acre-feet of "reserve" can be tapped in any drought year; however, following such an occurrence, pumping must be limited

to less than 22,000 acre-feet to allow the tapped reserve to be replenished. Installed South Tacoma well capacity can pump about 15,000 acre-feet in a four month period, so additional capacity would be needed to pump more water during the dry season.

7.3.4 University Place Wellfield

The University Place Wellfield consists of two wells. One well (UP 1) was constructed in 1986 as a replacement for two of the original wells (U6 and U7). Well U-10 is designated as an emergency source and has not been used for a number of years. The wellfield has a combined capacity of 1,800 gallons per minute (gpm) or approximately 2.6 MGD.

7.3.5 Tideflats Wellfield

Tideflats Well No. 1 was reactivated for emergency use only, in the late 1980s. It is located near Hylebos Waterway and 11th Street and provides a maximum of 700 gpm or approximately one MGD. A second well has been drilled in the Tideflats Wellfield in the vicinity of Milwaukee Way with an estimated capacity of 1.8 MGD. This well has received a permit from Ecology; however, the well has not been outfitted with pumping and chlorination equipment.

7.3.6 Portland Avenue Well

The Portland Avenue Well was constructed in 1986 adjacent to the Portland Avenue Reservoir. It discharges directly into the Portland Avenue Reservoir inlet line and has a rated capacity of 1,180 gpm, or approximately 1.7 MGD.

7.3.7 Prairie Ridge Spring

Prairie Ridge Spring is located east of McMillin Reservoir and contributes 0.8 MGD of capacity. The spring supply is reserved for emergency backup only.

7.4 Storage Reservoirs

Tacoma Water currently has seven large storage reservoirs and multiple small reservoirs and standpipes in the water system. McMillin Reservoir is the only remaining uncovered reservoir. Table 7-3 presents summary data on each of the reservoirs. The locations of the reservoirs are shown on Figure 7-3. The storage analysis presented in Chapter 10 discusses the operational interconnections of the reservoirs in the various pressure zones.

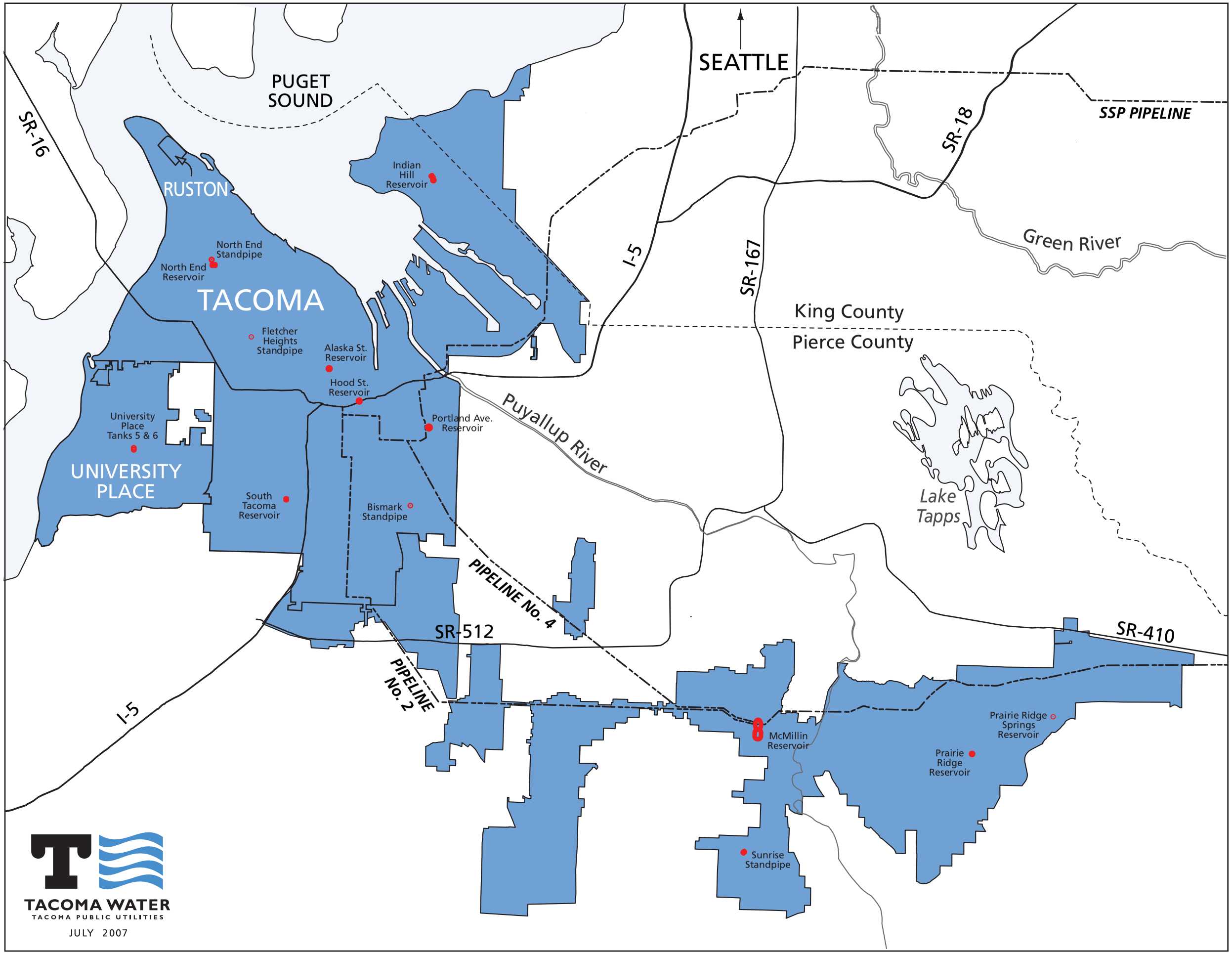
7.4.1 Headworks Reservoir

A ten MG reservoir (not shown on Figure 7-3; see Figure 7-1 for the location of the treatment facilities) is located adjacent to the Green River treatment facilities at the headworks of the Green River system. This reservoir stores water from the North Fork Wellfield and serves as an equalizing storage facility when the North Fork Wells are in operation.

7.4.2 McMillin Reservoir

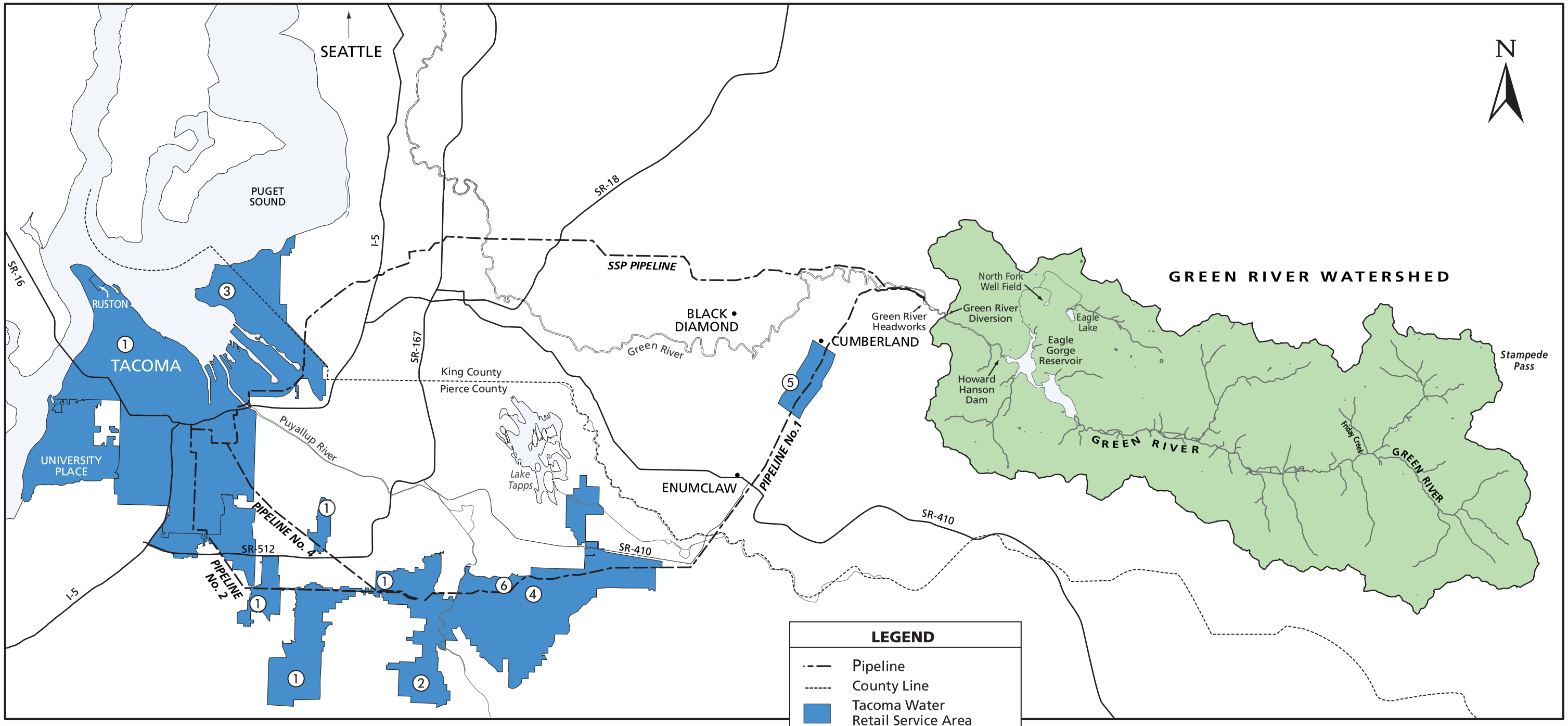
McMillin Reservoir is the most important storage facility in the Tacoma Water system. The reservoir consists of three uncovered cells: two 55 MG cells and one 100 MG cell. Water is supplied to the reservoir through Pipeline No. 1 at a maximum elevation of 576 feet. McMillin Reservoir is located near Puyallup at 130th Avenue East and Reservoir Road. Two pumping stations provide water from Pipeline No. 1 and Pipeline No. 2 to a 3.9 MG standpipe that serves the surrounding Sunrise zone at an elevation of 706 feet.

The combined storage of 210 MG in McMillin Reservoir is used as an equalizing facility for demands experienced throughout the distribution system. Flow from Pipeline No. 1 supplies the reservoir continuously. Water is conveyed from McMillin Reservoir to the City of Tacoma through Pipeline No. 2 and Pipeline No. 4 over a distance of about 11 miles. Planning is



NOTE: This is a graphic representation of Tacoma Water's service area only and is not intended to represent individual tax parcel location.

Figure 7-3 **Reservoir Locations**



TACOMA WATER
TACOMA PUBLIC UTILITIES

JULY 2007

NOTE: This is a graphic representation of Tacoma Water's service area only and is not intended to represent individual tax parcel location.

Figure 7-4 **Primary Service Zones**

currently underway to convert McMillin Reservoir to a covered facility with reduced capacity. McMillin covering is discussed further in Section 10.2.3 and 10.6.1.

Table 7-3
Storage Reservoirs

Reservoir	Spill Elevation	Location	MG
Primary Storage:			
Headworks	957.5	36932 Green River Headworks Rd.	10.0
*McMillin Reservoir	576	130th Ave. E. & Reservoir Rd.	210.0
TOTAL			**220.0**
Distribution Storage:			
North End	446	N. 31st & Shirley	10.0
Alaska Street	446	S. 20th 7 Wilkeson	6.0
Hood Street	251	S. 30th & I St.	10.0
Indian Hill	549.5	5225 NE Tower Dr.	5.0
Portland Avenue	251	3629 E. M St.	20.0
South Tacoma	265.5	S. 62nd & Cedar	0.5
Prairie Ridge	810	144th St. E. & 198th Ave. E.	2.5
Prairie Ridge Springs	401	13117 Spring Site Rd. E.	0.2
Cumberland	931	35420 Cumberland Way	0.1
University Place No. 5	481	4521 83rd Ave. W.	1.4
University Place No. 6	479		
TOTAL			**55.7**
Standpipes:			
North End	491	N. 31st & Shirley	1.3
Fletcher Heights	491	S. 10th & Tyler	0.6
Bismark	491	E. 64th & McKinley	0.3
Sunrise	706	12200 180th St. E., Puyallup	3.8
TOTAL			**6.0**

'*Denotes uncovered reservoir

McMillin Reservoir is on City-owned land and is protected by a security fence and is frequently patrolled by resident Tacoma Water staff. Because the reservoir is uncovered, all water leaving the reservoir in Pipeline No. 2 is re-chlorinated by continuous feed equipment. A control office is used to house personnel, instrumentation, and communication equipment. Distribution field crews also use the site as a satellite shop. A new Operations Building is currently under construction.

7.4.3 North End Reservoir

The North End Reservoir is located on North 31st Street between Pearl Street and Shirley Street. This reservoir has an operational range between elevation 436 feet and elevation 446 feet to provide water to the extreme northwest of the service area. The reservoir was downsized from 25 MG to 10 MG when the reservoir was rebuilt as a buried reinforced concrete tank in 1990. Water can be pumped from the reservoir to 478 High Service zone during peak demands.

7.4.4 Alaska Street Reservoir

The six MG Alaska Street reservoir is located at Wilkeson Street and South 20th Street. This welded steel reservoir replaced two uncovered concrete basins in 1988. With an overflow elevation of 446 feet, the reservoir serves the Middle Service zone. An adjacent pump station can be used to transfer water to the High Service zone if needed to help meet peak demands, although current demand levels have not required use of the pump station in recent years.

7.4.5 Hood Street Reservoir

The ten MG reinforced concrete Hood Street Reservoir replaced an uncovered concrete basin in 1987. Hood Street Reservoir is operated between elevations 246 feet and elevation 251 feet and is located just north of I-5 and west of the Tacoma Dome at South 30th Street and I Street. Supply to this reservoir is provided by two sources. The primary supply comes from McMillin Reservoir and the Second Supply Project Pipeline through nearby Pipeline No. 2 and Pipeline No. 4, which feed either pressure reducing valves or a hydroelectric turbine generator at Hood Street Reservoir. Secondly, the South Tacoma wells pipeline provides groundwater supply to the reservoir in the summer months. Water can also come from the Alaska Street Reservoir overflow, which connects to the South Tacoma wells pipeline. However, the Alaska Street Reservoir only overflows in the event of a system malfunction. The pump station at Hood Street Reservoir pumps into the elevation 576 pressure zone, and delivers well water to Pipeline No. 4 during high demand periods. Water leaving the reservoir by gravity serves the Low Service zone. An overflow weir spills at levels above elevation 251 feet.

7.4.6 Indian Hill Reservoir

The Indian Hill Reservoir is located at Tower Drive and Galleon Drive in Northeast Tacoma. The reservoir consists of four separate reinforced concrete covered tanks that were constructed between 1950 and 1981 with a combined capacity of 5 MG that serves the Indian Hill zone. Two adjacent pump stations supply the local area around the reservoir.

7.4.7 Portland Avenue Reservoir

This 20 MG buried concrete reservoir has a normal operational range between elevation 246 feet and elevation 251 feet. The reservoir is located at 3629 East M Street and is supplied directly by pressure reduction from Pipeline No. 4 fed from McMillin Reservoir and from the Second Supply Project Pipeline, which traverses the reservoir site. A 42-inch-diameter outlet pipe is connected into the Tideflats network at Portland Avenue and 26th Street. In conjunction with the Hood Street Reservoir, this reservoir controls the hydraulic gradeline of the Low Service zone in the downtown and Tideflats areas.

7.4.8 Other Storage Facilities

Ten additional smaller covered standpipes and reservoirs exist within the water system. The South Tacoma Reservoir, which is located at South 62nd Street and Cedar, has a capacity of approximately 0.5 MG, and operates at elevation 265.5 feet. This reservoir is in operation only when the South Tacoma pump station is operating. Prairie Ridge Reservoir, located at 198th Avenue East and 144th Street East, has a capacity of 2.5 MG and operates at elevation 796 feet. The remaining reservoirs include the reservoir located near the Prairie Ridge Spring source (elevation 387), the 120,000-gallon Cumberland tank (not shown in Figure 6-3) constructed in 1986 that operates at elevation 917 feet, and the two University Place tanks, Nos. 5 and 6, that operate at elevation 481 and have a combined volume of 1.4 MG. Standpipes include Bismark, Fletcher Heights, Sunrise and North End.

7.5 Pump Stations

The names, addresses, and capacities of the pump stations in the Tacoma Water distribution system are listed in Table 7-4. All are located in the City of Tacoma unless indicated otherwise. All of the pump stations are used to boost pressure to the system, not to provide additional supply.

TABLE 7-4
Pump Stations Capacity

Name	Address	(MGD)
Alaska Street	1616 S. 19th	7.2
Alder Lane'	12801 74th Ave E., Puyallup	0.7
Cumberland'	353 314th Way SE, Cumberland	0.5
Fennel Creek'	18002 Falling Water Blvd	3.4
Frederickson'	6300 176th St. E.	0.2
Highland'	12715 111th Ave. E.	1.0
Hood Street	3110 South I St.	15.0
Indian Hill	5225 NE Tower Drive	1.3
Marine View Drive	2950 Marine View	8.5
McMillin No. 1'	12602 Reservoir Rd., Puyallup	3.3
McMillin No. 2'	13008 128th St. E., Puyallup	4.2
McMillin Spill'	13008 128th St. E., Puyallup	0.5
Mildred Street	906 N. Newton	1.2
North End	5501 N. 31st St.	8.5
Palmer'	SE Green River Headworks Rd.	0.1
Prairie Ridge'	13117 Spring Site Rd. E., Orting	1.8
South Tacoma	6200 S. Clement	14.4

Name	Address	(MGD)
Westgate	2102 N. Pearl St.	2.5
South Summit'	13001 Canyon Rd.	2.2
128th and 62nd'	6122 128th St. E.	0.6
198th Avenue'	19601 117th St. E.	3.4
214th Ave. E. '	11617 214th Ave. E., Sumner	8.6
356th Street	1502 S. 356th St.	5.8
83rd & Cirque	4802 83rd Ave. W.	0.5

' Located outside the City of Tacoma.

7.6 Transmission

The transmission system conveys water from the Green River to the service area and consists of Pipeline No. 1, Pipeline No. 2, Pipeline No. 4 and the Second Supply Project Pipeline, which are shown in Figure 7-1. The basic strategy of the transmission system is to make use of the gravity flow of water from the Green River or North Fork Wellfield to the service areas for reliable and economical service.

There are more than 4,400 individual water customers supplied from Pipeline No. 1 above McMillin Reservoir. More than 1,000 customers supplied from Pipeline No. 2 below McMillin Reservoir before it joins with Pipeline No. 4. The majority of these services are supplied through connecting distribution mains in several isolated areas. The 214th Street Pump Station, 198th Avenue Pump Station, Fennel Creek Pump Station, and McMillin Pump Stations No. 1 and 2 provide the majority of supply to these customers. The Second Supply Project Pipeline provides water to Northeast Tacoma at the 356th pump and pressure reducing station. The Second Supply Project Pipeline connects to Pipeline No. 4 near Portland Avenue Reservoir. In addition to Tacoma, the other Regional Water Supply System partners (Lakehaven Utility District, City of Kent, and Covington Water District) also receive water from the Second Supply Project Pipeline.

7.6.1 Pipeline No. 1

Pipeline No. 1 has the capacity to transport up to 72 MGD of water from either the Green River or North Fork Wellfeld to McMillin Reservoir. McMillin Reservoir is located near Puyallup approximately eight miles southeast of the Tacoma city limits. The length of Pipeline No. 1 from the Green River Headworks near Palmer to McMillin Reservoir in Puyallup is approximately 26.6 miles.

Constructed in 1913, Pipeline No. 1 has undergone numerous phases of improvement and upgrading, resulting in varying pipeline diameters and materials along its length. The pipeline's transmission capacity is limited to 72 MGD due to the difference in inlet and outlet elevations and the pipeline diameter.

Tacoma Water installed flow controls that allow Pipeline No. 1 to operate at reduced flows while at the same time providing adequate pressure for on-line services. Running the pipe at reduced flows allows the Green River supply and the North Fork Wellfield to be used more efficiently, and allows the available diversion amounts to be allocated between Pipeline No. 1 and the Second Supply Project Pipeline.

7.6.2 Pipeline No. 2

Pipeline No. 2 conveys water from McMillin Reservoir (elevation 576 feet) into the City of Tacoma. Downstream of McMillin Reservoir, Pipeline No. 2 consists of two parallel pipelines. The first parallel pipeline, 60-inches in diameter and 10,000 feet long, leads into the 54-inch concrete Pipeline No. 4 at Meridian Avenue.

The second parallel pipeline of Pipeline No. 2 begins with 2,000 feet of 60-inch-diameter steel pipe connecting to 8,000 feet of 58-inch concrete pipe. The concrete pipeline continues as Pipeline No. 2 for 52,600 feet until it reaches 64th Street and Park Avenue. Pipeline No. 2 supplies numerous distribution mains as it traverses past Hood Street Reservoir and terminates at the J Street Standpipe. It also supplies the east-west line in 64th Street, which is a 30-inch-diameter pipe to the west and a 42-inch line to the east. Pipeline No. 2 is interconnected to Pipeline No. 4 in the City through the 42-inch-diameter pipe in South 64th Street.

7.6.3 Pipeline No. 4

Pipeline No. 4 was installed in 1934 to enable full use of the available flow from Pipeline No. 1 plus the storage in McMillin Reservoir. Pipeline 4 branches from Pipeline No. 2 approximately 2 miles west of McMillin Reservoir and follows a divergent right-of-way to the J Street Standpipe as it passes connections to the Second Supply Project Pipeline, and Portland Avenue and Hood Street Reservoirs.

In addition to supplying water from McMillin Reservoir, Pipeline No. 4 can also convey water from the Gravity wells. The point of connection of the Gravity wells is about a mile downstream of the divergence of Pipeline No. 2 and Pipline No.4.

7.6.4 Second Supply Project Pipeline

The Second Supply Project Pipeline (or Pipeline No. 5) was put into service in October 2005. Prior to that time, most of the upper section of the pipeline was in service providing water to Covington, and the lower section was in service providing water to Northeast Tacoma and to the Lakehaven Utility District when needed. The pipeline diameter varies from 90” diameter at the upper end, to 48” diameter in the lower sections. The pipeline runs from the Headworks to a point of connection to Pipeline No. 4 near Portland Avenue Reservoir. Although the pipeline has the ability to deliver approximately 72 MGD to Tacoma Water, at most times its capacity to transmit flow will be shared between Tacoma Water, the Covington Water District, the City of Kent and the Lakehaven Utility District. These utilities are partners in the Regional Water Supply System, which shares access to a Green River water right of up to 65 MGD, as well as access to stored municipal and industrial water behind Howard Hanson Dam. Tacoma Water has access to 15/36 of the project capacity, and each other partner has access to 7/36 of project capacity.

7.6.5 Other Transmission Facilities

The gravity system continues westward from Pipeline No. 2 to the City of University Place. Pipeline No. 2 and Pipeline No. 4 terminate at the J Street standpipe, and the gravity system continues to North End Reservoir through the North End Transmission Main and through the West End Transmission Main and North End Intertie. The pressure in this supply system varies, depending on the friction losses between McMillin Reservoir, at elevation 576 feet, and North End Reservoir, where the total head can fall to an approximate elevation of 500 feet.

The remaining transmission facilities are located throughout the city. A tabulation of the transmission supply system by pipe size and miles of length is presented in Table 7-5.

TABLE 7-5
Transmission Supply System

Size (inches)	Miles
28	0.46
30	9.87
32	2.8
34	5.29
36	6.85
39	2.6
40	0.01
42	10.64
48	24.53
51	1.46
52	6.99
54	12.33
58	16.92
60	27.85
63	1.95
64	0.43
72	6.48
78	1.3
84	0.13
90	0.49
96	0.15
Concrete Tunnel	0.25
TOTAL	**140.85**

7.7 Primary Water Service and Pressure Zones

The Tacoma Water Service Area is divided into six Primary Service zones based on elevation and source of supply. These Primary Service zones are shown in Figure 7-4 and discussed below.

- Cumberland
- Fennel Creek
- Prairie Ridge
- Sunrise Standpipe
- McMillin Gravity
- Indian Hill

In 2005 these zones served 93,912 active service connections. Residential customers account for the majority of these connections with 45 percent of water sales to residential users.

Within the six major service areas and four subareas, 43 different pressure zones are maintained to accommodate the topography and pressure requirements. Table 7-6 lists the pressure zones as well as their elevation and respective primary service zone. Flow between the service levels is accomplished by a combination of reservoirs, standpipes, pumping stations, and regulating valves to maintain adequate flows at a pressure range of 30 to 100 pounds per square inch (psi).

7.7.1 Cumberland

The small residential community of Cumberland located in unincorporated King County is served by pumping from Pipeline No. 1, approximately five miles downstream from the Green River diversion. The pumping capacity to this zone is 0.5 MGD. Pumped water is delivered to the 0.12 MG Cumberland Reservoir prior to delivery to customers.

7.7.2 Fennel Creek

The Fennel Creek service area is served by pumping from Pipeline No. 1, about two miles west of Rhodes Lake. Pumping capacity is 3.4 MGD, although at present there is minimal demand as construction proceeds in this newly developing area. The Fennel Creek Pump Station is equipped with backup power, and the zone has an emergency intertie with the City of Bonney Lake.

7.7.3 Prairie Ridge

Prairie Ridge is served by pumping directly off Pipeline No. 1 via the 214th Street Pump Station and 198th Ave Pump Station. Up to 12 MGD can be pumped at these stations. Additional supply is provided by the Prairie Ridge Springs, which has a capacity of 0.8 MGD. The total storage in the zone is 2.8 MG in two reservoirs.

TABLE 7-6
Pressure Zone and Service Area Zone Designation

Pressure Zone	Service Area Zone	Elevation (ft)'
Cumberland	Cumberland	931
Prairie Ridge	Prairie Ridge	810

Pressure Zone	Service Area Zone	Elevation (ft)'
Fennel Creek	Fennel Creek	705
McMillin	Sunrise Standpipe	705
S. Summit High	McMillin Gravity	669
Indian Hill High	NE Tacoma	649
Alder Lane	McMillin Gravity	626
Highland	Sunrise Standpipe	621
Frederickson	McMillin Gravity	588
Gravity	McMillin Gravity	576
S. Summit (70th Ave.)	McMillin Gravity	576
Park Royal	McMillin Gravity	556
NE Tacoma	NE Tacoma	549
Westgate	McMillin Gravity	538
University Place	McMillin Gravity	531
Southeast Tacoma	McMillin Gravity	520
Sunrise Terrace	Sunrise Standpipe	519
Beverly Heights	Indian Hill	486
High Service	McMillin Gravity	478
North End	McMillin Gravity	446
Middle Service	McMillin Gravity	446
Woodland Avenue	McMillin Gravity	426
Harbor View	Indian Hill	426
Fife Heights Low	Indian Hill	411
Dash Point High	Indian Hill	411
Twin Lakes	Indian Hill	411
Overlook	Indian Hill	370
Grandview	McMillin Gravity	351
Browns Point	Indian Hill	346
Dash Point	Indian Hill	346

Pressure Zone	Service Area Zone	Elevation (ft)'
East Dash Point	Indian Hill	346
Portland Avenue	McMillin Gravity	346
Old Town	McMillin Gravity	346
Narrows	McMillin Gravity	328
High Cedars	McMillin Gravity	316
Chambers Bay	McMillin Gravity	290
Low Service	McMillin Gravity	251
Dash Point Low	Indian Hill	226
Hyada	Indian Hill	226
Titlow	McMillin Gravity	226
Day Island	McMillin Gravity	202
Lakota Beach	Indian Hill	186
Sunset Beach	McMillin Gravity	155

‘ USGS Datum (NGVD29)

7.7.4 Sunrise Standpipe

The Sunrise Standpipe zone surrounds McMillin Reservoir. Water is pumped directly from Pipeline No. 1 or Pipeline No. 2 through two parallel pump stations, both with backup power. The equalizing storage is provided by Sunrise Standpipe. The main storage for this zone is provided by McMillin Reservoir.

7.7.5 McMillin Gravity

McMillin Gravity zone is the largest zone in the Tacoma Water service area and comprises the areas served primarily by gravity from McMillin Reservoir, with localized pumping and pressure reduction for individual pressure zones. Because of the size of this zone, it is further reduced into four sub-zones for the purpose of select analyses.

576 Gravity Zone

The 576 Gravity zone has an upper elevation of 576 feet and is serviced directly from the McMillin Reservoir. This zone is scattered along Pipeline No. 2 and Pipeline No. 4 in independent pressure zones. Storage for this zone is provided by McMillin Reservoir. Additional water is supplied to some of the pressure zones by pumping from the gravity wells and most of the South Tacoma wells through the South Tacoma or Hood Street Pump Station. During most times of the year, this zone feeds the Indian Hill zone by gravity flow, although during summer peaks, Indian Hill may receive pumped water from the 576 zone.

478 High Service Zone

The High Service zone is the largest and most extensive subzone in the McMillin Gravity zone. Supply to this subzone is predominately from McMillin Reservoir through pressure reduction

facilities. Additional sources of water for this subzone are Well UP10 and Well UP1, which pump directly into the High Service zone. Equalizing storage for the High Service zone is provided by the Bismark, Fletcher Heights, and North End standpipes, backed up by McMillin storage.

446 Middle Service Zone

The Middle Service zone supplies water to North Tacoma and a belt along the side hill from South 17th Street through Old Tacoma, overlooking Commencement Bay. It supplies the waterfront from South 7th Street to the Town of Ruston through pressure-reducing valves. Equalizing storage for the south portion of the Middle Service zone is supplied from the Alaska Street Reservoir, which operates with an overflow of 446 feet. The reservoir is normally kept full. The North End Reservoir also overflows at an elevation of 446 feet, and provides storage for the north area of the zone. The reservoir supplies North Tacoma directly and also provides water to adjacent zones through pumping or pressure reduction valves.

251 Low Service Zone

The area served by the Low Service zone is composed mainly of the City's principal business district, Ruston Way, and the Tide Flats industrial area. This zone also can supply water to the Indian Hill zone by pumping. The Hood Street and Portland Avenue reservoirs feed the Low Service zone from an overflow elevation of 251 feet.

7.7.6 Indian Hill

The Indian Hill zone includes Northeast Tacoma, Fife Heights, Dash Point, and Browns Point. Water for this zone is supplied from the Gravity zone by gravity flow during most times of the year. During peak demand periods, water may be pumped from the Gravity zone, or if needed, pumped from Low Service through the Marine View Pump Station. Storage in the zone consists of 5 MG in the Indian Hill Reservoirs.

7.8 Distribution System

Tacoma Water's distribution system provides water service within an area of approximately 150 square miles, including land in both Pierce and King counties. Major features of the distribution system are described in this section.

The distribution system contains nearly 1,200 miles of pipe, of which six-inch diameter pipe accounts for nearly 34 percent of the total, eight-inch pipe accounts for approximately 32 percent, 12-inch pipe accounts for 18 percent, and other pipes range in diameter from two-inches to 24-inches. Table 7-7 lists the pipe sizes, miles of pipe, and percentage of total for each category. Cast-iron and ductile-iron piping comprising 83.3 percent of the pipe miles, with asbestos cement accounting for another 12.6 percent. The remaining is made of galvanized iron (0.20 percent), steel (0.39 percent), and plastic (3.48 percent).

The distribution system was designed to provide adequate looping. Water pressures generally range from an average of 55 psi in residential areas and average up to 100 psi in industrial zones. The spacing of valves in the system is determined on a case-by-case basis during the design of the facilities and is generally adequate to ensure outages do not affect a significant amount of customers.

All of Tacoma Water’s customers are served through metered connections varying in size from 5/8 inch to 30 inches. An automated meter maintenance program facilitates repair and replacement to ensure highly accurate meter reading. In order to provide efficient meter reading and repair work, the location and construction of services are standardized. Tacoma Water has installed AMR (automated meter reading) on all wholesale meters and all new customers with

three inch and larger meters for their domestic water needs. A pilot program will be implemented in 2006 to evaluate the feasibility and cost/benefit of implementing AMR systemwide.

TABLE 7-7
Distribution System Water Mains: Inside and Outside City

Main Size (inches)	Quantity (miles)	Percent of Total System
2	3.8	0.3
3	0.1	<0.1
4	71.8	6.2
6	395.3	33.9
8	367.2	31.5
10	18.5	1.6
12	210.0	18.0
14	0.9	0.1
16	52.0	4.5
18	5.7	0.5
20	17.5	1.5
24	22.1	1.9
Total	**1165**	

7.9 Groundwater and Distribution System Treatment

The groundwater supply system is principally treated only with chlorine for disinfection. Each source is not treated at the wellhead, rather several are blended together, and treatment is applied at multiple confluence points. Groundwater disinfection typically targets a dose of 0.6 to 0.8 mg/L. Chlorination also occurs, or is available at the outlet of two major finished water reservoirs: McMillin and Portland Avenue. This chlorination is required to maintain distribution system residual. The current target chlorine residual out of McMillin is 0.8 to 1.0 mg/L and is continuously provided. With the covering of Portland Avenue, rechlorination has not been required, but may be in the event of protracted use of the Portland Avenue Well, or in late autumn when chlorine demand and decay are higher.

Table 7-8 lists the major points and types of treatment in the system (other than the Green River).

TABLE 7-8
In-Town Water Treatment Facilities

Location	Type of Treatment	Treatment Objective	Comments
McMillin Reservoir	Gas Chlorination	Open reservoir rechlorination, distribution system residual	500 pound per day chlorinator and a 1,000 pound per day chlorinator. Supplied by ton-cylinders.
Portland Ave Reservoir	Batched sodium hypochlorite	Distribution system residual	Has generally proved unnecessary since covering.
South Tacoma Pump Station[1]	Tablet chlorinator	Groundwater disinfection	Infrequently used.
Hood Street Reservoir[2]	On-site chlorine generation (0.8%)	Groundwater disinfection	System capable of treating 40 MGD groundwater supply.
Prairie Ridge Springs	Batched Hypochlorite	Groundwater disinfection	Emergency source – treated at source.
UP Well 1	Batched Hypochlorite	Groundwater disinfection	Replaced the tablet chlorinator in 2006 due to sporadic chlorine residual – treated at wellhead.
Well 10C	Batched Hypochlorite	Groundwater disinfection	Unfluoridated public access well – local disinfection and contact time.
Well 12 A	Stripping Tower	Removal of Volatile Organics	Substantially oversized, all VOC results are non-detect after stripping – treated at wellhead.
Portland Ave Well	Blending	Arsenic reduction through blending	Green River water blended with PA Well (highest recorded Arsenic level is 11 ppb) at 3.5:1 ratio.
SE Wells 2&6	Batched Hypochlorite, 25% sodium hydroxide	Groundwater disinfection, corrosion control	System installed by SE Tacoma Mutual, operated seasonally – treated at wellhead.
SE Well 8	Batched Hypochlorite	Groundwater disinfection	Seasonal system installed by SETM – treated at wellhead.
SE Wells 11 & 11A	Batched Hypochlorite	Groundwater disinfection	Seasonal system installed by SETM – treated at wellhead.

Notes:
1. *Wells that can feed STPS are 1B,3A, 7B, 8B, 10C, &13A.*
2. *Wells that can feed Hood St include the above, and 2B, 4A, 5A, 6B, 9A, 11A, &12A.*

7.10 System Interties

Tables 2-2, 2-3 and 2-4 located in Chapter 2 – System Background summarize Tacoma Water's interties by water system name, location, pipe size, and use. The interties are for either wholesale or emergency use or are associated with the Second Supply Project. These interties have served as essential links for emergency service and help ensure reliable service for a large area.

7.11 System Controls and Telemetry

The existing telemetry and control system consists of a combination of microwave relay, telephone circuiting, fiber optic and direct loop facilities to monitor and control system operation and to report mechanical failures.

The microwave communication system provides communications and telemetry between the Green River Headworks operations control building and the Water Control Center in the City of Tacoma. Work has begun on upgrades to this system to convert it to a looped system and to connect it with other outlying sites including McMillin, Enumclaw, Indian Hill and Cascadia.

Tacoma Water's telemetry system is a state-of-the-art distributed control telemetry, control, and management reporting system. The system includes a Water Control Center, which is located in the Water Distribution Building, adjacent to the administration offices for field operations. The system provides flexible automatic control for each pump station, well, and key control valve to ensure adequate water pressure is maintained in Tacoma Water's distribution system. The Water Control Center provides the operator with information to ensure proper and efficient operation of each facility. The telemetry system is designed using the distributed control approach, where individual stations will continue to operate on local control if communication is lost with the central control office. The operator has the capability to override automatic operations of remote facilities to meet emergency or unusual operating situations. Audible alarm and visual display for each alarm condition provides a means to alert operations personnel when any operating limits are exceeded or malfunctions occur. A data management reporting system stores hourly and daily summaries received at the Water Control Center and records any alarm conditions.

7.12 Electrical Power

The reliability of a water system is highly dependent upon the reliability of the electrical power that operates the system's equipment. The following discussion describes the electrical power facilities for the Tacoma Water system.

The Green River Headworks, treatment and operational control buildings are supplied by Puget Sound Energy's Cumberland Substation. This substation is fed by a single electrical transmission line and is vulnerable to electrical outages. Outages reportedly occur approximately 6 to 8 times per year, with a normal maximum duration of four hours. During such outages, the headworks facilities are powered by three standby generators, located at the Intake, Headworks Control Building, and Chemical Treatment Facility. The generators are sized to operate all treatment equipment, electrical valves, control and monitoring equipment, and communication equipment. Critical facilities at the Chemical Treatment Facility are also supported by an uninterruptible power supply system.

Power for the North Fork Wellfield comes from the City of Tacoma-owned Baldi Substation. This substation can be fed either from the east or west with Puget Sound Energy's 250-kilovolt (kV) White River transmission line. Outages at the substation are rare because of Puget Sound Energy's priority to keep the White River transmission system operational. Maintenance of the substation and the two miles of underground electrical lines to the North Fork Wellfield is the responsibility of Puget Sound Energy, under contract to Tacoma Water. Electrical repairs at the North Fork Wellfield and other Tacoma Water facilities are provided by a contract electrical service and/or the Tacoma Power, which are fully equipped to handle any type of emergency electrical repair. A 500-kW standby diesel generator set upon a tri-axle trailer, with a 1,000-gallon fuel tank is available to operate one well at the North Fork Wellfield or various other facilities in town.

McMillin Reservoir is equipped with two standby generators. A 15-kW unit can operate all chlorination and instrument equipment. A 5-kW unit is used at the office building to run the communication and telemetry facilities.

Within the service area, all of the groundwater sources have electrical feed from at least two substations to ensure electrical reliability and a continued supply of water. Auxiliary generators are available at the Hood Street Reservoir/Pump Station, the Water Control Center, the Distribution Dispatch Center, and the J Street Standpipe, to ensure continued operation of communication monitoring, hydraulic control, and telemetry equipment.

Many of the booster stations do not need auxiliary power. Stations that do not have auxiliary power have other sources at lower pressure, or system storage, which would provide time for repair. During power failure the mains remain full, although normal pressure may not be available. Some pump stations pump to storage tanks which could become depleted in an extended outage. In these cases and where lower pressure water cannot be provided to the zone, backup power is installed. These pump stations include the 214th Street Pump Station (250-kW), Indian Hills Pump Station #1 (35-kW), the McMillin Pump Station No. 1 (65-kW), McMillin Pump Station No. 2 (250-kW) and Fennel Creek Pump Station (250-kW). Although the Cumberland zone can be fed at low pressure by gravity flow from Pipeline No. 1, it is set up with a manifold for an emergency gas powered pump. The McMillin Pump Station No. 2 generator and the Fennel Creek generator are portable for use at other water division facilities as needed. Several pump stations, including Indian Hill #2, 356th St , and 198th Ave Pump Stations, are set up with transfer switches and power receptacles for use with portable standby power. A 500-kW trailer mounted portable generator is kept in Tacoma, with another kept at the North Fork Wellfield.

Two of the North Fork Wells are equipped with electrical equipment to allow for connection to backup power. One 500-kW generator is kept at the wellfield and is connected to a well. In town, two wells are set up to be easily connected to backup power. An additional well is planned to be modified in 2006 for backup power.

CHAPTER 8

OPERATIONS AND MAINTENANCE PROGRAM

CHAPTER 8

OPERATIONS AND MAINTENANCE PROGRAM

8.1 Introduction

The Operation and Maintenance (O&M) of the Tacoma Water system is a broad and multi-faceted effort. This chapter provides an overview of the major themes of O&M, including organizational structure and responsibilities, normal or routine operations, and examples of several distinct maintenance programs. Significant additional information is maintained by each operating section for the detailed O&M associated with the system. Priorities for improvements in O&M programs are presented.

As noted in Chapter 1 – Introduction, four Tacoma Water Business Plan Strategic Initiatives do not result in a capital expensive, but rather the Strategic Initiatives establish priorities related to Tacoma Water O&M programs. This section ends with a discussion of these four Strategic Initiatives.

8.2 Water System Responsibility and Authority

8.2.1 Organizational Structure

Appendix K contains a general organization chart for Tacoma Water. Tacoma Water is responsible for design, construction, operation, maintenance, quality control, and management of the water system.

Tacoma Water is separated into four sections, with the responsibilities outlined below. In addition, Tacoma Water receives support services from other utility divisions and various other City of Tacoma departments.

Water Distribution Section

This section is responsible for construction, operation and maintenance of the distribution system including mains (two-inch to 24-inch), hydrants, valves, service connections and meters. New and replacement water mains are installed by private contractors with engineering, design, inspection and construction management whether financed by local improvement districts, distribution capital funds, or private developers are performed by Water Distribution staff. Water service connections and meters are installed by section staff.

The Water Distribution section is also responsible for: customer service in support of billing issues, new services and service concerns; permitting and franchise management; maps and records maintenance; system analysis by hydraulic modeling; development and maintenance of GIS; SAP implementation; and the water apprenticeship program.

Water Quality Section

This section is responsible for management, operation, and maintenance of the Green River Headworks and watershed, the primary water source for the Tacoma Water system. This section designs, installs, operates, and maintains water treatment equipment throughout the water system. The Water Quality section also responds to all matters relating to water quality, from the source to the customer, including compliance and investigative testing and monitoring for contaminants and responding to customer service inquiries. This section is primarily responsible for

Washington State Department of Health (DOH) regulatory compliance and reporting and participates in relevant drinking water legislation and rule-making.

With the completion of the Second Supply Project (pipeline and initial treatment phase), the Water Quality section is responsible for the operation and maintenance of all Second Supply Project facilities associated with the Green River Headworks and Green River Watershed.

Water Supply Section

This section is responsible for operation and maintenance of Tacoma Water's transmission mains and storage facilities as well as the design, construction, and inspection of major civil engineering projects. The Water Supply section is also responsible for design, construction, operation, and maintenance of Tacoma Water's auxiliary wells system, which augments the Green River supply system, and for the reservoirs, standpipes, pumping, and pressure reducing stations, as well as major mechanical and electrical equipment.

With the completion of the Second Supply Project, the maintenance of the Second Supply Project Pipeline is performed by the Water Supply section. This section also has the primary responsibility for daily operation of the Second Supply Project Pipeline including issues such as supply to project partners, stored and river water availability, North Fork well supply, permit and agreement obligations and overall balance of supply sources.

Water Resource Planning Section

This section has the responsibility to plan for cost effective resources to meet future needs, including water supply projects and conservation activities. This section also manages watershed lands, fisheries, and wildlife issues. Financial, water system and business planning activities for Tacoma Water are coordinated through this section. Computer technical support is provided, as well as property acquisition and disposition, and securing and granting rights-of-way easements and permits.

With the completion of the Second Supply Project, the Water Resource Planning section has the primary responsibility for administrating the Second Supply Partner's Agreement, including preparing financial reports and maintaining billing records.

8.2.2 Personnel Responsibilities and Authority

Tacoma Public Utility Board

The Public Utility Board is a five-member panel appointed by the Tacoma City Council to oversee Tacoma Public Utilities. The Board provides policy direction and guidance, appoints the Director of Utilities, approves major expenditures, contracts and the biennial budget.

Director of Utilities

The director of utilities is appointed by the Public Utility Board and is directly responsible to the Board. This individual is responsible for coordinating planning efforts among the various divisions of Tacoma Public Utilities and for administering the policies, laws and ordinances governing the operation of Tacoma Public Utilities.

Water Superintendent

The water superintendent is responsible to the director of utilities. This individual is responsible for developing Tacoma Water budgetary requirements, as well as the administration and management necessary for effective performance of the water system and implementation of City of Tacoma ordinances and departmental policies regarding water service.

Water Distribution Manager

The Water Distribution manager is responsible to the water superintendent. This individual organizes, coordinates and directs the engineering, construction, maintenance and operations activities of the Water Distribution section.

Water Quality Manager

The Water Quality manager is responsible to the water superintendent. This individual organizes, coordinates and directs the management of the Water Quality section. This includes watershed management, water treatment, groundwater protection, cross-connection control and water quality monitoring.

Water Supply Manager

The Water Supply manager is responsible to the water superintendent. This individual directs the engineering, construction, maintenance and operation activities of the Water Supply section.

Water Resource Planning Manager

The Water Resource Planning manager is responsible to the water superintendent. This individual organizes, coordinates and directs the management of the Water Resource Planning section. This includes water supply planning; environmental stewardship; financial planning; watershed, fisheries and wildlife resources; computer technical support; and the water conservation program.

8.2.3 Operator Certification

Waterworks Operator Certification

WAC 246-292 requires that all Group A (serving 15 or more connections) public water systems have specified certified operator(s) in responsible charge. This program, referred to as the State Waterworks Operator Certification program, is administered by DOH.

Certified personnel are required for positions in responsible charge of a public water system or major segments of a system, and responsible for monitoring or improving water quality. The minimum requirements for Tacoma Water personnel are shown in Table 8-1.

TABLE 8-1
Certified Operator Positions

Position	Certification Level
Water Superintendent	WDM 4
Water Distribution Manager	WDM 3
Water Quality Manager	WDM 3
Water Supply Manager	WDM 3
Water Treatment Plant Supervisor	WTPO 2
Water Treatment Plant Operator	WTPO 1
Water Control Station Operator	WDM 1

All personnel currently occupying these positions are at least at the level indicated. In addition, several other persons within Tacoma Water hold Water Works Certifications at a variety of levels.

All certified personnel must review their certificates annually and demonstrate their continued professional growth in the field by accumulating three related college credits of continuing education units (CEUs) every 3 years.

Tacoma Water has run a Washington state approved water utility apprenticeship program for over 20 years. All staff in field positions, including construction inspectors, are required to successfully complete the apprenticeship program prior to advancing in the organization and performing responsible, independent activities on the system. The apprenticeship program includes 3000 hours of on the job training and two years of after hours college level courses in basic water works, including hydraulics, water quality, basic electricity, blueprint reading and other subjects.

Asbestos Worker Certification

Washington Industrial Safety and Health Act (WISHA) requirements for worker exposure to asbestos pipe must be satisfied. Permits and certified personnel are required for asbestos work in buildings and utility vaults. Short sections of asbestos cement pipe no longer needed for the water system may be left in trenches and buried when backfilling. If the abandoned pipe is left in the trench and buried, neither permits nor certified personnel are required. In addition, the utility does not have to notify the Puget Sound Air Pollution Control Agency (PSAPCA).

Tacoma Water has certified asbestos workers and will continue handling asbestos/concrete (A/C) pipe in an appropriate manner. The PSAPCA suggests using hand tools, keeping the materials wet, and cutting by the "score and break" method whenever possible. This program is coordinated and overseen by Tacoma Water's safety coordinator.

8.3 Customer Service

8.3.1 Customer Service Policies

Tacoma Water has adopted Customer Service Policies to document policies and fees relative to new services, main extensions, meter turn ons/offs, hydrant rentals and various other conditions and requirements for service from Tacoma Water's system. (Please see Chapter 3 – Policies and Design Criteria for additional information.)

8.3.2 Water Service Request Process

New service requests fall into the following categories:

- Service Outside Tacoma's Retail Service Area
- Service Within Tacoma's Retail Service Area
- Wholesale Service
- Emergency Service
- Satellite System Management

The process for responding to these requests is detailed in Appendix L. Tacoma Water's retail service area is shown in Figure 2-1. Retail water service is provided in both Pierce and King counties and several incorporated cities, including Tacoma, University Place and Ruston to which Tacoma Water is the sole provider of water. Since much of the Tacoma Water service area is developed, main extensions to serve new developments typically do not have many, if any, off-site mains required to be constructed. Some large tracts of undeveloped land within the service area do exist, particularly in the eastern extents of the service area. In such circumstances, extensive water facilities will be required to provide service.

Tacoma Water's distribution system is constructed by the owners of properties benefited by the provision of water service. This is accomplished through Private Contracts, Water Main Charges and Local Improvement District assessments. Once the mains are constructed, the maintenance and eventual replacements are funded through rates.

In accordance with the requirements of the Washington State Growth Management Act (GMA), a building permit cannot be issued until water is available to serve the proposed development. Water availability for all growth and development in the City of Tacoma is guaranteed. A "Certificate of Water Availability" is issued by Tacoma Water for development occurring outside Tacoma city limits and within its service area if there is sufficient water supply to meet the domestic water service and fire flow requirements of the applicant's proposed project. Tacoma Water tracks such commitments for water service to assure capacity is available prior to development occurring.

8.3.3 Service Complaints

Service complaints are logged in and responded to based on priority and availability of staff. A data base is maintained with information on who made the complaint, when it was made and what it was regarding. All complaints logged as priority 1 (emergency) are responded to within one hour. All others are responded to within one business day. Analysis of service complaints is one of the criteria used to target specific mains or service lines for replacement. Additionally, over the past 20 years Tacoma Water has had an ongoing program to upgrade areas where water pressure is low to a higher service zone and to provide better pressure for the customers in the affected area. A summary of all water quality complaints is provided to DOH with each monthly report.

8.4 Safety Program

Tacoma Water's safety program involves a commitment by management and staff to provide a safe working environment for all employees. The program involves many elements including safety education and training, regular and special safety meetings, a comprehensive safety manual, and dedication of one full-time employee as the safety coordinator under the direction of the water distribution assistant manager. Safety considerations come first for all aspects of the management, operation, and maintenance functions of the water system.

8.5 Normal System Operations

Multiple water quality and water supply issues affect normal operations. These include the following all of which are discussed in detail below:

- In-stream Flow Requirements
- Flood Control
- Winter Operations
- Summer Operations
- Gravity Flow System
- Unfiltered Surface-water Supply
- Pipeline No. 1 Customers
- Turbidity

- Open Reservoirs
- Groundwater

8.5.1 Instream Flow Requirements

Tacoma has a claimed right to 73 MGD or natural inflow, whichever is less, from the Green River known as the First Diversion water right (FDWR). The right is considered a claim rather than a certificated right because it predates the establishment of state water right law. The Muckleshoot Agreement of 1995 (MIT Agreement) requires Tacoma to guarantee minimum river flows at the Auburn gage once the Second Supply Project is in operation, and this guarantee will require that Tacoma either reduce the use of FDWR water or use water stored at Hanson Dam (once the Additional Storage Project is online) for streamflow support. Modeling efforts have indicated that the FDWR may be reduced by approximately half for about a month in order to meet this guarantee in dry years, with more severe reductions in the worst case years.

The Second Diversion water right (SDWR)is the water right permit associated with the Second Supply Project. It provides up to 65 MGD, of which Tacoma's share is 15/36, or 27 MGD. The remainder is shared between the Second Supply Project Partners: the Lakehaven Utility District, the City of Kent, and the Covington Water District. The SDWR is limited by minimum river flow levels established by the State of Washington, and by minimum and guaranteed river flow levels set by the MIT Agreement. The limitations are such that SDWR water will generally not be available during summer and early fall except during wet years. Because Tacoma Water's FDWR is senior to state in-stream flow requirements, only the SDWR must meet the State requirements.

8.5.2 Flood Control

During the wet season, Howard Hanson Dam and Reservoir are operated by the US Army Corps of Engineers (USACE) for flood-control purposes. This means that Tacoma Water's water quality and water supply goals must be pursued in a manner that is compatible with the USACE flood control goals. To the extent possible, the USACE coordinates activities to minimize adverse impacts to Tacoma Water. During flood events and other periods of high turbidity, Tacoma Water uses North Fork Wellfield water in place of turbid surface water.

8.5.3 Winter Operations

Typical winter demands are currently less than the capacity of the river diversion. During winter, the diversion is reduced to match demand, and the local wells are usually not needed. The North Fork Wellfield is used when needed to supplement or replace turbid Green River water with clean groundwater. The wells can only be used in place of river water, and only at times the river is turbid (other than during special cases such as during construction activity on the river intake works). (See Section 6.4.2 for additional information.)

8.5.4 Summer Demands

As with most water utilities, Tacoma Water's summer demands are significantly higher than winter demands. Summer demand typically exceeds the supply available from the Green River, so Tacoma Water uses the service area wells to help meet peak summer demands. In order to minimize pumping costs, well water is generally supplied to the lowest pressure zones first and is only pumped to the higher pressure zones when necessary. Wells are sequenced taking into consideration energy, treatment, and operational flexibility considerations.

8.5.5 Gravity Flow System

The founders of the City of Tacoma water system had the foresight to design a surface water supply system based on gravity flow, avoiding pumping costs for much of the service area.

Pipeline No. 1 was designed as a gravity flow main, which provided advantages such as the ability to use lower pressure pipes than would have been needed for a pressurized main. Gravity flow mains work well when run at full capacity, but present some complications if run at partial capacity. When Pipeline No. 1 is flowing at less than full capacity, some sections flow at atmospheric pressure and contain air. Tacoma does not have the ability to either operate the pipeline continuously at full capacity, or to convert it to a pressure main. Operating at full capacity would require that excess water be wasted during winter when demand is less than the pipeline capacity. Converting the pipeline to a pressure main would require replacement of much of the pipeline, in particular concrete sections that do not have excess ability to handle increased pressure. The Second Supply Project Pipeline was designed as a pressure main, so it is always completely full at all flow rates. Flow is apportioned between the two lines in order to maximize flow through McMillin Reservoir and to minimize age of water at low flows in the Second Supply Project Pipeline.

8.5.6 Unfiltered Surface Water Supply

Tacoma Water's Green River supply is an unfiltered surface water supply, and must meet the source water quality and site specific criteria to avoid filtration. These requirements are fully described in WAC 246-290-690, and are summarized in Table 8-2. Under the 1996 Amendments to the Safe Drinking Water Act, the Environmental Protection Agency now has the authority to consider limited alternatives to filtration if an unfiltered system meets stringent watershed control requirements, but fails to meet one of the other criteria. This provision must result in a level of public health protection from pathogenic organisms better than filtration plus chlorine disinfection alone.

TABLE 8-2
Criteria to Remain Unfiltered

• Raw water fecal coliform <20 per 100 mL in 90 percent of samples	• Detectable residual in 95 percent of distribution system samples
• Turbidity < 5.0 NTU prior to point of primary disinfection	• Watershed Control program
• 3-log *Giardia*, 4-log virus disinfection of the source water	• Compliance with Total Coliform Rule
• Disinfection system redundancy	• Compliance with Stage 1 Disinfectants / Disinfection Byproducts Rule
• Minimum disinfection residual entering system of 0.2 mg/L at all times	• No evidence of Waterborne disease outbreak
• Access to a certified laboratory 365 days year	

8.5.7 Customers along Pipeline No. 1

Tacoma Water has some customers along the upper sections of Pipeline No. 1 such as the City of Enumclaw that are served from direct connections to the pipeline. Other customers are fed from the small distribution system at Cumberland, which receives its water from Pipeline No. 1, and a small number of direct retail customers receive service directly from the pipeline. This requires operational awareness in terms of water supply and water quality. For example, disinfection concentration-time (CT) requirements are met at the Cumberland intertie point using normal disinfectant concentrations. The reservoir at Cumberland allows Tacoma Water to provide adequate CT for these customers. The reservoir is not taken out of service for routine

maintenance during the time of year when water temperatures are low and CT is dependent on the flow passing through the reservoir.

8.5.8 Turbidity

Tacoma Water uses both surface and groundwater for water supplies. Diversion and transmission facilities are available to divert up to 167 MGD from the Green River and deliver it to the Tacoma Water Service Area and to the Second Supply Project partners (Partners) in South King County. The Partners do not own any of the North Fork Wellfield capacity, so their connections are shut off at times when river turbidity requires use of the North Fork wells in place of river water. When the river is too turbid to use, the North Fork Wellfield in the watershed is activated, and its production is used in combination with or in place of the river water. To meet demands in excess of the river system's capacity and that of the North Fork wells, other wells located in or near the City of Tacoma are used.

8.5.9 Open Reservoirs

The Tacoma Water system has one remaining open reservoir, at McMillin. The 2000 Tacoma Water Comprehensive Water System Plan indicated that the McMillin Reservoir would be covered by 2005, which did not occur. Renewed emphasis on other critical infrastructure needs, including main replacement and major investment in new treatment have been key focuses of Tacoma Water over the past six years.

The original budget estimate of $4.1 million included in the 2000 Water System Plan has been shown to be inadequate. A floating cover, once thought to be a reasonable solution, has been implemented with reportedly unsatisfactory results in other municipal settings. While the capital costs are lower, the operational costs are high, and integrity of a floating cover is challenging to maintain. Tacoma Water hired Tetra Tech/KCM in 2003 to evaluate reservoir covering options, resulting in a recommendation that basin replacement with 30-35 MG prestressed concrete tanks is the best alternative. The total project cost is now estimated to be approximately $50 million, although this may be developed in two phases.

Current projections call for the first of the three 30-35 MG tanks to be constructed in 2009 with a second to be constructed in 2015. Once two basins are in service it is likely that any remaining uncovered basins will be removed from service. The final tank would be constructed as system needs dictate, but likely in the 2019-2020 timeframe.

8.6 Routine Operations

8.6.1 General

Routine operations involve regular tasks and procedures Tacoma Water has implemented to ensure that the water system provides safe, economical, high-quality water to customers. Inspection, monitoring, testing, cleaning, controlling, maintenance, and reporting systems are developed to achieve the goal of high-quality service. Several key procedures are presented below.

8.6.2 Reservoir Cleaning and Main Flushing

Tacoma Water's closed (covered) reservoirs and standpipes are normally drained, cleaned, and inspected every three years, while the remaining open basins at McMillin are drained and cleaned every year. The Headworks (raw water) tank is drained and cleaned every five years.

Two full-time, one-person crews are assigned to flushing all dead-end water mains in the system, as scheduled in the established flushing program. Other field crew assist, as needed, with main flushing in response to water quality calls from customers. The program goal is for all dead-end hydrants and blowoffs to be flushed every six months. All new mains are thoroughly flushed and

sampled before being placed in service. Additionally, Tacoma Water has implemented a directional flushing program to remove silt buildup in the distribution system. After nearly ten years, the first cycle of this flushing program is nearing completion. Subsequent directional flushing cycles should take no more than five years.

8.6.3 Operator Instructions

The Water Control Center and Headworks operators, and staff assigned to McMillin Reservoir have written procedures related to their facilities. Procedures relate to both normal and emergency operations. Supervisory and engineering personnel regularly supplement or revise the instructions in writing or by electronic mail. Copies of the Emergency Operating Plan are provided to supervisory and lead office and field personnel. This plan is updated annually. Normal daily communications occur between operating personnel and operations engineers and other office staff. Written operating procedures are prepared and followed for complex valve operations such as taking reservoirs in or out of service, isolating facilities for maintenance, or pipeline shutdowns. A Procedure Manual is also in place to support maintenance and operation of the distribution system, including safety procedures and record keeping.

8.6.4 Use of Fire Hydrants

City of Tacoma Municipal Code sections 12.10.510 and 12.10.520 provide for the authorized use of fire hydrants. Only authorized Tacoma Water, Fire Department, or Public Works employees may operate the hydrants, unless specific permission is given and a fee is paid. Contractors, street cleaning firms, manufacturers, and others often obtain permission for special use of hydrants. Restrictions are in place for hydrant use rental in areas where known water quality problems occur with intermittent hydrant flow. Additionally, hydrants used by others are checked to assure they are properly shut off after use to reduce leakage and verify performance.

Hydrant fire flow tests are conducted by Tacoma Water crews, as requested by customers, or as needed to verify water system conditions and calibrate the hydraulic model.

8.7 Preventive Maintenance

8.7.1 Special Programs

The Distribution Water Main Replacement Program is used to replace water mains known to be hydraulically undersized, of substandard material, or requiring frequent repair.

The Systematic Maintenance and Renewal Team (SMART) Program targets all water main appurtenances (hydrants, valves, services, and meters) for maintenance or replacement. Dedicated crews systematically move from neighborhood to neighborhood to complete system upgrades, starting with older neighborhoods first.

8.7.2 Distribution Mains

In 1995 the Distribution Main Replacement Program was funded in order to address the issue of aging infrastructure. Prior to that time, the projected age of Tacoma's distribution mains would have been 500 to 600 years due to the limited funding for replacements. Most in the industry consider water mains to have a useful life of around 100 years. Over the past ten years, the weakest and most fragile parts of the system have been addressed through this program. In 2005, Water Distribution staff analyzed the progress of the program, industry trends and information regarding infrastructure aging and replacement strategies and system information derived from service calls, GIS and Tacoma Water's hydraulic model. Tacoma Water produced a report which will be the road map going forward for this critical program. The main replacement report provides a strategy for analyzing multiple data to determine which sections of main should be prioritized for replacement each budget biennium. In the 2005/2006 budget biennium eight

million dollars was allocated to the Main Replacement Program. Each biennium an additional one million will be added until the funding level achieves a responsible useful life for mains. As information is developed within the Water industry to allow us to better predict life of our assets and as new strategies become available for extending these facilities, the Main Replacement Report will be updated to reflect these trends and strategies.

The focus of replacements over the past ten years has been acquired poor quality A/C mains, 2-inch galvanized steel, and old lead joint cast iron mains. The AC mains tend to fail dramatically causing a great deal of damage and inconvenience for Tacoma Water customers. The galvanized mains in addition to being a water quality problem are undersized and do not provide fire protection or in some cases adequate service pressure. Additionally, the cast iron mains installed in the1950s, post World War II, has been problematic and is of poor quality pipe. These mains will continue to be addressed through the replacement program until they are no longer an issue.

Currently over 1,165 miles of main are in the distribution system (two-to-24 inches in diameter). Tacoma Water sets priorities for which mains are to be replaced by using the criteria established in the report referenced above. The criteria include pipe material, age, history of leaks, water quality complaints, level of potential liability, critical customers and opportunities to synchronize with other utility/road construction and urban redevelopment. As older neighborhoods and commercial districts renew and recreate themselves, the opportunity to rebuild water distribution infrastructure with other utilities concurrently with new road and streetscape improvements presents itself. Such a joint partnership opportunity is the optimum solution for infrastructure projects. For example, plans can be coordinated such that the disruptions to the area are minimalized, costs are reduced through larger projects and once the projects are done there is little future disruption by others digging to replace their infrastructure or respond to growth. One of the primary reasons for mains failing is the disruption of the bedding for the pipe. Trench settlement can lead to leaks and main failures. As a result of coordination with infrastructure projects of the multiple jurisdictions located in the Tacoma Water service area, added progress toward meeting Tacoma Water's main replacement goals has been realized.

Regular leak detection surveys are conducted over large portions of the distribution system. Non ductile iron piping in the distribution system is generally surveyed every five years. Ductile iron piping that is located in corrosive soils has been added to the surveys. Surveying smaller portions of the distribution system on an annual basis with the goal of surveying all parts of the system at least every five years is being considered for the future. The information gathered on the system through this surveying program is of value for further informing the main replacement formula and for determining if there are trends occurring with respect to infrastructure deterioration or needed facility maintenance.

8.7.3 Transmission Mains

The 60 miles of Pipeline No. 1, Pipeline No. 2 and Pipeline No. 4 transmission main right-of-way are patrolled weekly. The 34 miles of Second Supply Project Pipeline right-of-way include areas where access is limited, so only selected areas of this line are regularly patrolled. In many cases, limited access provides the benefits of less illegal dumping and less vegetation and roadway maintenance. On the accessible rights-of-way, the right-of-way maintenance program includes mowing, brush-cutting, sign-posting, guardrail and barricade maintenance, and patrolling to detect leaks, unauthorized use, or possible changes in slope stability, drainage, or adjacent uses that may affect Tacoma Water's operation. Problems such as garbage dumping, missing signs, or damaged barricades are resolved when found. Air valve and blowoff valve assemblies are checked and serviced as needed, at least annually, with most checked every 6 months.

Cathodic protection systems are checked twice annually. A maintenance program is currently underway to repaint exposed pipeline sections, including removal of lead based paint at some sites.

8.7.4 Pump Stations and Other Buildings

Pump stations, well stations, and other Tacoma Water buildings are visited regularly. When pump equipment is operating, the facilities are inspected and maintained at least weekly. Equipment oil levels, unusual noises or odors, leaks, temperatures, and unusual vibrations are checked and investigated. Standby generators are exercised and maintained weekly. Roofs are inspected annually for all buildings and repaired or replaced as needed. Other building maintenance or repairs are completed as needed.

8.7.5 Valves

The transmission system has over 191 valves at 24-inch and larger diameters. The valves are partially tested every 4 years. However, full testing of these valves is not confirmed by fully closed conditions because the transmission system must be kept in service and cannot be shut down for routine valve operations. Valves are repaired or replaced as needed.

The distribution valve maintenance program includes exercising the almost 25,000 valves in the system at least once every five years. SMART crews, main repair crews, hydrant crews, and others operate many of the valves more often than every five years. Valves are checked for leakage or defects and to ensure they can be shut off when necessary. Valves over 60 years old are being replaced by SMART and other crews, when appropriate. Over 150 valves are replaced each year.

Pressure-reducing and relief valves are inspected every six months, with varying levels of maintenance being performed on a three-year rotation. All valves are fully serviced or repaired every three years.

8.7.6 Services

Tacoma Water has been actively replacing smaller (5/8- to 2-inch) old galvanized service lines with copper services at a recent rate of about 1,000 per year. Over the last ten years, 60 to 70 percent of all service leaks in the distribution system have been attributable to galvanized services. Also, many of these galvanized services are connected to the main with a short piece of lead pipe called a gooseneck, which is removed during service replacement. Old galvanized services can cause rusty water and low pressure for customers. Approximately 10,000 remain to be replaced. This constitutes 12 percent of all small service lines.

Plastic service lines are being replaced with copper pipe at the rate of about 500 per year. Approximately 10,000 remain to be replaced. Cracked plastic lines, caused by embrittlement, caused Tacoma Water to begin replacing plastic lines in 1985.

Approximately 3,000 service lines in the distribution system are larger than two-inches. The galvanized steel service lines are being replaced with ductile pipe, and bypasses are being installed. Approximately 400 galvanized steel services remain to be replaced.

8.7.7 Meters

There are over 85,000 meters in the water distribution system. All residential meters are scheduled to be replaced on or near a 20 year cycle or sooner if they should fail while still under warranty. Residential meters, sized in the 5/8- to one-inch range, that are replaced, are scrapped locally and replaced with a new meter. The system includes nearly 3,200 commercial and fire service meters in the 11/2- to 12-inch range. These meters are tested and rebuilt on a regularly

scheduled basis determined by the size and type of meter and reinstalled at some other location within the system. The system's high volume meters are identified and tested on an annual basis.

8.7.8 Reservoirs

Tacoma Water operates and maintains three open concrete reservoir basins and nineteen covered concrete and steel reservoirs and standpipes within the water system. Reservoir and standpipe cleaning is carried out on a three year cycle for closed facilities, annually for the open basins, and on a five year cycle for the enclosed raw water Headworks Tank, which holds North Fork well water. Routine maintenance and-repair completed by Tacoma Water crews include washing, repair of spalled concrete and joint caulking in open reservoirs, and correcting deficiencies identified during cleaning or safety checks.

More extensive work such as painting steel reservoirs and standpipes, strengthening tanks for seismic stability, and covering or replacement of reservoirs is performed by either contractors or Tacoma Water crews.

Cathodic protection systems are checked regularly, and painted reservoirs are typically repainted every 12 to 15 years.

8.7.9 Hydrants and Blowoffs

The water system includes more than 9,600 fire hydrants that are maintained by water distribution crews. Many hydrants are visually inspected and operated by fire departments and fire districts within the Tacoma Water's service area. Additionally, Tacoma Water's Hydrant Maintenance Program calls for specialized maintenance to renew all hydrants every four years. All solid barrel hydrants and those of non standard size, such as four-inch, are being replaced with modern hydrants. The directional flushing team also checks hydrants they use to assure that they are properly functioning and accessible.

Blowoffs at the end of dead-end mains are checked and flushed every six months. Where possible new mains are designed as loops to avoid dead ends.

8.7.10 Water Treatment Equipment

An overview of water treatment facilities for the Green River and in-town wells is included in Chapter 7. Each location and piece of equipment has an assigned water service mechanic charged with maintaining all facilities in an appropriate state of repair and readiness. Some infrequently used facilities are mothballed during the winter, and must be exercised and refreshed (chemical solutions, etc.) before each operating season. A data log of work completed is maintained. The new Green River facilities have a large number of systems and components, and the maintenance work plan lists a repair interval and the responsible party (either Tacoma Water staff, or external contractor) for each component or system.

8.8 Second Supply Operations

The Second Supply Project consists of the Second Supply Project Pipeline, Green River intake modifications, treatment upgrades including the chemical treatment plant at the Headworks, additional storage at Howard Hanson Dam, and multiple environmental mitigation projects, located within the controlled watershed and elsewhere in the Green River basin. The Second Supply Project was developed as a joint venture through an entity known as the Regional Water Supply System (RWSS), a partnership between Tacoma Water, the Lakehaven Utility District, the City of Kent and the Covington Water District. Operation and maintenance of the RWSS facilities is jointly funded, but is carried out entirely by Tacoma Water, in a manner as described in the *Second Supply Project Partnership Agreement, 2002.*

Water deliveries are scheduled on a weekly basis by an assigned Tacoma Water engineer. Tacoma tracks availability of run-of-the-river water for the RWSS, and when available, Tacoma will also track and coordinate delivery of stored water at Howard Hanson Dam. Tacoma maintains financial and water accounting records for the RWSS, providing reports in accordance with the Partnership Agreement. Daily flow records and other daily data are available to the project partners through a secure website. A monthly meeting is held by the project partners to discuss any issues or concerns related to the project. An operations subcommittee also meets monthly to deal with operational issues at a more detailed level than would be appropriate for the full committee.

8.9 Emergency Intertie Operations

State and local water supply plans encourage adjoining water utilities to share interties (connections) for emergency supplies of water. Often the intertie mutually benefits the connected water purveyors because water can move in both directions.

Tacoma Water has 20 emergency interties with 14 different water utilities. Most interties have meters or are prepared for meters to be quickly inserted. The meters can be placed properly for the direction of flow. City ordinances and customer service policies delineate procedures for installing and operating emergency interties.

8.10 Water Shortage Response Plan - 2005

In the event of weather patterns or water system operating emergencies that challenge Tacoma Water's ability to meet customer demand while maintaining guaranteed minimum stream flows in the Green River, Tacoma Water will implement its Water Shortage Response Plan (WSRP).

A water shortage, as it applies to Tacoma Water's supply system, is a temporary and insufficient flow of water in the Green River and/or lack of groundwater supplies that cannot be offset by supply of water from other portions of Tacoma Water's well, reservoir and distribution system. The Green River flow is measured at the U.S. Geological Survey stream gauges at Palmer (USGS #12106700) and Auburn (USGS #12113000). Such a shortage may be caused by insufficient snowpack and precipitation within the watershed, an insufficient volume of water available in the supplemental groundwater system, or a combination of each.

Water shortages can occur at any time, but Tacoma Water generally categorizes droughts according to their seasonal influence. A spring drought actually occurs during summer, but develops during the spring, usually because of low snowpack combined with lower-than-normal spring rains. Because there is minimal precipitation in summer, watershed conditions prior to summer govern streamflow during summer. A fall drought is much more difficult to foresee because it is caused by delayed fall rains. When dry summer conditions extend into fall, streamflow continues to decline, which can be particularly critical because salmon spawning begins in fall. Tacoma Water has experienced more fall droughts than spring droughts.

Water shortages related to system operating emergencies are not as predictable. Shortages may result from failures of major transmission mains; loss or failure of multiple wells, pump stations or water treatment systems; or contamination of the Green River upstream of the intake. Any major loss of a significant source of supply may require Tacoma Water to implement one or more stages of the WSRP.

The WSRP includes four stages of response related to droughts or other supply shortages. These include Advisory (Stage 1), Voluntary (Stage 2), Mandatory (Stage 3), and Emergency (Stage 4). Stages 1 through 3 will be used in response to droughts and water system disruptions and Stage 4 will be used in response to disasters.

During a drought, Stages 1 through 3 will be implemented in sequence based on Tacoma Water's evaluation of current and projected conditions. Conditions may include weather, streamflow, rainfall, reservoir storage level and anticipated fish runs. As conditions increase in severity through the three stages, consultation and collaboration with related resource and water management agencies will also increase. Actions of the previous stages will remain in effect in each successive stage. Water supply or use patterns could also be affected enough to impose Stages 2 or 3 without implementation of prior stages by a water system disruption, or by a volcanic eruption that emits ash affecting Tacoma Water's service area.

Tacoma Water's wholesale customers are expected to develop a water conservation and water shortage response plan for their own planning purposes or to follow Tacoma Water's conservation program implementation process and WSRP. In particular, these agreements include a provision that wholesale customers will assist and support emergency curtailment measures required to manage demand during an emergency or shortage.

8.11 Cross-Connection Control Program

As stipulated by Washington Administrative Code (WAC) 246-290-490, the purpose of the purveyor's cross-connection control program shall be to protect the public water system from contamination via cross-connections. Categories of cross connections requiring backflow prevention assemblies are defined by Washington state law and Tacoma Water policy. Required backflow prevention assemblies must be models approved by DOH. An effective program requires coordination among the purveyor, the customer, the administrative authority, and DOH. Trained personnel and the enabling of local ordinances are critical to establishing and maintaining an effective cross connection control program.

Tacoma Municipal Code Section 12.10.220, prohibits uncontrolled cross connections. Tacoma Water operates a thorough cross-connection control program designed to comply with DOH standards and manuals of standard practice including the American Water Works Association manual, Accepted Procedure and Practice in Cross-Connection Control.

Key elements of this program include plan review of proposed new construction and remodeling projects, field inspections to identify potential cross connections, inspection of new and replacement installations of backflow prevention assemblies, and mandatory testing of all backflow prevention assemblies. The cross-connection control program is administered by the Water Quality section. Tacoma Water currently has four people certified as a cross connection control specialist (CCS). One CCS is the designated program manager and is responsible for the development and implementation of the program per WAC 246-290-490.

Facility inspections, device testing, and plan checks on new construction are continually carried out using the PNWS-AWWA Manual as a basic guideline.

For new construction within Tacoma city limits other than residential homes, Tacoma Water receives copies of the plans from the Public Works Building and Land Use Services division. Tacoma Water forwards comments to the Building and Land Use Services division and those responsible for the building construction. Tacoma Water withholds signature on the Certificate of Occupancy until all cross connection control requirements have been met. Tacoma Water will not provide new water service to facilities identified in Table 9 of WAC 246-290-490 until appropriate backflow prevention is verified properly installed.

On new construction within Tacoma Water's service area boundary, but outside City of Tacoma limits, Tacoma Water receives plans from the owner or contractor. Tacoma Water

then works with the customer and local administrative authority to ensure that all backflow protection requirements are met.

Tacoma Water maintains a record of all inspections, testing, and correspondence related to the backflow prevention assemblies. Paper copies of the records are maintained for a minimum of one year, electronic copies are maintained for the life of the assembly.

The customer is responsible for the initial and annual testing of the backflow assemblies. Tacoma Water notifies the customer that they must obtain the services of a state-certified backflow assembly tester to perform the annual test and return the test results to Tacoma Water.

8.12 Emergency Preparedness and Security

Emergency preparedness is necessary in order to effectively respond to both natural and man made disasters. One of the most effective ways to reduce consequences of a disaster is to ensure that the water system is built with redundancy, so if a facility is lost, an alternate means of providing service is readily available. Common examples of system redundancy are using looped distribution mains and minimizing dead ends, having reservoirs operate in parallel, providing bypass lines on all reservoirs, installing multiple pumps at pump stations, having independent transmission main alignments, and having multiple independent treatment trains. As a design philosophy, Tacoma Water makes a consistent effort to provide redundancy where possible. To be better prepared for a major earthquake, Tacoma Water conducted a seismic vulnerability assessment on the supply, transmission and storage system. To date, Tacoma has strengthened structures and tanks with life safety concerns and has improved initial response capabilities through stockpiling of repair materials, acquisition of additional emergency generator capacity, and by preplanning staffing assignments if an earthquake should occur during nonworking hours. Tacoma is now addressing operational reliability of the transmission, source and water treatment facilities. To address intentionally caused disasters, in 2003 Tacoma prepared and submitted to the U.S. Environmental Protection Agency (EPA) a Vulnerability Assessment (VA) as discussed below. Tacoma's Emergency Operating Plan (EOP) was also updated as required following the submittal of the Vulnerability Assessment, and certification of its completion was submitted to EPA.

The Water Control Center is staffed 24 hours per day. Control station operators respond to system alarms and otherwise operate the water system as needed. Tacoma Water's major supply facilities at McMillin Reservoir and the Headworks on the Green River have staff that are housed onsite, and that can respond to after hours operational emergencies. Service trucks and tools are taken home by the on-call emergency crews to minimize delays in case of emergencies. Additional radio-equipped cars and trucks are taken home each night by supervisory personnel to assist in efficient response to emergencies. In addition, the City subscribes to the Washington Utilities Coordinating Council (WUCC) one-call locating service to reduce risk of damage that could be created by an improperly located excavation.

Standard written emergency operating procedures are maintained to cover incidents which have the potential to cause damage or endanger public health. The written procedures are updated periodically and distributed to appropriate staff. Included in the written procedures is the following information for use in contacting water system personnel responsible for making decisions in specific emergency situations: A standby list that provides for response to typical after hour emergencies; a list of available crews that can be called out if more than just the standby person is needed; and, a list of all employees' home phone numbers. Tacoma Water presently has an incentive goal to carry out two

unannounced emergency response exercises during the year. These exercises are intended to involve multiple work groups and all levels of the organization.

8.13 Emergency Notification Response Program

8.13.1 Vulnerability Assessment

Vulnerability Assessments were mandated by the EPA for all public water systems serving populations over 100,000, with the completion date of the end of 2002. In compliance with the EPA requirement, Tacoma Water prepared a comprehensive Vulnerability Assessment of system facilities in 2002. After an external review, a final report was issued in early 2003. The VA was updated in 2005 to cover system improvements such as completion of the Second Supply Project Pipeline and the new Headworks treatment facilities. The VA prioritizes critical facilities, evaluates vulnerabilities to various intentional attacks, and makes recommendations on upgrades that will reduce risk or consequences of an attack. Since the time of completion of the VA, numerous improvements have been made in the areas of improvements to existing procedures, development of new procedures, upgrades of existing security systems and addition of new equipment, and mechanical system upgrades.

8.13.2 Emergency Operating Plan

Tacoma Water has maintained an emergency operating plan for many years. Following completion of a VA, the development of or update to an existing emergency operating plan (EOP) is required by EPA, including submittal of a statement to EPA that the EOP had been updated or developed. Tacoma updated the Tacoma Water EOP and submitted the required statement to EPA in 2003. The EOP was subsequently updated in 2005.

The EOP covers emergencies as a result of natural hazards such as severe storms, earthquakes, floods, widespread fires, volcanic eruptions and lahars, as well as manmade hazards such as major hazardous material releases, civil disorder, major water contamination incidents, and terrorism. Regardless of the cause of the disaster, many incidents require similar responses which involve management of the emergency, personnel assignments, tracking of actions and status, response to water quality or supply related issues, notifications and communications with others including regulators, customers, outside agencies and other utilities. For emergencies related to core functions such as supplying adequate quantities of water, or supplying good quality water, the EOP provides a higher level of detail than is provided for more general emergencies. For example, specific guidance is provided to respond to potential contamination incidents, or to loss of specific supply and transmission infrastructure.

Included in the EOP is a list of home phone numbers for Tacoma Water managers, senior engineers and other key staff for use in contacting water system personnel responsible for making decisions in specific emergency situations. The EOP also includes contact information for DOH and other agencies, such as the Tacoma-Pierce County Health Department (TPCHD) and samples of various notifications to the public such as boil water orders, do not drink orders and do not use orders. The EOP designates a primary spokesperson and two alternatives.

8.13.3 Work Stoppage Staffing Plan

The Work Stoppage Staffing Plan (WSSP) is intended as a document to assign minimum levels of staff to sustain the basic functions of the utility in the event of a labor strike. The WSSP was updated in 2005, and is kept current at any time when there is a potential for labor disruptions. The WSSP is also of value in planning for continued operations in case of any labor shortage, such as could be caused by a pandemic.

8.14 Tacoma Water Maintenance Plan

A written maintenance plan provides the framework for maintenance planning in the Water Supply section. Pressure reducing valves are maintained at six month intervals, with major overhauls at three year intervals. Closed finished water reservoirs are cleaned and inspected every three years. Open reservoirs are cleaned and inspected annually. Standby generators are test run weekly. Steel tanks and structures are repainted on a 12 to 15 year cycle. Cathodic test stations are checked twice yearly. Pump stations, wells and key pressure reducing stations are checked weekly.

The reconstruction of the Intake, Green River Treatment Facilities, and the addition of new facilities has required a rewrite of the maintenance plan for the Green River facilities. This plan identifies all major components of the facilities, their specific maintenance requirements, the applicable period of maintenance, and the responsible party (in-house staff or external contract support). In-town maintenance is managed through on-site checklists and procedures, with individual water service mechanics assigned to maintain specific facilities.

The Water Distribution section operates a number of maintenance programs including leak detection, valve survey, hydrant maintenance, meter maintenance and flushing. These programs have criteria and target goals, but do not have well documented maintenance plans at this time. To accomplish this effort, Tacoma Water is anticipating the creation of a professional engineering position responsible for managing existing maintenance programs and developing and implementing well documented maintenance plans with performance measures and industry best practices. Tacoma Water will also expand the use of SAP for maintenance planning and scheduling.

8.15 Sampling Procedures and Violation Response Procedures

Tacoma Water is regulated by DOH through the WAC 246-290. The rules are intended to conform with the Federal Safe Drinking Water Act of 1974, and as amended in 1986 and 1996. The latest rules became effective in April 2003, and are amended from time to time. The following sections identify key monitoring programs, both mandatory under regulation and voluntary for improved system operation, along with public notification procedures.

8.15.1 Monitoring

DOH provides an annual Water Quality Monitoring Report that outlines many of the regulatory monitoring requirements, with notable exceptions of the Lead and Copper Rule and the Disinfection Byproducts Rules due to their system-specific nature and complexity. Tacoma Water uses this information to schedule applicable compliance monitoring, along with monitoring plans for Disinfection Byproducts, the Total Coliform Rule, and our routine Lead and Copper Rule monitoring. Monitoring generally occurs at the source, in distribution, and in some cases at the customer's tap. Chapter 9 provides additional information regarding Tacoma Water's monitoring programs.

8.15.2 Violation Response

The Federal Public Notification Rule became effective June 5, 2000 and is codified in Washington under WAC 246-290-71001. This rule establishes three tiers of notification based on the real or perceived seriousness of a specific violation. These three tiers are summarized below:

Tier 1 (Immediate Notice, Within 24 Hours)

- DOH must be contacted within 24 hours for consultation.
- Notice as soon as practical or within 24 hours by radio, TV, hand delivery, posting or other method specified by primacy agency.
- Fecal coliform violations: failure to test for fecal coliform after initial total coliform sample test positive.
- Nitrate, nitrite or total nitrate and nitrite Maximum Contaminant Level (MCL) violation; failure to take confirmation sample.
- Exceedance of maximum allowable turbidity level, if elevated to Tier 1 by DOH;
- Waterborne disease outbreak or other waterborne emergency.
- Other violations or situations determined by DOH.

Tier 2 (Notice as Soon as Possible, Within 30 Days)

- Notice as soon as practical or within 30 days via direct delivery or mail. Repeat notice every three months until violation is resolved. DOH may permit alternate methods.
- All MCL, Maximum Residual Disinfectant Level and treatment technique violations, except where Tier 1 notice is required.
- Monitoring violations, if elevated to Tier 2 by DOH.
- Turbidity consultation: Where there is a treatment technique violation from a single exceedance of the maximum allowable turbidity limit, DOH must be consulted within 24 hours. DOH will then determine whether a Tier 1 notice is necessary. If consultation does not occur within 24 hours, violations are automatically elevated to Tier 1.

Tier 3 (Annual Notice)

- Notice by mail or direct delivery within 12 months; repeated annually for unresolved violations. Notices for individual violations can be combined into an annual notice (including the Consumer Confidence or Water Quality Report, if public notification requirements can still be met). DOH may permit alternate methods.
- Monitoring or testing procedure violations, unless DOH elevates to Tier 2.
- Special public notices (fluoride secondary maximum contaminant level (SMCL) exceedance, availability of unregulated contaminant monitoring results).

Tacoma Water has experience successfully completing Tier 2 and Tier 3 notifications, although no specific treatment technique or MCL violations have occurred in the last 6 years of the planning period. However, very short term interruptions in chlorine treatment at the Green River Headworks, and brief excursions in raw water turbidity have resulted in the need for direct mail notifications to a subset of Tacoma Water customers. A Tier 1 notification would be more challenging, but Tacoma Public Utilities maintains 24-hour Community and Media Services availability, with established media contacts, and templates for notifications from the Public Notification Rule Guidance Manual.

Detailed procedures for loss of chlorine and contamination of supply at the Green River Headworks have been developed, and include immediate notifications to the water quality and water supply managers. All Water Quality staff have been trained to know that contact to DOH, and the TPCHD must be made immediately after the situation is brought under control.

Tacoma Water maintains 24 hour staffing, and alternate phone numbers for all senior staff are available to the Water Control Center.

Tacoma Water also regularly provides non-regulatory notifications to customers. Commercial customers with process water needs are informed when we change their supply from Green River (very soft, low in alkalinity) to groundwater (moderate in hardness, moderate alkalinity). A list of kidney dialysis patients' addresses in the Tacoma Water service area is maintained so Tacoma Water staff can attempt to notify these customers if turbid water or no water is expected in their neighborhoods.

8.16 Tacoma Water Business Plan – Strategic Initiatives

In addition to documenting a water utility's commitment to pursuing needed capital improvements, a water system plan should also document a water utility's commitment to implementing an O&M program, including a commitment to pursuing needed improvements to existing programs. Through the development of a business plan, Tacoma Water evaluates and prioritizes its O&M needs on a two-year schedule. The highest priorities for the 2007-2016 Business Plan, known as Strategic Initiatives, related to Tacoma Water's O&M program are described below. (Please see Section 1.4.1 and Section 11.3 for additional information regarding the Tacoma Water Business Plan.) Taken together, Tacoma Water's O&M budget for the 2005/2006 biennium is $78,484,477. This level of funding is expected to increase in the 2007/2008 biennium.

8.16.1 Implementation of Conservation Programs and the Associated Impact on Water Revenues

Although Western Washington has a reputation for over-abundance of water, most of the rivers and streams running into Puget Sound have shortages of water at least part of the time during a normal-to-dry year. For this reason, in additional to many others, Tacoma Water encourages water conservation. Through the implementation of conservation programs, Tacoma Water strives to provide conservation opportunities and education to customers in order to further expand conservation successes of the past. Conservation is emphasized along with providing adequate water supply and the distribution of that supply to current and future customers. This supply must be adequate to meet all legitimate needs for public health and safety, economic development, and enhancement of quality of life. Providing water to customers must also be accomplished with careful attention to the environmental concerns associated with Tacoma Water's operations.

The recent agreement with the Washington State Department of Ecology and DOH regarding Tacoma Water's Second Diversion Water Right includes commitments by the Second Supply Project Partners to carry out enhanced conservation programs. The partners agreed to promote water use efficiency to reach a cumulative reduction in water use of ten percent by 2010.

Currently, Tacoma Water is conducting a water conservation program assessment. Tacoma Water anticipates additional costs associated with implementing its conservation program in the future.

8.16.2 Assure Adequate O&M of the Existing System

Distribution System

Maintenance programs for the Tacoma Water distribution system began to be superseded by new construction for growth starting in the late 1970s. Throughout the 1990s, Tacoma Water focused on re-establishing adequate maintenance programs for the distribution system. The SMART program, hydrant maintenance, meter maintenance, and systematic flushing are all a result of those efforts. These programs are very effective and are models that other water purveyors have

looked at to improve maintenance on their own systems. The resources committed to these programs have not increased since the initial implementation of the programs, even though a growth of about 2 1/2 percent per year in the number of hydrants, valves and meters has occurred.

Tacoma Water's levels of service in regards to the maintenance of the distribution system have been established as follows:

Hydrants	Full maintenance once every four years.
Valves	Operate once every four years.
Services	Leak detection of all services once every five years.
	Emergency response to leaks/no water, other issues within one hour of call.
Meters	Test/exchange all commercial water meters in accordance with AWWA parameters.
Mains	Leak detection once every five years.
	Emergency response to leaks/breaks within one hour of call.
Meter Lids	Emergency response to notification of missing lid or safety issue within one hour.

Supply System

A written maintenance plan provides the framework for maintenance planning in the Water Supply section. Progress has been made in reducing the backlog in maintenance of rights-of-way, tanks and pipe painting, and reservoir cleaning. Some challenges remain, such as making improvements in electrical maintenance and in making further use of SAP in maintenance planning and scheduling. Additionally, improvements in the valve exercising program for transmission line valves and improvements in the maintenance of electrical motor starters and other switchgear are needed. Some representative Water Supply levels of service are listed below:

- Pressure reducing valves are maintained at six month intervals, with major overhauls at three year intervals.
- Closed finished water reservoirs are cleaned and inspected every three years. Open reservoirs are cleaned and inspected annually.
- Standby generators are test run weekly.
- Steel tanks and structures are repainted on a 12 to 15 year cycle.
- Cathodic test stations are checked twice yearly.
- Pump stations, wells and key pressure reducing stations are checked weekly.

8.16.3 Watershed Ownership and Management

Tacoma Water currently owns approximately ten percent of the Green River Watershed lands, concentrated around waterfront areas. There are 13 other landowners in the watershed. The strategic mission of land ownership has historically focused on the most sensitive areas for protection of water quality. However, the larger protection of the watershed is also an important mission of Tacoma Water. Control of the watershed is one of the fundamental regulatory requirements for remaining unfiltered; however, even if filtration is employed, watershed control and protection remain important values for the utility. While Tacoma Water has focused on

purchase of properties along water bodies, there is currently no written strategy for long term ownership and procurement of additional lands. Tacoma Water proposes to develop a systematic and strategic plan for Green River Watershed land holdings that balances the importance of watershed control, environmental stewardship responsibilities, and sound fiscal planning and operations.

8.16.4 Work Force Planning

This Strategic Initiative stresses the importance of preparing for a changing workforce, including a shortfall of workers in the next decade, the retirement of existing Tacoma Water employees and changing workforce demographics.

A key work force challenge facing Tacoma Water in coming years is the anticipated turnover in staff as baby boomers start to reach retirement age. It appears that turnover in Tacoma Water could exceed 25 percent in the next ten years. This is slightly under the 35 percent predicted for the water industry in general. Since the people retiring are the most senior employees in the organization, these retirements will result in a serious brain drain and a loss of institutional knowledge. A great deal of this knowledge is understood, but is not well documented yet is extremely important to the utility's ability to respond to emergencies. As the labor market tightens with the retirement of the Baby Boomers, maintaining a competent workforce will become increasingly difficult.

Tacoma Water will continue its involvement in the Youth Build Tacoma Program as a means to recruit minority candidates.

Many of the procedures followed by Tacoma Water are not "on-paper", but rather procedures learned and adapted over time simply "by doing". To prepare for the departure of long-time employees and ensure new employees are aware of Tacoma Water's procedures, Tacoma Water is committed to developing and maintaining procedures in a common format and in a single document and providing training to applicable employees on their implementation.

CHAPTER 9

WATER QUALITY AND TREATMENT REQUIREMENTS

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WATER QUALITY AND TREATMENT REQUIREMENTS

9.1 Introduction

This chapter evaluates existing water quality conditions in relation to existing and future drinking water quality regulations for Tacoma Water. Compliance has been evaluated and recommendations concerning water quality, water treatment, and watershed management are presented. Table 9-1 summarizes Tacoma Water's compliance with the current regulations.

TABLE 9-1
Summary of Existing Regulatory Compliance

Regulation	Requirement Met?
Surface Water Treatment Rules (SWTR, IESWTR)	Yes – all filtration avoidance criteria met; reference to *Cryptosporidium* included in Watershed Control Program.
Bacteriological (Total Coliform Rule)	Yes – no acute or non-acute coliform violations since implementation of TCR in 1991. Early repeat monitoring violations did occur in 1991 and 1992.
Lead and Copper Rule	Yes – 90 percent percentile tap results below Action Levels in all years tested since implementation of corrosion control.
Organic Contaminants	Yes – no treated source has organics over the Maximum Contaminant Level (MCL).
Stage I Disinfectants / Disinfection Byproducts Rule	Yes – System wide annual averages all below the TTHM and HAA5 MCLs.
Inorganic Chemical and Physical Parameters	Yes – no treated source has inorganic chemical concentrations over the MCL.
Arsenic	Yes – the single active source (Portland Ave Well) with Arsenic above the MCL (11 – 12 g/L) is blended at a 3.5:1 ratio with Green River supply.
Distribution Reservoir Covering	Yes – a recent bilateral compliance agreement established timeframes for completion of McMillin reservoir covering.
Radionuclides	Yes – no source has ever detected positive results for radionuclides.
Wellhead Protection Program (WHPP)	Yes – the plan is completed, and biennial notifications have been sent to parties in the Wellhead Protection Areas.

Recently finalized and known pending regulations will continue to impact public water systems. Summaries of key future regulations and their impact on Tacoma Water are presented in Section 9.3.

9.2 Existing Treatment and Monitoring Program

Tacoma Water's primary water source is the Green River, which is an unfiltered surface supply. During periods of high turbidity in the Green River, the supply is supplemented or fully replaced by water from the North Fork Wellfield.

Historically, during high demand periods in the summer, the Green River supply has been augmented by water from local groundwater supply in the Tacoma Water service area. During peak-demand days, the in-town wells can supply up to 40 percent of the total system demand. During the six year period of the 2006 Update, it is anticipated that full implementation of the Howard Hanson Dam Additional Storage Project will occur, and in most normal precipitation years, this will mean a significantly reduced demand on in-town groundwater supplies, and increased use of Green River supply.

9.2.1 Treatment

The Green River/North Fork well system is the primary water source for Tacoma Water and with the exception of planned or emergency maintenance is used continuously. The Green River diversion and major components for withdrawal and treatment are described in Chapter 7 – System Inventory.

Supplemental and emergency supply is available from multiple groundwater resources owned by Tacoma Water. Table 7-8 provides a list of current treatment systems in service by location and treatment objective. Additional treatment needs anticipated in the period of this water system plan are discussed below.

9.2.2 Monitoring

The monitoring of water quality may be done for operational, informational, or regulatory compliance purposes. Tacoma Water conducts a significant amount of monitoring in each of these three categories. Table 9-2 provides a listing of all significant monitoring programs currently in place for Tacoma Water. Additional project-specific monitoring may be added from time to time.

TABLE 9-2
Monitoring Programs

Location	Parameter	Frequency	Purpose
Watershed	Fecal coliform	Weekly	Watershed health, early warning of possible problem (dead animal, etc.)
	Total Coliform	Weekly	Watershed health, early warning of possible problem (dead animal, etc.)
	Chemicals	Periodic – Associated with pesticide/herbicide applications	Assure proper application procedures by land owners/managers
	Algae	Seasonal / Special Projects	Howard Hanson Dam Reservoir monitoring – assess water quality for future operations

Location	Parameter	Frequency	Purpose
	Dissolved Oxygen and temperature profiles	Seasonal / Special Projects	Howard Hanson Dam Reservoir monitoring – assess water quality for future operations
Green River – Raw @ Intake	Turbidity	Continuous and daily grabs (two day)	Control North Fork Blending system, provide river quality information
	pH/Temp	Continuous and daily grabs (two day)	Monitor river water quality
	UV_{254} Transmittance	Daily grab	Monitor water quality – surrogate for organics and chlorine demand/decay
	Total & Fecal coliform	Weekly	Watershed health, early warning of possible problem (dead animal, etc.)
	Total Coliform	Weekly	Watershed health, early warning of possible problem (dead animal, etc.)
	Manganese	Weekly/bi-weekly	Monitor source water
	Cryptosporidium & Giardia	Monthly	Water Quality information, may use for grandfather data under LT2 Rule
	TOC	Monthly	Water Quality information, possible to use for reduced DBP monitoring.
Green River – Blended (Headworks Control Building)	Turbidity (Each operating Reactor)	Continuous and daily grabs (two day)	Compliance (turbidity prior to primary disinfection)
	Total & Fecal Coliform	Daily	Compliance (source fecal coliform requirements)
	UV_{254} Transmittance	Daily grab	Monitor blended water quality – surrogate for organics and chlorine demand/decay

Location	Parameter	Frequency	Purpose
Green River – Treated (Chemical Facilities – each operating Reactor)	Chlorine Residual	Continuous and daily grabs (two day)	Process control and entry point compliance monitoring
	pH/Temp	Continuous and daily grabs (two day)	Process control and monitoring
	Fluoride Concentration	Continuous, daily grabs (two day) and biweekly sent to Lab (compliance)	
	Turbidity	Continuous (future) and daily grabs (two day)	
	Total Coliform	Daily	
North Fork Wellfield Source –from wellheads	Inorganic Chemicals, Volatile Organic Chemicals, Synthetic Organic Chemicals	Periodic – Annual to triennial per Water Quality Monitoring Report	Compliance
Green River	Inorganic Chemicals, Volatile Organic Chemicals, Synthetic Organic Chemicals	Periodic – Annual to triennial per Water Quality Monitoring Report	Compliance
214th Corrosion Control Facility	Chlorine Residual	Continuous and daily grab (five days/week)	CT compliance and process control
	pH/temperature	Continuous and daily grab (five days/week)	
Covington Turnout	Chlorine Residual	Continuous and periodic grabs	CT compliance
	pH/temperature	Continuous and periodic grabs	
McMillin Reservoir Inlet	Chlorine Residual	Continuous and daily grabs	Water quality monitoring
	pH/temperature	Continuous and daily grabs	

Location	Parameter	Frequency	Purpose
McMillin Reservoir Outlet Prior to Rechlorination	Chlorine Residual	Continuous and daily grabs	Process control and water quality monitoring
	pH	Continuous and daily grabs	
	Fluoride	Continuous	
	Cryptosporidium & Giardia	Monthly	Open Reservoir water quality evaluations
	Algae	Seasonal / Special Projects	
McMillin Reservoir Outlet (post rechlorination)	Chlorine Residual	Continuous and daily grabs	Water quality monitoring and process control
	pH/Temperature	Continuous and daily grabs	
	Turbidity	Continuous	
In town Well Supplies	Inorganic Chemicals, Volatile Organic Chemicals, Synthetic Organic Chemicals	Periodic – Annual to triennial per Water Quality Monitoring Report	Compliance
Hood Street Reservoir Inlet	Chlorine Residual	Continuous and periodic grabs	Water quality monitoring
	pH/Temperature	Continuous and periodic grabs	
Hood Street Reservoir Outlet	Chlorine Residual	Continuous and periodic grabs	Water quality monitoring and process control when chlorinating (groundwater in service)
South Tacoma Pump Station	Chlorine Residual	Continuous and periodic grabs	Water quality monitoring and process control when pump station in service.

Location	Parameter	Frequency	Purpose
Portland Ave Reservoir	Chlorine Residual	Continuous and periodic grabs	Water quality monitoring and process control when rechlorinating
	pH/Temperature	Continuous and periodic grabs	
North End Reservoir	Chlorine Residual	Continuous and periodic grabs	Water quality monitoring
Marine View Pump Station	Chlorine Residual	Continuous and periodic grabs	Water quality monitoring
UP-1	Chlorine Residual	Continuous and periodic grabs	Water quality monitoring & process control when well in service
SE-2 & SE6	Chlorine Residual	Continuous and periodic grabs	Water quality monitoring & process control when well in service.
	pH	Continuous and periodic grabs	
SE-8	Chlorine Residual	Continuous and periodic grabs	Water quality monitoring & process control when well in service.
	pH	Continuous and periodic grabs	
SE-11/11A	Chlorine Residual	Continuous and periodic grabs	Water quality monitoring & process control when well in service.
	pH	Continuous and periodic grabs	
Sunrise Tank	Chlorine Residual	Continuous and periodic grabs	Water quality monitoring
Prairie Ridge (Future)	Chlorine Residual	Continuous and periodic grabs	Water quality monitoring

Location	Parameter	Frequency	Purpose
Distribution System	Routine Coliform	Generally four days per week, M-Th. Typically 45 samples collected per week.	Compliance with Total Coliform Rule – per Coliform monitoring plan
	Heterotrophic Plate Count Bacteria	Selected coliform samples where the chlorine residual is ≤0.2 mg/L	Demonstrate adequate disinfection in the distributions system, identify problems.
	Chlorine Residual	Grab: same as Routine Coliform above	Water quality monitoring in conjunction with coliform monitoring
	Total Trihalomethanes and 5 Haloacetic Acids	Quarterly for each designated and operating (> 15 days) treatment plant. Quarterly (If Wells run for 15 days)	Stage 1 - Disinfection By-product Rule – per submitted monitoring plan.
	Lead & Copper & WQ parameters	Every three years at the tap (Reduced Monitoring)	Lead and Copper Rule
Designated monitoring wells and selected production wells.	Total & Fecal Coliform	Quarterly or Semi-annually	Wellhead Protection Plan Implementation– track changes/ provide early warning
	Volatile Organic Chemicals	Quarterly or Semi-annually	
	Inorganics and physical (including Nitrate)	Quarterly or Semi-annually	
	Nitrate	Quarterly or Semi-annually	
	Ammonia as N	Quarterly or Semi-annually	
EPA Well Site 12A (not Tacoma production well)	Volatile Organic Chemicals and pH	Every two weeks/Quarterly	Monitoring Time Oil Clean Up

9.2.4 Reporting

Regulatory reporting is a fundamental part of public water system operations, and may take many forms, and occur over a range of time intervals, both planned and unplanned. This section discusses the major planned reporting requirements and how Tacoma Water is meeting those requirements. In addition to these planned, or predictable reporting requirements, certain system operational problems or a failure to comply with a national primary drinking water regulation

may require consultation with the State Department of Health (DOH) in a very rapid (within 24 - 48 hours) timeframe (WAC 246-290-480(2) and WAC 246-290-71001.

Table 9-3 shows that large amounts of data are collected, and an enormous amount of operational data is logged in Tacoma Water's SCADA system and in many cases also tracked on physical circular charts. These data provide the basis for monthly regulatory reporting, which now has reached several sheets to fully describe flow, turbidity, and chemical addition processes at the Green River Headworks, 214th Avenue Corrosion Control Plant, Covington Turn-out, McMillin Reservoir, and the Hood Street Reservoir.

The major routine reporting effort to DOH is the preparation of the monthly reports. These reports contain minimum regulatory reports required under Chapter 246-290 WAC, as well as other operational reports not necessarily required for submittal. The major pieces are the *Unfiltered Sources Surface Water Treatment Monthly Report Summary* for each Green River Treatment Plant Reactor, and the *Surface Water Treatment Rule (SWTR) Report*. This latter report includes all relevant operational data for the unfiltered Green River Supply, and contains 22-26 pages of tabular data and information, including water quality complaints, and quarterly, disinfection byproducts rule requirements (Disinfection Byproducts and Maximum Residual Disinfectant Levels).

Other reporting for source water monitoring occurs via the accredited laboratory reporting process. This must be periodically verified to ensure laboratories are fulfilling their regulatory and contract requirements.

Finally, a method of reporting used annually by all public water systems is the Consumer Confidence Report, or Water Quality Report as the document is called at Tacoma Water. This report summarizes occurrences of constituents found in the water at levels below allowable, and provides customers additional information about the water they receive.

Through the use of DOH's Water Quality Monitoring Report and internal planning activities, Tacoma Water is in compliance with applicable monitoring and reporting requirements. Additionally, processes are in place to assure continued compliance.

9.2.5 Data Management

Currently, Tacoma Water tracks regulatory information collected as part of Tacoma Water's monitoring program using spreadsheets for the following parameters: complete inorganics, radionuclides, lead and copper, pH, and chlorine. Detections of volatile organic contaminants have also been stored and tracked electronically. While there are no requirements or guidelines by DOH for data management programs, these tools have been useful to note changes in source water quality. Tacoma Water is continuously evaluating data storage and data management approaches.

9.3 Regulatory Requirements and Schedule

While source water protection and disinfection remain important aspects for providing high quality drinking water, the Safe Drinking Water Act (SDWA) amendments of 1986 and 1996 have resulted in rules and regulations that will increasingly affect treatment processes and utility operations. New standards for contaminant levels and treatment techniques are being established, and public water systems must respond to those requirements.

The DOH has been designated by the U.S. Environmental Protection Agency (EPA) as the "primacy" agency for Washington State in matters related to drinking water quality. To maintain primacy, DOH must adopt federal drinking water criteria as minimum standards and must administer the state's drinking water program. This includes regulatory aspects, enforcement,

monitoring and surveillance, technical assistance, laboratory analysis, laboratory certification, and program development.

The following subsections summarize programs that are of particular interest to Tacoma Water. An evaluation of future regulatory requirements and Tacoma Water's ability to meet those regulations is also assessed. Table 9-3 presents a list of the recently promulgated and known future regulations that will (or may) affect Tacoma Water.

TABLE 9-3
Future Regulations Affecting Tacoma Water

Regulation	Status
Stage II - Disinfectants/ Disinfection By-Products Rule	Rule finalized January,2006 – Tacoma Water completing monitoring plan, do not anticipate compliance problem.
Groundwater Rule	EPA proposed the Ground Water Rule on May 10, 2000, and expects to finalize in August 2006. Do not expect compliance concern – could require additional monitoring and reporting for virus CT at some locations.
Radon Rule	Proposed rule issued November 2, 1999. Proposed MCL is 300 picoCuries per liter (pCi/L) and the proposed Alternate MCL is 4,000 pCi/L. No date for final rule known. Some Tacoma wells are over 300 pCi/L – outcome is uncertain.
Long Term 2 Enhanced Surface Water Treatment Rule (LT2)	Rule finalized January, 2006 – Requires McMillin Reservoir covering, *Cryptosporidium* monitoring and a *Cryptosporidium* treatment response for Green River supply. Covering is addressed through a Bilateral Compliance Agreement with DOH. Business plan currently proposes UV disinfection by 2014.
Total Coliform Rule revisions (Distribution Rule)	Possible revisions or new rule in 2007. Provisions unknown – may involve operational considerations to minimize risk of intrusion into distribution piping system. May include federal requirement for cross-connection control, however State requirement is strong, so little impact expected.
Unregulated Contaminant Monitoring Rule 2	Rule proposed August, 2005 – expect final in late 2006. Will require additional monitoring and will be included in 2007/2008 budget.
Lead and Copper Rule Revisions	Possible revisions in 2006 – to address public notification, lead service line management, coordination with WDOH if treatment changes are contemplated, and lead in schools. No impact to Tacoma Water expected.

In addition to the above regulatory actions, EPA is continuing to evaluate guidance and rulemaking opportunities for contaminants that have shown presence in some regional settings. These include perchlorate, an ingredient of solid rocket propellants, and Methyl Tertiary-Butyl Ether (MTBE), a gasoline additive that has not been widely used in Washington State. Neither of these has been detected in Tacoma Water sources.

9.4 Future Treatment Improvements

9.4.1 Federal Rulemaking Drivers

Based on the regulatory actions described in Table 9-3, Tacoma Water expects to develop additional physical treatment responses to address the requirement for *Cryptosporidium* inactivation. The two reasonable options are Ultraviolet Light (UV) disinfection or filtration, each with significantly different cost implications. An overview table of advantages and disadvantages for each approach is presented in Table 9-4 below.

The uncertainty associated with filtration avoidance status is an important consideration, because it is conceivable that the lower cost UV disinfection solution may have to be followed with filtration anyway. In addition, the significant changes at the Howard Hanson Dam operation discussed in Section 7.2.2, create uncertainties in terms of making the best choice for treatment, irrespective of the substantial cost difference. The combination of changing reservoir flow patterns and hydrodynamics, increased storage, and withdrawal of warmer upper elevation water means that the water passing down the Green River in the near future may be significantly different than the water served for the last 40 years. This means that a final decision for filtration can not be made, at best case, until 2009-2010, too late to meet the LT2 timeline. Tacoma Water will be in active dialogue with DOH as this decision and timeline unfold.

TABLE 9-4
Cryptosporidium Treatment Solution Comparison Overview

Ultraviolet Light Disinfection				
	Advantages			**Disadvantages**
1	Relatively lower cost (current estimate approximately $20 million)		1	System still subject to unfiltered criteria and risk
2	Very effective against *Cryptosporidium and Giardia*		2	Limited value beyond specific organisms
3	Smaller site footprint		3	Relatively new (but rapidly expanding) technology for this application
4	No waste stream		4	No improvement in resource reliability
5	No known disinfection byproducts			
6	Simpler to operate			
Filtration				
	Advantages			**Disadvantages**
1	Very effective against a broad range of organisms, including *Cryptosporidium and Giardia*		1	Expensive ($150 to $200 million total cost - $100 to $135 million Tacoma share)
2	Increases source of supply reliability		2	Significantly more complex operation
3	Removal of particulate matter, with consequential reduction in settling in the distribution system		3	Creates a waste disposal stream
4	Effective removal of natural organics, reducing disinfection byproduct formation		4	Large site footprint
5	Regulatory certainty			

9.4.2 Non-regulatory drivers

Additional treatment improvements are planned that do not tie directly to federal rulemaking. These include the implementation of fluoridation for in-town groundwater supplies, chlorination system replacements or improvements, and continued evaluation of groundwater treatment for corrosion control. An overview and description of these projects are provided below.

Fluoridation

Currently, all water leaving the Green River Treatment Plant is fluoridated at a dose of between 0.8 and 1.3 mg/L, as required by WAC 246-290-460. During the majority of the year (typically more than eight months) this is the only supply, so fluoridation is consistent throughout the system.

Historically the vast majority of summer groundwater supplemental resources have been focused through the Hood Street Reservoir, feeding the largely industrial area of the Tideflats. Several sodium fluoride saturators have been used at the South Tacoma Pump Station and the Hood Street Reservoir, but given their relatively infrequent use, and since an overfeed from a makeshift facility occurred in 1996, the problematic groundwater fluoridation systems have been dismantled.

An additional dynamic that continues to affect the decision to implement improved fluoridation at the groundwater supplies is the completion of the Second Supply Project Pipeline, and the evolving timeline for the Howard Hanson Dam Additional Water Storage. Once additional water storage is in place, groundwater will likely have a reduced role in extended peak season peaking, although it will remain an important resource, and will be used more in the future. Current planning is to have groundwater fluoridation in place by 2009. This coincides with the anticipated need for additional use of groundwater resources with the completion of the transmission pipeline to the Cascade Water Alliance.

Groundwater and Open Reservoir Chlorination System Improvements

The provision of groundwater disinfection is a standard expectation for source operation, and the active disinfection systems are identified in Table 7-7. Of these, most are used only seasonally, and their use will diminish with increased availability of Second Supply Green River water.

Major new initiatives for chlorination during the six-year planning period will include:

- Disinfection Treatment for the Gravity Pipeline Wells. With a combined capacity of approximately 7 MGD, these wells feed directly into Pipeline No. 4, which is one of the two pipelines feeding from McMillin Reservoir. These have historically been treated with blending, however with a shift in a portion of the supply from McMillin to the Second Supply Project Pipeline, the blending ratio may no longer be adequate.
- McMillin Reservoir. Concurrent with the major covering effort, the gas chlorination system may be reduced in size, and replaced with a sodium hypochlorite facility.

Groundwater Corrosion Control

Since the implementation of corrosion control at the 214th Street Corrosion Control Facility in mid-1997, Tacoma Water has monitored lead and copper results in compliance with DOH requirements. At the tap lead and copper results were monitored twice per year from 1995 through 2000, and shifted to annual monitoring on 2001, and triennial in 2004. The shift in monitoring did require a shift in monitoring period from April and October to July. One effect of this was that during the years 2001 to 2004, samples were reflective of warmer water and

groundwater likely influenced results, and 90th percentile results, while still below the action level, did increase from 8 μg/L for lead in October 2000 to 13 μg/L in July 2001. Ninetieth percentile copper results also increase from 0.22 mg/L to 0.3 mg/L for the same two rounds. In July 2004, at the tap 90th percentile results were 12 μg/L for lead, and 0.6 mg/L for copper.

While Tacoma Water does not believe this represents a public health or regulatory compliance issue, these results suggest the possibility that groundwater may be adversely affecting corrosion control in a portion of the distribution system. Tacoma Water will continue to evaluate this situation. Currently the first phase of this work, evaluating the effectiveness of sodium hydroxide on pH control of many of the Tacoma Water wells, has been completed. Tacoma Water will also install equipment to determine the actual pH shift due to aeration in the groundwater fluming to Hood Street Reservoir.

9.5 Source Water Protection

WAC 246-290-135 prescribes general source protection requirements, and WAC 246-290-690 includes specific requirements for Watershed Control for unfiltered surface water systems. The following two sections provide an overview of the Watershed Management Plan, which is an attached volume to the 2006 Update, and an overview of our Wellhead Protection Plan, which we are actively implementing.

9.5.1 Green River Watershed Management Plan

The Green River Watershed Management Plan is attached as Volume II to this report, and has been updated from the previous approved plan submittal. The document identifies key expressed topics of concern, and proceeds through those topics to demonstrate compliance with the Watershed Control expectations of WAC 246-290-690. In addition, this document is a useful tool in developing work plan goals and objectives, and measurement tools to evaluate improvement.

Since the 2000 Green River Watershed Management Plan was prepared, Tacoma Water has demonstrated a good-faith effort to improve upon the watershed control program in the Green River Watershed. Key activities include the following: continuing to negotiate land acquisitions in critical areas; executing and updating written agreements with other landowners; preparing a Habitat Conservation Plan and developing habitat mitigation and restoration projects within the watershed; gaining administration rights to roads; and maintaining appropriate inspection and patrol, water quality monitoring, and other watershed control programs. The attached Green River Watershed Management Plan describes these activities and identifies changes within the watershed (changes in land ownership for example) and to the watershed control program (new landowner agreements for example) that have taken place since the Management Plan was last updated.

9.5.2 Wellhead Protection Program

The Wellhead Protection Program (WHPP) was established by the EPA as a part of the 1986 Amendments to the SDWA. The DOH's WHPP is summarized in the guidance document Washington State Wellhead Protection Program (DOH, December 1993). Completion of Tacoma Water's wellhead protection activities have been coordinated with the ongoing activities associated with the South Tacoma Groundwater Protection District (STGPD). The STGPD program was established in 1988 (City Ordinance No. 24083, Tacoma Municipal Code 13.09), and the special protections for groundwater supplies within the district are enforced by the Tacoma-Pierce County Health Department (TPCHD). At this time, the STGPD is the primary means of protection of the sensitive South Tacoma Aquifer, which contains over half of Tacoma Water's wells and holds the potential for additional viable groundwater supplies. The TPCHD

activities within the protection district include permitting, inspections/consultations, tank removals, tank installations, and cleanup oversight.

As part of its update of the Critical Areas Preservation Ordinance in 2004 and 2005, Tacoma worked to bring best available science to the designation of critical areas, including the designated Aquifer Recharge Area (ARA). Soils maps were collected, and superimposed on the modeled 1, 5, and 10 year time – of –travel boundaries, and the area so identified was the first basis for the ARA. Not surprisingly, the current STGPD and the new boundary of the susceptible soil and 5 year time-of-travel overlay were very close, with the new boundary encompassing a slightly larger area. The Tacoma City Council has adopted this area as the new designated ARA. Tacoma Water and TPCHD continue to collaborate to make revisions to the enacting land use ordinance to strengthen the effectiveness of the STGPD. This effort should culminate in ordinance revision in late 2006, or early 2007.

As required by WAC 246-290-135, Tacoma Water has been working with TPCHD to ensure that the latest hazards within our Wellhead Protection Area have been identified, and mailings to all businesses so identified were sent in 2005.

Public education efforts were undertaken in 2003 and 2004, with the development of key messages and direct mail brochures. These were developed through a focus group process, bringing in customers and interested citizens to give us feedback on content, format, message, and presentation. This work resulted in two communication pieces: one focused to homeowners, and the second to automotive business. These were direct mailed to all customers with the South Tacoma Groundwater Protection District.

Tacoma Water will continue to meet minimum regulatory requirements for wellhead protection, while also investing in the continued collaboration with the TPCHD to provide focus beyond the regulations in the most critical and important industrialized areas around our major production sources.

9.6 Summary

Tacoma Water takes its responsibility to meet and exceed minimum regulatory requirements for water quality very seriously. This extends across all operating sections, and is a core requirement of our apprenticeship training program.

The challenges that face the utility include the continued development of new regulatory requirements and the cost of understanding and implementing them, the need to refurbish aging infrastructure, ever more complex operation of treatment processes, a growing and expanding physical system, and hiring and retaining qualified staff at all levels; each of these can have an eventual impact on water quality.

Tacoma Water will continue to depend on, and work closely with our public health experts at the state, federal, and local levels. Tacoma Water believes the 2006 Update lays out an effective monitoring and reporting program, illustrates planning considerations for future potential shifts in water quality, and lays the groundwork for addressing those shifts.

CHAPTER 10

WATER SYSTEM ANALYSIS

CHAPTER 10

WATER SYSTEM ANALYSIS

10.1 Introduction

This chapter provides analyses of the ability of Tacoma Water's existing storage and transmission and distribution system facilities to supply a sufficient quantity of water to meet existing and projected demands. System deficiencies based upon the presented analysis and recommendations for improvements are presented.

10.2 Storage Analysis

This water storage analysis is a comparison of Tacoma's available storage to that required for operations, equalizing, standby, fire and dead storage uses, both now and in the future. The storage analysis has been conducted for the Tacoma Water service area by evaluating current and future water requirements, analyzing the present storage available, and anticipating the impact of future changes such as new development or annexation of adjacent areas. No system modeling has been done to supplement this analysis.

10.2.1 Methodology

The current Tacoma Water service area is divided into six primary service zones. A Primary service zone is defined as a zone which is not backed up by another Tacoma Water zone in the event of loss of the normal supply to the zone. The primary service zones are listed below:

- Cumberland
- Prairie Ridge
- Sunrise Standpipe
- McMillin Gravity
- Indian Hill
- Fennel Creek

The storage analysis was completed for each of the zones, with the exception of the Fennel Creek zone. The Fennel Creek zone has no storage, but instead is backed up by an emergency intertie with the City of Bonney. The six primary service zones are shown in Figure 7-4. Water demands were allocated to each of the zones based on the population and employment forecasts contained in the 2003 Water Demand Forecast as prepared by Integrated Utilities Group and as described in Chapter 5 – Water Demands. A conservative approach to the use of the forecast data was used. For example, where historical growth data exceeded the forecast data, the historical data was used. Table 10.1 summarizes the growth forecast data used in the storage analysis.

TABLE 10-1
Growth Forecast Data

Zone	Zone Location	Historical Growth Rate (Percent)	Forecast Growth Rate (Percent)	Growth Rate Used (Percent)
Cumberland	King County	1.64	0.92	1.64
Prairie Ridge	Outside City	5.47	1.67	5.50
Sunrise Standpipe	Outside City	5.47	1.67	5.50
McMillin Gravity	Area Wide	2.09	1.45	1.00
Indian Hill	Inside City	0.71	1.97	0.71

Note that the most conservative estimates of growth were used for all except the Indian Hill zone and the McMillin zone. Due to the high density of households already existing in the Indian Hill area, it was determined that the historical growth rate for use inside the city would still be appropriate in this case. For the McMillin zone, a 50 year planning horizon was used, and therefore, a slightly lower growth rate was assumed.

The storage analysis is conducted in accordance with the Water System Design Manual (WSDM) published by the Washington State Department of Health (DOH) in August of 2001.

10.2.1 Storage Requirements

Storage requirements are divided into five components: operational storage, equalizing storage, standby storage, fire suppression storage, and dead storage. Per-zone storage requirements for each of the five storage components are presented below.

The following storage analysis is conducted using present pump capacity only. Future pumps were not considered in the analysis but are discussed in section 10.2.2 under each individual zone.

Operational Storage

Operational storage is required by WAC 246-290-010, and WSDM 9.0.2 to perform several functions. Operational storage is provided to prevent excessive cycling of pumps that supply the tank. It must be of adequate volume to allow for intentional raising and lowering of the tank for water quality purposes. It also must be of adequate size to account for level-sensing equipment inaccuracies. Operational storage must be additive to the other components of storage.

TABLE 10-2
Operational Storage Requirements

Zone	Storage (Feet)	2006 Storage (Million Gallons)	2012 Storage (Million Gallons)	2020 Storage (Million Gallons)
Cumberland	4.50	0.051	0.051	0.051
Prairie Ridge	8.00	0.794	0.794	0.794
Sunrise Standpipe	5.00	0.188	0.188	0.188
McMillin Gravity	11.00	42.308	42.308	42.308
Indian Hill	3.00	0.822	0.822	0.822

Equalizing Storage

Equalizing storage in a water system is required to meet daytime demands that exceed the transmission or pump capacity of the system. It is required by WAC 246-290-235(2), and WSDM 9.03. If sufficient pump capacity and sufficient source reliability exists, the required amount of equalizing storage could be zero. Required equalizing storage is assumed to vary based on the magnitude of diurnal peaks that an area experiences. Residential areas experience greater daily peaks than highly commercial/industrial areas. The Simpson Tacoma Kraft Mill is a special case; its peak flow is established as 25 million gallons per day (MGD) based on usage patterns rather than by applying a peaking factor to average use.

TABLE 10-3
Equalizing Storage Requirements

Zone	2006 Storage (Million Gallons)	2012 Storage (Million Gallons)	2020 Storage (Million Gallons)
Cumberland	0.01	0.01	0.02
Prairie Ridge	0.00	0.00	0.24
Sunrise Standpipe	0.00	0.00	0.34
McMillin Gravity	0.00	0.00	0.00
Indian Hill	1.06	1.11	1.19

Standby Storage

Standby storage is required by several sections of the WAC, including 246-290-420, and WSDM 9.0.4 to perform several functions. Standby storage is required to provide reliability should sources fail, or when unusual conditions impose higher than normal demands. It is recommended that twice the average day demand (ADD) per equivalent residential unit (ERU) be provided. (When needed for storage calculations, a value of 220 gallons per day per ERU was used for ADD). Standby storage may be reduced by the amount of water supplied to the zone with the largest source considered out of service. The minimum standby storage is set at 200 gallons per day per ERU. Only currently installed and available sources are shown in the following tables. Planned additions to the pumping capacities in the zones are discussed in section 10.2.2 below.

TABLE 10-4
Determination of Additional Sources

Zone	Largest Source	Additional Sources	Capacity (Million Gallon Day)
Cumberland	210-gpm pump	1 pump	0.3
Prairie Ridge	1,500-gpm pump	7 pumps	10.7
Sunrise Standpipe	2,000-gpm pump	8 pumps	7.4
McMillin Gravity	Green River	Wells	58
Indian Hill	2,900-gpm pump	7 pumps	11.4

TABLE 10-5
Minimum Standby Storage Requirements (200 * # of ERU's)

Zone	2006 Storage (Million Gallon)	2012 Storage (Million Gallon)	2020 Storage (Million Gallon)
Cumberland	0.11	0.11	0.12
(nested with Fire Suppression Storage)			
Prairie Ridge	1.09	1.50	2.31
Sunrise Standpipe	0.92	1.27	1.95
McMillin Gravity	22.68	24.04	25.86
Indian Hill	1.83	1.91	2.02

Fire Suppression Storage

Fire Suppression storage is required by WAC 246-290-221(5), and WSDM 9.0.5. In zones with storage, fire flow criteria provide a minimum flow for a predetermined period of time during maximum day demands (MDD). The criteria are based on the land use classification in the zone, such as single- or multi-family residential or commercial. The specific criteria are presented in Chapter 3 – Policies and Design Criteria. The criteria approved by Tacoma Water for this storage analysis are typical of other water purveyors in King and Pierce counties and are equal to, or more stringent than, the criteria established by the counties. The zones, zone classifications, and required fire flow storage for each are listed in Table 10-6. These storage requirements are independent of water demands in the zones.

TABLE 10-6
Fire Flow Storage Requirements

Zone	2006 Storage (Million Gallon)	2012 Storage (Million Gallon)	2020 Storage (Million Gallon)
Cumberland	0.18	0.18	0.18
Prairie Ridge	0.24	0.24	0.24
Sunrise Standpipe	0.60	0.60	0.60
McMillin Gravity	14.40	14.40	14.40
Indian Hill	0.84	0.84	0.84

Dead Storage

Dead storage is the water that would not be available at sufficient pressure to customers. Dead storage is required in certain circumstances to ensure that the other storage types (above) are delivered at sufficient pressure.

TABLE 10-7
Dead Storage Requirements

Zone	2006 Storage (Million Gallon)	2012 Storage (Million Gallon)	2020 Storage (Million Gallon)
Cumberland	0.01	0.01	0.01
Prairie Ridge	0.10	0.10	0.10
Sunrise Standpipe	1.69	1.69	1.69
McMillin Gravity	19.23	19.23	19.23
Indian Hill	0.27	0.27	0.27

Total Storage Summary

The total storage required for each primary service zone is summarized in Table 10-8. As demonstrated by the results in this table, total storage requirements will increase with time, as the population of each zone increases.

Table 10-8 may be compared to Table 10-9 to compare storage requirements with the existing storage capacity in each zone to determine if any storage deficiencies may occur in the future. The reservoirs, standpipes and their storage volumes are listed by primary service zones in Table 10-9.

TABLE 10-8
Total Cumulative Storage Requirements

Zone	2006 Total Storage (Million Gallon)	2012 Total Storage (Million Gallon)	2020 Total Storage (Million Gallon)
Cumberland[1]	0.24	0.24	0.25
Prairie Ridge	2.23	2.63	3.68
Sunrise Standpipe	3.40	3.75	4.77
McMillin Gravity[2]	88.66	90.02	91.84
Indian Hill	4.82	4.95	5.14

[1] Standby Storage, Firefighting Storage, and Dead Storage were nested for Cumberland Zone.

[2] A portion of the Fire Flow Storage was nested with Dead Storage for the McMillin Gravity Zone.

TABLE 10-9
Reservoirs and Standpipes, Volumes, and Service Zones Storage Volumes

Primary Service Zone	Reservoir/Standpipe	2006 (MG)	2012 (MG)	2020 (MG)
Cumberland Zone	Cumberland Tank	0.12	0.12	0.12
Prairie Ridge Zone	Prairie Ridge Reservoir	2.50	5.00	5.00
	Prairie Ridge Spring Tank	0.20	0.20	0.20
Sunrise Standpipe Zone	Sunrise Standpipe	3.90	3.90	3.90
McMillin Gravity Zone	McMillin Reservoir	210	66.7	100
	Fletcher Standpipe	0.15	0.15	0.15
	Bismark Standpipe	0.10	0.10	0.10
	Hood Street Reservoir	10.0	10.0	10.0
	Portland Avenue Reservoir	20.0	20.0	20.0
	South Tacoma Reservoir	0.50	0.50	0.50
	University Place Tanks	1.40	1.40	1.40
	North End Reservoir	10.0	10.0	10.0
	North End Standpipe	0.33	0.33	0.33
	Alaska Street Reservoir	6.00	6.00	6.00
Indian Hill Zone	Indian Hill Reservoirs	5.00	5.00	5.00

10.2.2 Storage Evaluation Results

The existing and future storage requirements for each primary service zone are discussed below. The Tacoma Water system, as a whole, has excess storage capacity; however, some individual zones do not currently have adequate storage for anticipated growth. And as such, more storage and/or pump capacity is being planned to stay ahead of future growth. The impact of new service will depend on the location or zone in which it occurs.

Cumberland

Cumberland has one storage reservoir with a volume of 0.12 MG. The recommended fire flow is 1,500 gpm for 2 hours, which results in a total water volume of 0.18 MG. Given the pump station capacity of 0.5 MGD off of Pipeline No. 1, the system cannot provide the recommended fire flow to the customers in the Cumberland zone. The available storage is adequate to meet the King County fireflow requirements of 1,000 gpm for two hours (0.12 MG) for single-family residences, assuming the peak-hour demands can be met through pumping. However, this zone does not have overall adequate storage. In an emergency, a 450-gpm gasoline pump is available for hookup to a four-inch connection. This pump is stored in Enumclaw. This zone is also backed up by gravity flow from Pipeline No. 1.

Prairie Ridge

Prairie Ridge has 2.7 MG of storage in two reservoirs: Prairie Ridge Reservoir (2.5 MG) and Prairie Ridge Spring Tank (0.2 MG). Additional growth is anticipated in this area primarily from two large master-planned communities. The required storage is anticipated to be a combined total of 5.2 MG as early as 2012 and an additional amount of approximately 6.6 MG at some future date to be determined.

Sunrise Standpipe

The Sunrise area has one standpipe with a volume of 3.9 MG. The recommended fire flow is 10,000 gpm for one hour due to the possibility of light industry populating the area. This fire flow capacity was built into the standpipe. The current pumped capacity of the zone is 5.1 MGD supplied from two independent pump stations. The storage is estimated to be adequate until at least 2016. Prior to 2016, additional pumps must be installed. The newest pump station in the zone has provisions and two empty pump bays in preparation for the additional needed pump capacity. A proposed high zone pump station will also allow for a larger portion of the standpipe's capacity to be usable.

McMillin Gravity

The McMillin Gravity zone has excess storage volume. This zone would have about 150 MG excess in 2020. However, the reservoir will be downsized beginning in 2009. McMillin Reservoir is presently uncovered. Storage will be reduced when the open basins are replaced with buried tanks (see 10.2.3 below). The anticipated future volume of McMillin has not been firmly determined, however, initial studies have suggested a total capacity of 100 MG would be adequate for planning horizons as far out as 50 years.

McMillin Reservoir feeds the zone through two parallel pipelines. The combined capacity of the pipelines is about 105 MGD. If one of the pipelines is out of service, the remaining pipeline can supply approximately 80 MGD. Adequate source and storage is available in the McMillin Gravity zone from the storage available in town, the capacity of one of the parallel pipelines from McMillin Reservoir, the Second Supply Project Pipeline and the wells.

Indian Hill

Indian Hill has five MG of storage. This storage is adequate to meet storage requirements through at least the year 2014. Prior to 2014, additional pumps may need to be installed. The 356th Street Pump Station has provisions and two empty pump bays in preparation for the additional needed pump capacity. Construction of the pump station provided sufficient source capacity such that additional storage is not needed. During most of the year, the 356th Street Pump Station supplies the Indian Hill zone by gravity flow from the McMillin zone.

Note that by contract with the Lakehaven Utility District (LUD), 2,080 gpm of the 356th Street Pump Station capacity, and 1,700 gpm of the Marine View Drive Pump Station capacity are to be available for use by LUD (and are therefore not to be considered available for use by this zone). These capacities were excluded from calculations for this zone.

New Service

The impact of new service on the storage requirements depends on the zone to which the service is added. If new service is added to the McMillin Gravity zone, the additional storage required would most likely be supplied by the existing storage. New service in the McMillin Gravity zone would affect the extent to which the McMillin Reservoir volume could be decreased to facilitate reservoir covering. If significant new service is added in zones with minimal or inadequate storage, the impact will be significantly greater. New services will be monitored and storage requirements reevaluated continually, as needed.

10.2.3 Reservoir Covering

DOH has established requirements for each utility to plan for covering all uncovered reservoirs within a reasonable period of time. The only remaining uncovered reservoirs in the Tacoma Water system are the three basins at McMillin Reservoir.

McMillin Reservoir consists of three separate concrete-lined basins with a total storage capacity of 210 MG. Two of the basins were constructed in 1913 with a capacity of 55 MG each. The third basin was constructed in 1956 and has a capacity of 100 MG. McMillin Reservoir is located on the South Hill of the City of Puyallup. Two employees reside onsite, providing security and fulfilling operations and maintenance functions. A portion of the Green River supply currently flows through McMillin Reservoir.

The storage analysis has shown that Tacoma Water has approximately 150 MG of excess storage in the McMillin gravity zone. To reduce the cost of covering the reservoirs and increase the turnover rate, the size of McMillin will be reduced. Current projections call for the first of three 30-35 MG tanks to be constructed in 2009, with a second to be constructed in 2015. Once two basins are in service it is likely that any remaining uncovered basin will be removed from service. The final tank would be constructed as system needs dictate, but likely in the 2019-2020 timeframe.

10.3 Transmission and Distribution System Analysis

The transmission and distribution system analysis predicts system functions under situations such as peak-daily flows to help identify system deficiencies and needed system improvements. This section presents the results of computer modeling of Tacoma Water's transmission and distribution system.

10.3.1 Methodology

Tacoma Water's distribution system is currently being modeled using WaterCad,

Version 7. WaterCad is a graphically based, AutoCAD-compatible network modeler with a KY pipe numerical modeling engine algorithm.

Tacoma Water's WaterCad model encompasses the gravity transmission mains and distribution mains. The Second Supply System Project Pipeline, also known as Pipeline No. 5, was modeled separately as a backbone system. The Pipeline No. 5 model was analyzed to determine any flow reversal/water quality effects of its operation as well as determining the effects of Second Supply Project Partner's demands on this pipeline. Tacoma Water's hydraulic model is continually being expanded and updated, to include smaller piping and to model areas of the system that have not been wholly represented by previous models.

Construction of the model includes the normal components of pipe length, pipe diameter, elevations of system components, reservoir sizes, pump curves, pressure relief valve (PRV) settings, and other measurements that are known. Such information, readily obtained from construction as-builts and related documents, forms the foundation upon which the model is based.

An interesting aspect of the construction of the model was the fact that its construction was expedited and enhanced through an in-house development program. This program involved an application, which electronically converted existing GIS/AutoCAD data to WaterCad pipe data and automatically inserted it into the model. The time savings realized from this program was significant. To populate the model in the most expedient way, the program obtains three types of data from the AutoCAD maps of our system. First, main diameter and type of pipe is extracted from the AutoCAD layer in which a particular main exists. The installation date is extracted from an "extended entity data table" and is used to calculate whether the main was installed prior to 1950. This year was chosen, based on empirical data, as the break point for our "C" factors. The data is run against a custom program developed for ESRI software to aggregate mains based on these three criteria, eliminating unnecessary nodes for bends, tees, etc. For example, a 12-inch Cast Iron main, installed in 1945, is classified as "OldCIP12", which has a corresponding "C" factor. The list of "C" factors, used in our model as initial setting, before calibration, is detailed in the Table 10-10.

TABLE 10-10
"C" Factors

Material Designator	Description	"C" Factor
PVC	PVC	150
PLS	PLASTIC	140
STEEL	STEEL	140
ACP	ASBESTOS CEMENT	135
CON	CONCRETE	120
DIP	DUCTILE IRON	120
CMP	CORRUGATED METAL	100
NEWCIP24	POST 1950 CAST IRON-24"	87
NEWCIP16	POST 1950 CAST IRON-16"	85
NEWCIP20	POST 1950 CAST IRON-20"	85
BRS	BRASS	80
NEWCIP12	POST 1950 CAST IRON-12"	80
OLDCIP20	PRE 1950 CAST IRON-20"	80
OLDCIP22	PRE 1950 CAST IRON-22"	80
OLDCIP24	PRE 1950 CAST IRON-24	80
OLDCIP18	PRE 1950 CAST IRON-18"	78
NEWCIP10	POST 1950 CAST IRON-10"	77
NEWCIP08	POST 1950 CAST IRON-8"	75
OLDCIP16	PRE 1950 CAST IRON-16"	75
COP	COPPER	70
NEWCIP04	POST 1950 CAST IRON-4"	70
NEWCIP06	POST 1950 CAST IRON-6"	70
OLDCIP12	PRE 1950 CAST IRON-12"	70
OLDCIP14	PRE 1950 CAST IRON-14"	70
OLDCIP10	PRE 1950 CAST IRON-10"	68
OLDCIP08	PRE 1950 CAST IRON-8"	65
GLV	GALVANIZED	60

OLDCIP06	PRE 1950 CAST IRON-6”	60
OLDCIP02	PRE 1950 CAST IRON-2”	58
OLDCIP04	PRE 1950 CAST IRON-4”	58

Localized current water demands are obtained electronically from our customer information data base and are uploaded into an overlaying parcel grid. The demands are then apportioned by spatially assigning them to the nearest node. The application for obtaining and inserting this data was also developed in-house.

The computer model of the distribution system fully integrates all portions of the system. The model is checked and calibrated with hydrant flow test data on file and with specially requested flow tests conducted by field personnel. Extensive flow test results are available for both older developed areas, as well as newer areas, of the system. Calibration is an on-going process. Although the model is complete, reflecting all pipes in the system, it is not completely calibrated. The goal is to achieve complete system calibration by the end of 2006.

Proper water main, storage and pump station sizing are some of the outputs from the model. The model also helps to pinpoint any pressure or flow deficiencies in the transmission and distribution water system. This data is used as part of an overall plan for main replacement or new main construction. In addition to flow/pressure deficiency data, other modeling criteria as listed below are also used to prioritize needed water main replacements or repairs:

- Age of Pipe
- Number of Pipe Failures
- Planned Road Work
- Water Quality Complaints
- Main Depth
- Dead-end Mains
- Priority Areas, (i.e., Business/Industrial Areas)
- Pipe Material
- Pressure Zone Improvement

10.3.2 System Strength

Basic system strength was evaluated under MDD and Peak Hour Demand (PHD) scenarios. Under MDD conditions, the water system must be able to maintain 20 psi, minimum residual pressure, to all customers during a fire flow. Figure M-1 denotes fire flow availability during MDD. As shown, the majority of the system supports available fire flows in excess of 1,000 gpm, the minimum fire flow required in residential areas by the Uniform Fire Code. Although the City of Tacoma has not established minimum fire flow requirements in the downtown core, consultation with the Fire Protection Engineer for the City of Tacoma indicates that fire flow requirements in that area are generally slightly lower than 2,500 gpm. There are several other areas of higher than typical residential fire flow requirements. These are the Tideflats, an area of heavy and medium industry, the Frederickson Industrial area, which includes a division of the Boeing Commercial Airplane Division, two power plants, several wood products manufacturing and distribution companies, a food products company and a composites manufacturing firm,

among others, and a relatively small light industrial park, located in the Orting Valley. Fire flows available in the Tideflats area, as shown; well exceed the UFC requirements 2,500 gpm. Due to a backbone grid of large diameter mains, available fire flow is around 10,000 gpm. Available fire flows in the Frederickson Industrial area are approximately 8,000 gpm and exceed the minimum required. This is due to a looped feed of 20-inch and 24-inch mains in Canyon Road and 38th Avenue E connected to Tacoma Water's 58-inch transmission main in 128th Street E. Source water for this main is the 210 MG McMillin Reservoir on the South Hill of Puyallup. The final industrial area served by Tacoma Water is in the Orting Valley. This small area is fed through a backbone of 12-inch main from a single connection to Pipeline No.1, which consists of two 39-inch steel mains at that location. Fire flows in the industrial park area also exceed 2,500 gpm.

Under PHD conditions, the water system must be able to maintain 30 psi minimum pressure. Figure M-2 depicts the residual pressure under PHD conditions. As shown, there are very few isolated areas showing less than 30 psi during PHD conditions.

10.3.4 Distribution System Water Quality Modeling

Current hydraulic modeling software has been used in Extended Period Simulation (EPS) mode in a study of water age in the Sunrise area. Specifically, an analysis was run of the Sunrise Tank, which supplies the 706 Zone. Data from the study is being used to determine which of several system modifications will be most effective in improving water age in the tank. The selected solution will be budgeted for and constructed in 2007.

EPS functionality was also used in a recent emergency drill. The drill was based on a clandestine contamination of a reservoir. The software was used to determine the expected contamination plume limits, thereby providing a tool in obtaining effective contaminant isolation. In general, EPS will continue to be used as a tool for storage, pumping and distribution system operation and design.

10.4 Deficiencies / Recommendations

10.4.1 Storage Facilities

The storage analysis included evaluating storage requirements in the primary service zones in the Tacoma Water service area. The analysis shows that the system, as a whole, has excess storage. However, individual zones were found to be deficient. Recommendations from the storage analysis are as follows:

- The Cumberland zone was shown to have inadequate storage based on the criteria developed for this evaluation.
- The Prairie Ridge zone will require additional storage at some point prior to 2012. This storage expansion is anticipated and being planned.
- The Sunrise Standpipe zone has adequate storage until at least 2017. Additional capacity needs in this zone will be accommodated by increasing the pump capacity. The newest pump station in the zone has provisions and empty pump bays in preparation for the additional needed pump capacity. Zone modifications may allow for increased use of existing Sunrise Standpipe capacity.
- The McMillin Gravity zone storage volume will be reduced beginning in 2009. The reduction in reservoir size will be accomplished in conjunction with the covering of the reservoir, and will be designed to accommodate the anticipated storage needs of the zone for at least the next 50 years.
- The Indian Hill zone has adequate storage until at least 2020.

- The Fennel Creek zone has adequate pump capacity and an emergency redundant backup supply from the City of Bonney Lake.

Additional storage will be planned and added, as needed.

10.4.2 Transmission and Distribution System

System Deficiencies

Figure M-1 depicting fire flow capabilities shows some areas where the system is not capable of providing 1,000 gpm at 20 psi residual pressure. A significant number of these deficient areas can be explained by observing that they occur at the end of small diameter dead ends. Typically, on dead ends, water main downstream of hydrants is reduced to four-inch diameter for water quality considerations. An example of this situation can be seen in the City of University Place; specifically, west of Bridgeport Way West, between 47th and 56th streets. Figure M-1 depicts the area as deficient in fire flow. A more detailed view of the area (available using the enclosed CD), shows that nearly all of the areas depicted as deficient are in areas of short four-inch dead end mains (depicted in a lighter shade of blue). Consequently, graphical representation of fire flow capability will show areas surrounding many of these dead ends, as deficient, when, in fact, it is just the graphics (depicting deficiencies) engulfing the entire area. Rather than eliminate the nodes, which produce this graphical anomaly, they have been retained in the model. The main reason for this is that often one of these nodes, because of its high elevation, is the constraining node used in the computation of minimum available fire flow available at 20 psi. In other words, eliminating all of these dead end four-inch nodes from the computation would, in certain situations, depict artificially high available fire flow. Obviously, the more nodes (with accompanying elevations) that are included in fire flow computations, the more accurate the results. There are; however, some low flow areas which were identified and are indicative of system deficiencies. Specific deficient areas include:

- Fife Heights (411 Zone) - Limited supply and lengthy runs of six-inch and four-inch mains.
- Stadium District – Grid of small diameter, late 1800s and early 1900s vintage gray cast iron mains.
- East Tacoma (346 Zone) – Supplied via PRVs in the south end of this area feeding through old, small diameter mains.
- North End 478 Zone- This area is deficient, primarily as a result of lower than optimal service head. The area is bounded by Proctor Street on the west, Lawrence Street on the east, South 12th on the south and North 11th on the north.
- S. "L" Street; S.5th to S.27th – This area consists of 1800s vintage four and six-inch, severely corroded mains, with few cross connecting mains. Flow testing and "C" Factor testing confirms this, with "C" Factors in the 50 range and some flows in the 500 gpm range.

System Improvements

Tacoma Water staff has analyzed the deficiencies identified above. Most areas are being addressed through main replacement projects currently underway or planned in the next year. Others are still being studied to determine the best solution to improve water service to the area of concern. Details are provided below:

- Fife Heights - More analysis is necessary. A likely remedy would be an additional feed coupled with additional piping cross-ties within the street grid.

- Stadium District – Complete reconstruction of the piping grid is planned for 2007.
- East Tacoma (346 Zone) – More analysis is necessary; however, an additional feed to this small zone from the north would likely provide the needed additional fire flow. The grid is composed of early 1900s vintage six-inch gray cast iron mains and will also be a candidate for replacement.
- North End (478 Zone) – In June 2006, work will begin that will result in a significant expansion of the 538 zone eastward. This work is expected to be completed by the end of August 2006. The project includes the installation of approximately 14,000 feet of new water main, including replacements of aging and/or small diameter mains, the installation of a 12-inch trunk in Adams Street. between S.12th and N. 11th and the activation of a PRV at S. 17th and Adams Street, which is connected to the 42-inch North End Transmission Pipeline (576 head). The PRV will be set to feed the expanded 538 zone. The PRV, coupled with the piping improvements will alleviate the current marginal/inadequate fire flow and/or service pressure deficiencies.
- S. "L" Street - A main replacement project will be constructed in 2006 to upgrade the main in "L" between S.5th and S.27th streets as well as establishing additional grid cross-ties, replacing two-inch galvanized at two locations. The new pipe will alleviate flow and pressure problems in this main and in the area just to the east.

10.5 Hydraulic Analysis of the Distribution System Using Future Demands

As noted in Section 10.3, the hydraulic analysis of the distribution system was completed using current customer water demand information. The identified system deficiencies noted in Section 10.6.2 will be addressed as previously discussed. As new development occurs throughout the Tacoma Water service area, the hydraulic model is used to size the facilities needed to provide service. On-site distribution mains are typically all that is required to serve new development, but in some cases new development also requires off-site mains and either pumping or a pressure reducing valve. Although most of the Tacoma Water service area is developed, considerable open tracts are available for development in the eastern part of the system. The hydraulic model analysis completed for this water system plan included projections of growth in these areas. As land that has been previously undeveloped becomes developed, it is the responsibility of the developer to pay for construction of the mains required to serve the site. Tacoma Water will provide the transmission and storage required as stated in the above reference analysis. Tacoma Water is well positioned to meet the development needs of the entire Tacoma Water service area. A great deal of coordination and early communication regarding zoning, preliminary planning and permitting occurs between Tacoma Water staff and city and county staff in order to appropriately plan for infrastructure improvements throughout the service area. In recent years, considerable redevelopment within downtown Tacoma and other business areas has required the coordination efforts to broaden. Within the City of Tacoma, a team assigned with coordination activities has focused on using coordination of infrastructure projects to recreate neighborhoods and develop urban villages. Such projects have been a partnership of the City, utilities and abutting property owners.

CHAPTER 11

CAPITAL IMPROVEMENT PROGRAM

CHAPTER 11

CAPITAL IMPROVEMENT PROGRAM

11.1 Introduction

This chapter discusses recommended capital improvement projects for Tacoma Water along with their estimated costs and proposed implementation schedule. Financing for the projects is discussed in Chapter 12 – Financial Evaluation.

11.2 Water System Improvements Since Last Plan

In addition to the completion of system improvements associated with the Second Supply Project (i.e, the 34-mile Second Supply Project Pipeline, improvements to the Tacoma Water Headworks diversion dam, the fish trap-and-haul facility and the new treatment facilities), system improvements since the development of the 2000 Water System Plan include the following major capital projects:

- Replacement of the Portland Avenue Reservoir
- The Addition of the Following Pump Stations: 198th Street, Fennel Creek and 356th Street
- Well 6A Replacement
- 50 Miles of Main Replacement
- 6,000 Service Renewals
- SAP Software Implementation (leading to changes to the following processes: billing; financial systems, HR management, permitting, warehousing etc.)

11.3 Capital Improvement Projects Summary

Tacoma Water operates under the guidance of a ten-year business plan, which was most recently revised in 2006 to cover the period 2007 through 2016. The 2007-2016 Business Plan identifies key planning, customer and operation and maintenance (O&M) and capital programs which the utility must address in order to meet customer expectations for high quality water service, to address new regulations and to respond to growth in system demands. The business plan also addresses financing and rate requirements necessary to support the implementation of the projected operations and capital program needs. Because the business plan update cycle associated with the 2007-2016 Business Plan coincided with the water system plan update, the results from the water system plan's system analysis have been incorporated into the business plan's projection of capital program needs. From the projection of needs, the Capital Improvement Program (CIP) for the water system was derived. The CIP is an element of the City's Growth Management Act (GMA) Comprehensive Plan and is updated annually. Tacoma Water budgets biennially and must revisit the CIP in context with the fiscal realities at each budget cycle. (Please see Section 1.4.1 for additional information.)

The following section describes the recommended capital projects from the 2007-2016 Business Plan. Table 11-1 contains the Water Division Capital Projects, including projected costs and schedule for implementation. The following section generally describes the recommended capital projects from the 2007-2016 Business Plan for the short term (2007 – 2008) and the long term (2009 and beyond). The 2007-2016 Business Plan priorities related to Tacoma Water's Operation and Maintenance programs are contained in Chapter 8 – Operation and Maintenance Program.

11.4 Water Supply, Transmission and Storage Improvements

11.4.1 Background

The Tacoma Water Business Plan Strategic Initiatives which establish the priorities for water supply, transmission and storage capital improvements for the years 2007-2015 include:

- Emergency Preparedness and Security
- Supply System Renewal and Replacement
- McMillin Reservoir

A summary of each Strategic Initiative follows and includes a reference to the 2006 Update's relevant analysis where applicable.

Emergency Preparedness & Security

Tacoma Water places great emphasis on assuring the reliability of the water system and the quality of the water. Since 2001, a primary emphasis has been on protecting against deliberate acts of destruction by groups interested in disrupting security for the region. Prior to that time, the emphasis was on response to major natural disasters such as a large earthquake. A proper emergency preparedness and response approach must adequately address both natural and man-made disasters, bearing in mind the relative likelihood of each occurring. For example, it would be inappropriate to concentrate entirely on mitigating major terrorist attacks while ignoring earthquake response given the occurrence of future large earthquakes is a certainty in this region. An emergency response program must also differentiate between chronic but minor vandalism attacks and low probability international terrorist attacks. Many elements of emergency preparedness and response are applicable to both man-made and natural disasters.

System redundancy remains a key design philosophy at Tacoma Water. Redundancy is one of the most effective means of reducing the consequences of loss of a facility, whether due to intentional acts or natural events. Tacoma Water makes every effort to avoid single points of failure, where loss of one component or facility will severely disrupt the operation of the utility. This principle governs design of all Tacoma Water system components, from the distribution system to pump stations, sources, storage, control systems, transmission mains and treatment systems.

Supply System Renewal and Replacement

The water supply system consists of transmission mains, wells, pump stations and reservoirs. A number of Tacoma Water's distribution reservoirs have been modernized in the past 20 years and many wells installed in the 1930s have been rehabilitated and replaced since 1980. However, the major transmission mains are now reaching the beginning of the time period where major renewal and replacement will be required. In order to maintain an ongoing estimate of capital expenses required to keep the existing transmission system operable into the future, Tacoma Water implements a Transmission Main Renewal and Replacement Program. Based upon the characteristics of each section of main, Tacoma Water estimates a life expectancy and a resulting replacement year for each transmission main section. A variety of information is used to evaluate life expectancy, including leak history, material (steel or concrete pipe), coating (coal tar or epoxy, compared to older painted coatings), and the presence or absence of cathodic protection. During the next several decades it is anticipated that the amount of supply infrastructure in need of replacement will increase dramatically, driven largely by the need to replace transmission mains that are reaching the end of their service lives. Additionally, new wells which will make full use of existing water rights and available capacity of the aquifers will be necessary in order to

meet projected increases in demands for water. (See Sections 6.5, 6.7, 10.2, and 10.6 for additional information.)

McMillin Reservoir

McMillin Reservoir is the last remaining uncovered reservoir in the Tacoma Water system. Adverse impacts on water quality and recent federal water quality regulations make it imperative that the McMillin basins be replaced as soon as possible with enclosed tanks. (See Sections 7.5.2, 9.3, 10.2.3, 10.6.1 for additional information.)

11.4.2 Short Term (2007 - 2008)

The 2007/2008 biennium includes a combination renewal and replacement project involving a portion of Pipeline No. 1 in the Puyallup River valley. Preliminary design began on this project in late 2005. The project will replace the pipeline bridge crossing of the Puyallup River and a section of pipe that crosses a wetland on piers. The new pipe and river crossing will be underground, and will be much better protected against lahars, floods, earthquakes and intentional attacks. A section of buried pipe, constructed in 1913, will be relined and will receive upgraded cathodic protection.

A section of Pipeline No. 2 near Canyon Road will require pipe joint repairs this biennium to renovate a section with chronic leak problems.

A portion of Tideflats Trunk Main 1 in the vicinity of the Tacoma Dome will be realigned and replaced.

Funds are budgeted to replace broken valves on the transmission system and to construct some seismic upgrades on mains.

Well 2C is planned to be drilled to the deep aquifer in the upcoming biennium. Well SE-7 will be equipped with a pump, treatment, controls and communications. Funds will also be budgeted to replace an existing pump and motor should one fail. Well 15A is planned for the shallow aquifer.

Construction of the Sunrise high zone pump station is anticipated during 2007/2008 (See Table 11-1, Future Pump Stations).

11.4.3 Long Term (2009 and beyond)

Through the Transmission Main Renewal and Replacement Program, initial projects for transmission main replacements or renewals to occur in subsequent bienniums have been identified. These include relining of Pipeline No. 1 near Boise Creek, in an area with a history of leakage problems; another, on Pipeline No. 2, is located west of Woodland Avenue along 128th Street. This area may also be suitable for relining rather than complete replacement. These areas were identified for improvement based on their history of leak occurrence, cathodic protection issues, and the presence of poor soils. Future transmission main replacement work is expected to be required on an ongoing basis.

In subsequent years, old wells will be replaced and additional new wells will be drilled to deeper aquifers on existing well sites. Additional wells are necessary in order to make full use of water rights and of the available capacity of the aquifers.

The existing McMillin Reservoir open basins will be replaced with covered tanks starting in 2009 (design work to occur in 2008).

As identified in Chapter 10 – System Analysis, additional storage is planned for the Prairie Ridge zone (See Table 11-1, Future Reservoirs).

11.5 Water Quality Improvements

11.5.1 Background

The Tacoma Water Business Plan Strategic Initiative "Long-range Water Quality Plan" establishes the priorities for water quality capital improvements for the years 2007-2015.

A summary of the Long-range Water Quality Plan Strategic Initiative follows and includes a reference to the 2006 Update's relevant analysis where applicable.

Long-range Water Quality Plan

Tacoma Water is able to operate as an unfiltered surface water supply due to the high quality of the Green River source, an active Green River Watershed control program, effective treatment and the availability of groundwater supplies in the watershed and in town when the river turbidity exceeds acceptable limits. Recently finalized regulations increase the treatment requirements for Tacoma Water. Regulations developed under the Federal Safe Drinking Water Act require treatment for *Cryptosporidium* from the Green River/North Fork well supply by 2014 (assuming a two-year extension is granted by the State). There are two practical options for dealing with *Cryptosporidium*: Removal of the oocysts through filtration or inactivation of the oocysts using Ultraviolet Light disinfection. A pilot study to evaluate potential treatment processes is needed prior to implementing a course of action. (See Section 9.4 for additional information.)

With start-up of the Second Supply Project Pipeline, there are changes in how water is supplied to the distribution system. To the greatest extent possible, Green River water will be used prior to pumping more costly water from the South Tacoma wells. When demand increases beyond that which can be supplied by Pipeline No. 1 and the Second Supply Project Pipeline or if Green River flow commitments dictate, the wells will be pumped to meet demands. Much of this water will flow into residential areas of Tacoma. Presently, the water from the South Tacoma wells is disinfected with chlorine, but is not optimized for corrosion control nor it is fluoridated. Installation of corrosion control and fluoridation facilities for the South Tacoma wells and other groundwater sources is needed. Additionally, several upcoming regulations may require additional treatment at some wells, depending on background water quality. Studies conducted in 2005 for corrosion control and fluoridation of the groundwater supply have highlighted several significant challenges, therefore refining alternatives to meet treatment objectives is required prior to implementing a solution. (See Section 9.4.2 for additional information.)

11.5.2 Short Term Projects (2007- 2008)

The construction contract to build a new ozonation treatment facility was executed in January, 2006 and the ozone facility is expected to go online in mid-2007.

Installation of corrosion control and fluoridation facilities for the South Tacoma Wells and other groundwater sources are planned for the 2007/2008 biennium.

Studies conducted in 2005 for corrosion control and fluoridation of the groundwater supply have highlighted several significant challenges with this work, and focus in the 2007 -2008 period will be refining alternatives to meet treatment objectives.

11.5.3 Long Term Projects (2009 and beyond)

The Long Term 2 Enhanced Surface Water Treatment Rule (LT2ESWTR) requires Tacoma Water to have the facilities in place to remove or inactivate *Cryptosporidium* by 2012. The rule does allow a two year extension from the Washington State Department of Health (DOH) if capital facilities are being constructed to comply with the rule. Tacoma Water plans to conduct a pilot study to evaluate several treatment processes for *Cryptosporidium* beginning in 2009, assuming Howard Hanson Dam downstream fish passage is in service.

Concurrent with the covering of the McMillin Reservoir, the gas chlorination system may be reduced in size and replaced with a sodium hypochlorite facility.

11.6 Water Distribution Improvements

11.6.1 Background

The Tacoma Water Business Plan Strategic Initiatives which establish the priorities for water distribution capital improvements for the years 2007-2015 include:

- Distribution System Renewal and Replacement
- Tacoma Water Public Road Project Main Replacement
- Support of Economic Development

A summary of each Strategic Initiative follows and includes a reference to the 2006 Update's relevant analysis where applicable.

Distribution System Renewal and Replacement

Tacoma Water's distribution system infrastructure is aging. At the current budgeted rate of main replacement, water mains and appurtenances will be in service well beyond their anticipated life, which could increase the risk of service interruptions and damage due to main breaks. Tacoma Water staff will continue to analyze the distribution system to develop a more refined approach to the main replacement program. The Tacoma Water Distribution System Renewal and Replacement Program is a combination of the Main Replacement Program and Systematic Maintenance and Renewal Team (SMART) work. SMART is a program that replaces valves, hydrants, services and meters. These components typically need replacement more often than mains. (See Sections 10.3 and 10.6.2 for additional information.)

Tacoma Water Public Road Project Main Replacement

Tacoma Water replaces water mains and related appurtenances in response to projects implemented by state, county and city jurisdictions that impact water facilities. The work by Tacoma Water in coordination with these projects is referred to as Public Road Projects (PRP). The PRP program and budget were created to address other jurisdictions' road replacement priorities that would have previously affected the Main Replacement Program priorities and budgets.

Ideally, Tacoma Water's Public Road Projects Program would replace mains that were of high priority and targeted within the Main Replacement Program for replacement. In many cases, however, the priorities of road improvements and water main replacement do not match. Where the main is not of high priority for replacement, a judgement must be made whether the expected life remaining in the water main will outlast the street surfacing. Break history, pipe material and age are all considered. This analysis can result in a decision to replace mains that might have otherwise had ten to 20 or 30 years of life remaining.

Ongoing communications with the cities and counties to which water service is provided is imperative to anticipate and prepare for upcoming projects. Doing so allows Tacoma Water to take advantage of savings that can be realized by avoiding the cost of pavement replacement. The goal, whenever possible, is to incorporate water main work within the local agency road project contract. It is the belief of Tacoma Water that overall project coordination will be improved via such cooperative agreements. In addition, construction impacts to the public and overall project costs will be reduced.

Support of Economic Development

With implementation of the Growth Management Act in the 1990s, cities were required to assure that infrastructure was in place or would be installed prior to development occurring. Tacoma designated the entire city-limits as a tier 1 area. This generally means that all infrastructure is in place and able to meet the needs of development. Although this does not mean that a project will not be required to construct off-site improvements, it does imply that there are no significant capacity issues in regards to required urban services – including water service. Expenditures associated with supporting economic development include a portion of the dollars allocated to the Main Replacement Program and the Public Road Project Main Replacement.

Tacoma Water is an active participant on the City of Tacoma Infrastructure Committee focusing on economic development. The Committee's charter is to recommend strategies to better support economic development with respect to infrastructure and permitting. In order to understand the issues from a developers' perspective, several developers and property owners have been involved in the Committee's meetings. After studying four areas in the city with a great deal of development interest, it was determined many existing portions of the Tacoma Water distribution system are inadequate to support anticipated redevelopment. The goal of Tacoma Water is to utilize the advance information made available by the development community to pursue an early start on planning and construction to accommodate the significant growth anticipated in Tacoma. Tacoma Water facilities and systems should never represent an impediment to development. Tacoma Water continues to develop and implement creative new processes, systems and standards that contribute to the attraction of the Tacoma area to potential development.

11.6.2 Short Term (2007-2008)

It is anticipated that approximately 5.75 miles of water main will be replaced per year as a result of implementing Tacoma Water's Water Main Replacement Program. An additional 2 to 3 miles of water main is anticipated to be replaced per year as a result of Public Road and Water Division projects.

11.6.3 Long Term (2009 and beyond)

The Port of Tacoma has extensive plans for redevelopment within the Tideflats area. Current coordination of projects such as the Lincoln Avenue and D Street grade separation is required. In addition, Tacoma Water has opened a dialogue with the Port to understand the Port's Master Plan for the Tideflats area and their future supply requirements. Many old large diameter supply lines only serve a distribution function and could be downsized. Current demands in the Port are not for the large heavy industrial uses of the past as the Port's focus has moved towards large container loading/unloading facilities. The Port's activities also include the expansion of rail service within the area resulting in the grade separation projects listed above.

Continued coordination will be needed with BNSF and Sound Transit as they expand and add track service for the Port of Tacoma and the surrounding area. Grade separations, track expansion and commuter rail are under current consideration along rail rights-of-way and will have significant impacts to both our distribution and supply systems where they cross.

Continued coordination with the Washington State Department of Transportation rights-of-way is also required. Both SR16 and I-5 corridors through Tacoma are currently being improved. Additionally, several other highway projects are anticipated with Tacoma Water's service area.

11.7 General Improvements (Miscellaneous Improvements)

11.7.1 Background

The Tacoma Water Business Plan Strategic Initiatives which establish the priorities for general capital improvements for the years 2007-2015 include:

- Tacoma Water Support Facilities
- Technology Implementation to Maintain Strategic Position
- Environmental Response

A summary of each Strategic Initiative follows.

Tacoma Water Support Facilities

Tacoma Water support facilities include office, shop, warehouse, dispatch, employee housing and control center space. Tacoma Water's support facilities are located in Pierce and King Counties at six primary sites. The sites are known as the Green River Headworks complex, Enumclaw office and shops; McMillin Reservoir complex; Water Distribution Center, and Public Utilities Administration Building. Several of the support facilities are inadequate to meet the needs of Tacoma Water in coming years and are, therefore recommended for improvements.

Technology Implementation to Maintain a Strategic Position

Technology plays a critical role in Tacoma Water's pursuit to stay a leader in the water industry, work effectively and provide quality service to customers. Available technology must be used, such as SAP software, to improve Tacoma Water's operational and financial effectiveness. Tacoma Water proposes to assess technology usage and needs in the areas of automated meter reading, work management, communications, document and drawing management and GIS.

Environmental Response

Tacoma Water has made a significant commitment to the protection of the Green River environment particularly with regard to salmon protection and restoration. This commitment involves a 1995 settlement with the Muckleshoot Indian Tribe, a mitigation agreement with King County for the Second Diversion pipeline project, commitments to significant mitigation associated with the permitting of the Second Supply Project and a Habitat Conservation Plan approved by the U.S. Fish and Wildlife Service and the National Marine Fisheries Service in 2001.

In addition to obtaining water resources from the Green River, Tacoma Water also uses groundwater wells. As new facilities are built, environmental regulations must be followed. Therefore, Tacoma Water is engaged in environmental protection activities outside those related to the Green River operations.

11.7.2 Short Term Projects (2007 – 2008)

The SCADA (supervisory control and data acquisition) system is continually being upgraded in order to avoid obsolescence and to support additional facilities and data volumes. In the short term, the central SCADA computer hardware located in the Water Control Center will be upgraded and the tone-based data transmission equipment at some sites will be replaced with digital modem-based transmission equipment.

The replacement of radio equipment and preliminary design work associated with a major system upgrade is budgeted to occur in 2007/2008.

Tacoma Public Utilities has a substantial work force dedicated to acquiring consumption readings from electric and water meters. These costs are shared between both the Water and Power utilities. Tacoma Power is currently implementing automated meter reading (AMR) technology that utilizes the Click! Network in order to eliminate the need to manually read power meters. In order to avoid incurring all meter reading costs, Tacoma Water is similarly investigating technologies that would eliminate the need to manually read water meters.

Tacoma Water will continue to pursue its environmental commitments during the short term. Projects include: gravel placement; the installation of a snowtel site for snowpack monitoring purposes; tree plantings, and; the movement of wood debris behind Howard Hanson Dam down river.

11.7.3 Long Term Projects (2009 and beyond)

The long term lack of additional space in the Public Utilities Administration Building and the advantage of bringing water administration, engineering, and Tacoma field operations to one location lead to the following recommendations:

Due to the long term lack of additional space in the Public Utilities Water Distribution Center and the advantages of bringing similar field operations staff to one location, the construction of a new shops building adjacent to the existing Distribution Center is recommended. The shops building would include not just the meter, machine and tool shops from the Distribution Center, but also those in the Annex to consolidate equipment and resources, some of which are duplicated between the two buildings. Once the shops have moved from their existing locations, the Annex will be abandoned and the space available within the Distribution Center will be remodeled for a computer training room, office space and meeting rooms. Additionally, the locker rooms need to be expanded.

Due to the potential long term lack of additional space in the Public Utilities Administration Building and the advantage of bringing together water administration, engineering, and Tacoma field operations, continued planning for a new Water Headquarters Building on the east side of the existing Water Distribution Center is recommended.

Tacoma Water will continue to pursue its environmental commitments during the long term, including continued gravel placement and tree plantings.

WATER DIVISION CAPITAL PROJECTS 2007-2014

	2007	2008	2009	2010	2011	2012	2013	2014	TOTAL 2007-2014
Water Supply / Transmission / Storage:									
Tideflats Wells				900.0		650.0			1,550.0
Frederickson Well			930.0						930.0
New So. Tacoma Wells	490.0	490.0			630.0	1,000.0			2,610.0
Corrosion Control Projects	230.0	230.0	250.0	250.0	250.0	250.0	250.0	250.0	1,960.0
Future Pump Stations	160		650.0	350.0	750.0			500.0	2,410.0
Future Reservoirs			2,400.0	1,500.0			3,000.0		6,900.0
74th Street Wells Line					1,000.0				1,000.0
McMillin Res. Cover		500.0	17,000.0						17,500.0
Supply System Improvements	170.0	170.0	200.0	200.0	200.0	200.0	200.0	200.0	1,540.0
Seismic Modifications	110.0	110.0		500.0		500.0			1,220.0
Replace Large Valves	50.0	50.0	50.0	75.0	75.0	75.0	75.0	75.0	525.0
Transmission Line Additions			500.0	500.0	500.0	500.0	500.0	500.0	3,000.0
Transmision Main Renewal & Replacement Program	475.0	475.0	2,000.0	2,000.0	2,000.0	2,000.0	2,000.0	2,000.0	12,950.0
South Tacoma Wells (replacement/Improvement)	865.0	865.0	500.0	500.0	500.0	500.0	500.0	500.0	4,730.0
Repl. /Improve Other Wells & Appurtenances		450.0		500.0		500.0			1,450.0
Replace PL1 @ Puyallup River	6,500.0								6,500.0
Tools	10.0	10.0	15.0	15.0	15.0	15.0	15.0	15.0	110.0
Sub-total	9,060.0	3,350.0	24,495.0	7,290.0	5,920.0	6,190.0	6,540.0	4,040.0	66,885.0
Water Quality:									
Chlorine Safety upgrade						9.0			9.0
McMillin Chlorine Replacement		50.0	450.0						500.0
Various Equipment	50.0	50.0	75.0	75.0	75.0	75.0	100.0	100.0	600.0
Land Acquisition	500.0	500.0	500.0	500.0	500.0	500.0	500.0	500.0	4,000.0
Chlorine Facility & Improvement (Existing Source)	50.0		50.0		50.0		50.0		200.0
Fluoridation for Wells			300.0	200.0					500.0
Corrosion Control for Wells			500.0						500.0
Reservoir Improvement (Mixing)	50.0		50.0	50.0			50.0	50.0	250.0
Coliform Monitoring Stations			10.0						10.0
Treatment at Gravity Pipeline Wells	250.0	250.0							500.0
Enhanced System Monitoring	50.0	50.0							100.0
Enhanced Security at Watershed & Headworks	125.0	125.0							250.0
Sub-total	1,075.0	1,025.0	1,935.0	825.0	625.0	584.0	700.0	650.0	7,419.0
Water Distribution:									
Public Road Projects	2,500.0	2,500.0	2,500.0	2,500.0	2,500.0	2,500.0	2,500.0	2,500.0	20,000.0
Distribution Main Upgrades & Renewals	4,500.0	4,500.0	5,000.0	5,000.0	5,500.0	5,500.0	5,500.0	5,500.0	41,000.0
LIDs	200.0	200.0	200.0	200.0	200.0	200.0	200.0	200.0	1,600.0
Private Projects--Main oversizing, etc.	150.0	150.0	150.0	150.0	150.0	150.0	150.0	150.0	1,200.0
Tools	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	800.0
Hydrant Upgrade & Replacement	500.0	500.0	500.0	500.0	500.0	500.0	500.0	500.0	4,000.0
Water Service Replacement	3,750.0	3,750.0	3,200.0	3,200.0	3,500.0	3,500.0	3,500.0	3,500.0	27,900.0
Valve Upgrades & Replacement	450.0	450.0	500.0	500.0	550.0	550.0	550.0	550.0	4,100.0
Water Division Projects	500.0	500.0	500.0	500.0	500.0	500.0	500.0	500.0	4,000.0
Replace FM Meters	250.0	250.0							500.0
MRP Program - Jefferson St AC & Galv Mains	2,500.0	2,500.0	2,500.0	2,500.0	2,500.0	2,500.0	2,500.0	2,500.0	20,000.0
Main Replacement to Support City Street Overlay Program	4,000.0	4,000.0	4,000.0	4,000.0	4,000.0	4,000.0	4,000.0	4,000.0	32,000.0
Parallel Main for Sunrise High Zone	1,027.0								1,027.0
Cascadia		750.0							750.0
Sub-total	20,427.0	20,150.0	19,150.0	19,150.0	20,000.0	20,000.0	20,000.0	20,000.0	158,877.0
General Improvements (Miscellaneous Improvements)									
Water Administration Building							1,000.0	6,000.0	7,000.0
Comm. & SCADA Upgrade	830.0	800.0	1,350.0	1,400.0	200.0	200.0	400.0	350.0	5,530.0
Automated Meter Reading	250.0	250.0	6,000.0	6,000.0	6,000.0	6,000.0			24,500.0
Watershed Betterments (Road, Bridge)	150.0	150.0	150.0	150.0	175.0	175.0	175.0	175.0	1,300.0
Headworks Road Replacement	450.0	1,000.0							1,450.0
Intake Bridge Replacement	450.0	1,000.0							1,450.0
New Shops Building	1,500.0	1,500.0							3,000.0
Remodel of Existing Distribution Building	500.0	500.0							1,000.0
Landscape & Outfit McMilling Building	500.0								500.0
Admin Bldg. Outfitting and Furniture	500.0	750.0							1,250.0
McMillin Road Widening (Repavement & Storm)		350.0							350.0
HCP Culvert Replacement	375.0	375.0	375.0	375.0	375.0	375.0	375.0	375.0	3,000.0
Sub-total	5,505.0	6,675.0	7,875.0	7,925.0	6,750.0	6,750.0	1,950.0	6,900.0	50,330.0
General Plant:									
Computer / Equip./ Serv. Division	525.0	525.0	525.0	525.0	525.0	525.0	525.0	525.0	4,200.0
Fleet	175.0	175.0	175.0	175.0	175.0	175.0	175.0	175.0	1,400.0
Security	50.0	50.0							100.0
Sub-total	750.0	750.0	700.0	700.0	700.0	700.0	700.0	700.0	5,700.0
Second Supply Project(Tacoma Share)									
Environmental Mitigation PL#5 (Muckleshoot, King Co, HCP, Friends of Green)	70.0	70.0	65.0	65.0	65.0	60.0	60.0	60.0	515.0
Howard Hanson Storage	300.0								300.0
Treatment for Taste & Odor-O_3	705.0								705.0
Treatment for *Cryptosporidium* -UV			351.6	703.2	1,758.0	1,758.0			4,570.8
Muckleshoot Fisheries Trust Fund	2,500.0								2,500.0
Filtration	70.3	70.3							140.6
Sub-total	3,645.3	140.3	416.6	768.2	1,823.0	1,818.0	60.0	60.0	8,731.4
PL 1 Obligations from SSP									
Muckleshoot Agreement (Past damages)	200.0	200.0	200.0	200.0	200.0	1,000.0	250.0	250.0	2,500.0
Treatment for Taste & Odor-O_3	1,295.0								1,295.0
Treatment for *Cryptosporidium* -UV			648.4	1,296.8	3,242.0	3,242.0			8,429.2
Filtration	129.7	129.7							259.4
Sub-total	1,624.7	329.7	848.4	1,496.8	3,442.0	4,242.0	250.0	250.0	12,483.6
TOTAL	42,087.0	32,420.0	55,420.0	38,155.0	39,260.0	40,284.0	30,200.0	32,600.0	310,426.0

PLEASE NOTE: As of August 3, 2006, this document is based on a Draft Budget and subject to Tacoma Public Utilities Board approval.
All values times 1,000

CHAPTER 12

FINANCIAL EVALUATION / PROGRAM

CHAPTER 12

FINANCIAL EVALUATION / PROGRAM

12.1 Introduction

This Chapter contains an evaluation of the financial status of the Tacoma Public Utilities Water section (Tacoma Water), including existing rate structure and fees, alternative revenue sources and capital improvement financing.

12.2 Financial Status

Table 12-1 summarizes operating income and expense information for Tacoma Water for the years 2000 through 2005. The information is taken from Tacoma Public Utilities, Tacoma Water annual financial reports. Available revenue sources are shown in Table 12-1 in the row titled "Net Income Available for Bond Redemption and Plant Addition."

TABLE 12-1
Past and Present Financial Status

	2005	2004	2003	2002	2001	2000
Balance Sheet						
ASSETS:						
Utility Plant – Net	$515,240,672	$449,792,203	$391,992,687	$328,497,886	$258,090,234	$239,797,425
Special Funds &Non-Utility						
Property	98,980,127	86,235,235	128,107,319	111,051,760	45,226,731	22,993,841
Current Assets	15,880,090	21,804,006	19,223,128	16,097,870	9,791,934	7,492,155
Deferred Charges	2,938,485	2,954,978	3,380,733	2,957,394	1,202,418	1,759,241
Total Asset	**633,039,374**	**560,786,422**	**542,703,867**	**458,604,910**	**314,311,317**	**272,042,662**
NET ASSETS	355,944,995	327,326,910	305,678,001	273,351,382	225,440,687	--
LIABILITIES AND EQUITY:						
Long-Term Debt	224,760,581	199,174,091	203,913,661	170,542,535	77,292,631	43,110,621
Current Liabilities	12,820,700	14,542,631	12,150,879	11,896,274	7,567,108	6,173,108
Deferred Credits	39,513,098	19,742,790	20,961,326	2,814,719	4,010,891	3,779,256
Equity	--	--	--	--	--	--
Total Liabilities	277,094,379	233,459,512	237,025,866	185,253,528	88,870,630	218,979,677

TOTAL NET ASSETS AND LIABILITIES	**633,039,374**	**560,786,422**	**542,703,867**	**458,604,910**	**314,311,317**	**272,042,622**
Statement of Income						
OPERATING REVENUES:						
Residential and Domestic	27,611,024	26,589,163	24,497,359	21,277,778	18,033,215	16,799,076
Commercial and Industrial	7,174,647	6,619,432	5,809,774	5,442,100	5,329,293	5,259,844
Special Rater – Simpson	3,511,199	3,293,335	3,044,266	2,726,194	2,514,362	2,436,500
Municipal	316,562	308,884	218,852	206,254	275,146	265,789
Other Public Buildings and Grounds	1,409,107	1,523,562	1,353,062	1,190,054	1,014,132	1,023,816
Unbilled	--	(903,969)	680,497	194,702	312,477	(69,633)
Sales to Other Water Utilities	1,599,919	1,622,206	1,531,004	876,610	712,813	877,672
Total Water Sales	**41,622,458**	**39,052,613**	**37,134,814**	**31,913,692**	**28,191,438**	**26,593,064**
Other Operating Revenues	1,428,135	792,302	871,547	858,133	823,504	876,559
Total Operating Revenues	**43,050,593**	**39,844,915**	**38,006,361**	**32,771,825**	**29,014,942**	**7,469,623**
OPERATING EXPENSES:						
Operation and Maintenance	26,448,761	25,590,407	23,675,319	20,931,027	20,873,670	19,660,327
Taxes	2,995,424	2,480,667	2,276,909	1,802,616	1,708,422	3,903,305
Depreciation	9,386,363	8,934,860	7,469,798	6,810,105	5,948,292	5,353,022
Total Operating Expenses	**38,830,548**	**37,005,934**	**33,422,026**	**29,543,748**	**28,530,384**	**28,916,654**
NET OPERATING INCOME (LOSS)	4,220,045	2,838,981	4,584,335	3,228,077	484,558	(1,447,031)
NON-OPERATING REVENUES (EXPENSES)						
Other Income	2,841,371	1,190,100	1,108,555	1,100,448	160,164	2,576,530

Interest Income	1,695,578	1,484,779	1,586,825	1,047,376	1,477,894	1,515,542
Gain from Disposition of Property	4,622,927	4,500	2,872,246	793,002	--	--
Interest Charges (net)	(7,185,197)	(6,253,392)	(3,655,291)	(2,787,024)	(1,613,155)	(1,542,018)
Net Income (Loss) Before Contributions & Transfers	6,194,724	(735,032)	6,496,670	3,381,878	509,461	1,103,023
Total Capital Contributions	26,375,137	25,597,104	28,892,401	47,599,106	9,166,126	--
Grants	--	803,224	344,857	--	--	--
Transfers Out	(3,951,776)	(4,016,387)	(3,407,309)	(3,070,290)	(3,214,577)	--
NET INCOME AVAILABLE FOR BOND REDEMPTION AND PLANT ADDITION	**28,618,085**	**21,648,909**	**32,326,619**	**47,910,695**	**6,461,010**	**1,103,023**

Source: Tacoma Water 2005 Financial Report
Notes: Beginning with the 2001 results have been reclassified to conform to the new GASB No. 34, Financial Reporting Model for Local Governments. Beginning in 2001, City Gross Earnings Tax is reported as a transfer out rather than an operating expense in accordance with GASB No. 34.

12.3 Existing Rate Structure and Fees

Tacoma Water's *Water Rate Policy* (2002) establishes the following guiding objectives for water rate decisions:

- Water Rates Should Ensure Adequate Supply
- Water Rates Should be as Low as is Responsible
- Water Rates Shall be Fair
- Water Rates Should be Stable and Understandable
- Water Rates Should be the Product of Customer Involvement

Using the above guiding objectives, the Water Rate Policy documents specific policies related to water rates. The result of implementing these policies is described below.

Tacoma Water's customer classes are divided into the following:

- Residential
- Commercial/Industrial – General
- Commercial/Industrial – Large Volume
- Parks and Irrigation
- Wholesale

Table 12-2 summarizes Tacoma Water's metered consumption rates (or commodity charge) for the above listed customer classes. Tacoma Water's rates were last revised in 2004, with increases effective in January 2005. At that time, the Public Utility Board and City Council also approved, in Ordinance No 27299, a system-average water rate increase of 8 percent over the newly established 2005 rates to begin on January 1, 2006. In addition to the metered consumption rates in place for 2006, Tacoma Water's rate structure also consists of a monthly service charge based on meter size (see Table 12-3).

TABLE 12-2
2006 Consumption Fees

RATE CATEGORY	FEE ($/CCF)
Residential	
Inside City	
Winter	$1.046
Summer Up To 5 Units	$1.046
Summer GreaterTthan 5 Units	$1.308
Outside City	
Winter	$1.255
Summer Up To 5 units	$1.255
Summer Greater Than 5 Units	$1.569
Commercial/Industrial –General Service	
Inside City (All Levels)	$1.007
Outside City (All Levels)	$1.208
Commercial/Industrial-Large Volume	
Inside City (All Levels)	$0.806
Outside City (All Levels)	$0.967
Parks and Irrigation	
Inside City (All Levels)	$1.078
Outside City (All Levels)	$1.294
Wholesale	
Constant Use Customer	
October – May	$0.995
June – September	$1.246
Summer Season, Peaking	
June – September	$1.868

Table 12-3
2006 Ready to Serve Charge

Meter Size (Inches)	Inside City Limits	Outside City Limits
5/8	$12.82	$15.38
3/4	$19.24	$23.09
1	$32.06	$38.47
1-1/2	$64.11	$76.93
2	$102.57	$123.08
3	$192.33	$230.80
4	$320.54	$384.65
6	$641.09	$769.31
8	$1025.74	$1230.89
10	$1474.50	$1769.40
12	$2163.66	$2596.39

Tacoma Water charges a uniform rate for all customer classes except residential and wholesale, which, instead, have an increasing block rate for the summer months. The rate structure incorporates a 25 percent seasonal differential for the commodity charge. This rate structure was first instituted in 1992 to encourage water conservation among the residential and wholesale customer classes; the customer classes that demonstrate the greatest seasonal variation in consumption rates.

The Tacoma Water rate structure also incorporates a 20 percent differential for all charges to customers located outside the city versus inside the city. This outside of city differential is designed to collect the additional costs of business associated with such factors as longer distance to service customers, additional costs for franchise fees and fire protection. Fee differentials of this type have been recognized and provided for in state statutes.

Each new water service connection is subject to a water service construction charge and a system development charge. Tacoma Water constructs all water service installations. The water service construction charge reimburses Tacoma Water for such construction costs. In 1990, Tacoma Water implemented the system development charge (SDC). The SDC is a one-time charge on new services. In 1998, Tacoma Water conducted a study of the SDC fee structure and subsequently adopted in 1999 a new fee structure for SDC based upon the utility's ten year capital improvement program. The SDC fees are developed to pay for approximately 50 percent of growth-related capital costs within 10 years.

12.4 Alternative Revenue Sources

Tacoma Water uses two general sources of funds for capital improvement projects: rate revenues and bond funds. Additionally, special funds, such as the Water Assurance Fund and the System Development Charge Fund, can also be used to fund capital improvement projects provided such an action is authorized by the City Council. The Water Assurance Fund is supplied by the sale of surplus property and the sale of timber from Tacoma Water property. The System Development Charge Fund is supplied by system development charges.

Sources of revenue for the recommended capital improvement projects in the 2006 Update could include obtaining low interest public works trust fund loans, issuing new revenue bonds, using money available from special funds and increasing water service rates.

In 2005, Tacoma Water received a water revenue bond rating of Aa3 from Moody's and a rating of AA- from Standard & Poor's. The assigned ratings were based on strong management, ample water supply, competitive water rates, strong system financial performance and an expanding and diversifying economic base. The resultant bond ratings reflect a high level of confidence in Tacoma Water's ability to repay related debt obligations.

The following state programs could provide a funding source for the utility improvements set forth in the 2006 Update provided the project meets relevant program eligibility criteria:

Drinking Water State Revolving Fund. In 1996, Congress established the federally-funded Drinking Water State Revolving Fund (DWSRF) as part of the reauthorization of the Safe Drinking Water Act. The DWSRF loan program is jointly administered by the Public Works Board and the Washington State Department of Health (DOH). The loan program is to improve drinking water systems and protect public health and is designed for both publicly and privately owned systems.

Public Works Trust Fund. The Public Works Trust Fund (PWTF) is a commonly used, low-cost revolving-loan fund established by the 1985 State Legislature to provide financial assistance to local governments for public works projects. Currently, there are four unique loan programs under the umbrella of the Public Works Trust Fund: Construction, public works planning, pre-construction and emergency. Because the PWTF provides a stable source of loans, it is a way for local governments to maximize their own resources by allowing them to fix problems as they emerge, rather than waiting to amass necessary funds for critical projects.

12.5 Capital Improvement Funding

Tacoma Water's Water Rate Policy provides guiding principles for funding capital improvement projects. This policy document explains how water rates, long-term debt and special funds are used to fund capital improvement projects. The document sets out the following policies:

- Long-term major capital projects, such as development of sources of supply, will be financed primarily through debt.
- Fifty percent of all renewal/replacement capital requirements will be financed through rate revenues. Additional revenue financing may be planned if rate adjustments do not exceed the rate of inflation. Any debt financing used shall not be for periods longer than the useful life of the capital projects.
- Major capital investments and other commitments that would significantly affect costs, rates or prices for Tacoma Water services will be evaluated against costs and benefits and documented before commitments are made. Such evaluations will address both short- and long-term, as well as potential or uncertain, impacts on costs and revenues.

The Water Assurance Funds (Water Quality and Resource Development) can be budgeted on a biennial basis as revenues become available for appropriate capital projects related to watershed protection and water quality, resource development and system renewal.

The System Development Charge (SDC) Fund is intended to provide capital funding for source development, transmission, storage and related facilities. A minimum balance of $2,000,000 will be maintained in the SDC Fund to deal with unforeseen emergencies and contingencies. The SDC, a one-time charge on new services, was first instituted in 1990. In 1998, Tacoma Water conducted a study of the SDC fee structure and subsequently adopted in 1999 a new fee structure for SDC based upon the utility's ten year capital improvement program. Tacoma Water evaluated the fee structure for large meter size customers (meters three-inches or larger) and determined that a change to a calculated fee, based upon water use projections, would be more

equitable. The result of this new fee structure was an increase in SDC revenues. The SDC fees were developed to pay for approximately 50 percent of growth-related capital costs in ten years.

12.6 Conclusion

Tacoma Water developed its first ten-year Business Plan prior to the 2003/2004 biennium. At that time, a broad and thorough assessment was made of the programs which would be required of Tacoma Water in the future in order to achieve the mission of health protection, excellent customer service, support of the economy and protection of the environment. The strategic initiatives developed as a result of the business plan development effort became the focus for the first business plan. At that time, an estimate of the cost necessary to fully implement the business plan's programs indicated that a 40 percent rate increase in the 2003/2004 budget would be required. This was considered to be an unacceptably large rate increase and Tacoma Water evaluated several approaches to reduce the rate increase while still achieving the desired program goals, although at a slower pace.

In 2005/2006, Tacoma Water pursued a phased approach to the financial impacts of the Strategic Initiatives identified in the revised ten-year Business Plan. Tacoma Water reduced revenue funded capital for several years to reduce the amount of early rate increases and to make additional cash available to accelerate the rate at which needed operation and maintenance increases could be accomplished. This approach accommodated the three key elements of the Business Plan; current operation and maintenance programs with allowances made for inflation, Tacoma Water's capital improvement program, and implementation of the key strategic initiatives of the business plan, including both operation and maintenance and capital components.

Revenue sources to finance the business plan capital improvement program include: policy-based rate revenue, System Development Charges, Water Quality Assurance Fund transfers, sale of surplus property and revenue bond proceeds.

APPENDIX A

SATELLITE SYSTEM MANAGEMENT PROGRAM

APPENDIX A

SATELLITE SYSTEM MANAGEMENT PROGRAM

A.1 INTRODUCTION

On January 8, 1997, the Tacoma Public Utility Board approved Resolution U-9242 giving Tacoma Water the authorization to apply for Washington State Department of Health (DOH) approval as a satellite system management agency or SSMA. This authorization was further defined by Tacoma Water's Customer Service Policies, April 1997, which states:

As state and federal regulations regarding design, management, operation and maintenance of public water systems become more complex, small water system owners are finding it increasingly difficult to own, manage and operate their water systems. In recognition of this, the Division (Tacoma Water), as a state-approved Satellite Management Agency, will offer various services (management and operations, contract services, or ownership) as deemed prudent and feasible to new and existing water systems in Pierce County east of Puget Sound or other water systems owned by other City departments.

A presubmittal conference was held on March 12, 1997, attended by Tacoma Water, Washington State Department of Health (DOH) and Tacoma-Pierce County Health Department (TPCHD) representatives to address the contents of Tacoma Water's SSMA plan and the requirements for SSMA approval. The first Tacoma Water SSMA Program was incorporated into the Tacoma Water Comprehensive Water System Plan Update, 2000 and therefore was approved in conjunction with the 2000 Water System Plan in September 2000.

Once again the Tacoma Water SSMA Program is incorporated into a WSP update process, therefore, this WSP update process serves as the required periodic review of the Tacoma Water SSMA Program. Tacoma Water continues to meet the SSMA criteria as demonstrated and documented by the contents of this SSMA Program.

A.2 BACKGROUND

A.2.1 Pierce County Coordinated Water System Plan

As part of the Pierce County Coordinated Water System Plan (CWSP), participating water purveyors have identified and agreed upon existing and future direct water service areas. The identification of and agreement on service areas helps ensure that water purveyors adequately plan for the orderly development of capital facilities as well as an adequate and safe water supply to service new development and future growth expected to occur within their designated service areas. The development of comprehensive water system plans by each existing water purveyor gives Pierce County and DOH the assurance that water purveyors have the necessary resources to provide safe and reliable water within their designated service area(s).

The Pierce County CWSP establishes utility Service review guidelines to be used by all water purveyors for the approval of new water systems or the expansion of existing water systems. As a general practice, no new water systems will be permitted unless an existing purveyor is unable to provide service. The focus of the Pierce County utility service review policies is to refer new service requests to an approved SSMA and make sure the proposed project meets engineering, financial, management and operational requirements, including established land use and fire flow considerations for the area to be served.

The Pierce County CWSP also establishes and details the County's satellite system management program. The program is designed to ensure that qualified management agencies are available to provide comprehensive water system services. Approved SSMAs must be committed to full-time water system management and operations and have sufficient resources available to provide quality utility services on a long term or permanent basis.

SSMA services may include:

- Contract Services – Technical and Management Services
- Contract Services – Management and Operations Services
- Direct Services – Ownership Transferred / Complete Takeover

Pierce County's SSMA policies state:

- No new systems are allowed unless owned/operated by an approved SSMA.
- SSMAs established within the boundaries of an approved water system must follow the water system plan of that company.
- Systems developed in areas of no service may contract with an existing SSMA.
- Contracts will be required between the two parties sharing the water system.

To qualify as an SSMA, the applicant must demonstrate the capability to assume full management responsibility or ownership of existing water systems in satellite areas.

By combining economies of scale among several water systems and by establishing formal planning programs, the SSMA becomes a partner in meeting the objectives of the Pierce County CWSP and Pierce County Comprehensive Plan.

To ensure that SSMAs have adequate resources to meet both current and future needs, Pierce County recommends that a prequalification process be completed. An agency may request prequalification as an SSMA at any time by submitting documentation of minimum qualifications to DOH and the Pierce County Public Works and Utilities Department.

A.2.2 State Law and Regulations

The framework for a statewide satellite system management program was enacted by the 1991 State Legislature (RCW 70.116.134). Under state law, an SSMA is defined as a person or entity certified by DOH to own or operate more than one public water system on a regional or countywide basis, without the necessity for physical connection between such systems.

The 1991 state legislation required DOH to adopt rules and regulations to establish criteria for designating qualified SSMAs. These regulations were adopted in 1994 (Chapter 246-295 WAC). Under the regulations, the County is required to identify potential SSMAs to the DOH. Preference is given to public utilities or utility districts or to investor-owned utilities (under the jurisdiction of the Utilities and Transportation Commission).

In 1995, the state legislature passed Engrossed Second Substitute Senate Bill No. 5448. Section 3 of the ESSSB 5448 stipulates that: No new water system may be created unless it is owned or operated by a SSMA or, where one is unavailable, it must be determined that the new system has sufficient management and financial resources to provide safe and reliable service.

If the new water system is not owned by an SSMA, the approval must be conditioned on future management or ownership by an SSMA if it may be done with reasonable economy or efficiency or on periodic review of its operational history.

DOH and local health jurisdictions must enforce this requirement under a variety of statutory authorities.

A.3 TACOMA WATER SSMA PROGRAM

A.3.1 Service Area Description

The Tacoma Water SSMA direct service area is equal to the Pierce County approved CWSP water service area boundary (Pierce County retail service area) and is shown on Figure 2-1**.** The boundary generally indicates the course of Tacoma Water's transmission line from source of supply to its customer distribution system area. Tacoma Water's core water service area is surrounded by other water purveyors; therefore, any expansion of service must be coordinated with adjacent utilities and must be consistent with Tacoma Water policies.

All of Tacoma Water's SSMA direct service area is located in the County's Comprehensive Urban Growth Area, except for the eastern portion running from 214th Avenue East to the City of Buckley's Urban Growth Area boundary and in the Summit area. The potential for Tacoma Water needing to provide SMA direct service within its designated service area is relatively low. The service area either already has water mains within1,000 feet of each other over most of its area, or there are other large areas with a known single ownership such as the Cascadia development, Frederickson Industrial Area (owned by the Port of Tacoma) and the Sunrise development that have planned or completed major water main extensions.

The Tacoma Water SSMA contract service area is in Pierce County east of Puget Sound, west of Range 7 East, and north of Township 16 North. Areas within Pierce County farther east and south of the SSMA contract service area were judged to be too remote for reasonable service from Tacoma Water. Crews dispatched during normal working hours from the proposed SSMA operations center at Tacoma's McMillin Reservoir property should be able to respond to satellite system needs within one half hour in the SSMA contract service area. After normal working hours, emergency crews should be less than one hour from the SSMA contract service area.

Tacoma Water will consider providing SSMA management and operations services to small independent systems in Pierce County east of Puget Sound, west of Range 7 East, and north of Township 16 North, or to systems owned by other City of Tacoma departments despite location, in cases where the purveyor requests such service

A.3.2 Listing of Existing Systems

Currently, Tacoma Water provides SSMA services to the City of Tacoma owned Tacoma Narrows Airport, located on the Gig Harbor Peninsula, outside the City of Gig Harbor. Tacoma Narrows Airport – PWSID 86798 – has a total of 21 connections.

A.3.3 System Design Standards

Tacoma Water's current water system design standards, including those established for new satellite systems are discussed in Chapter 3 – Policies and Design Criteria of the Tacoma Water, Water System Plan

A.3.4 Financial Viability

Chapter 12 – Financial Program of the Tacoma Water, Water System Plan provides both an analysis and an evaluation of Tacoma Water's financial viability as a public water purveyor and qualified SMA. This includes a full description of available and potential revenue sources (including bonds, loans, and grant sources), a summary of recent water revenue bond ratings, a history of itemized Tacoma Water budgets by category and object of expenditures for the past three years, a budget forecast of planned expenditures for the next 6 years, and general financial

policies describing how Tacoma Water, as an approved SSMA, will finance purchasing systems and satellite system improvements.

A.3.5 Operation and Maintenance

A description of Tacoma Water's system facilities is provided in Chapter 7 – System Inventory of the Tacoma Water, Water System Plan. Chapter 8 – Operations and Maintenance Program identifies the existing water system owned, managed, and operated by Tacoma Water, including the DOH identification number. Chapter 8 also presents a current organizational structure showing ownership, management, and operating positions within Tacoma Water as a public water purveyor and SSMA direct and contract service provider. Also included in Chapter 8 is a discussion of Tacoma Water's legal authority, mailing address, the principal responsibilities of each position, required levels of certification and identification of the current position holder, responsible party, and the contact person in charge of Tacoma Water's SSMA Program.

Chapter 8 presents documentation that many Tacoma Water employees are certified at a Water Distribution Management 2 level or higher and that Tacoma Water, as an approved SSMA provider, will meet any additional DOH required satellite system operator certification requirements. Chapter 8 also discusses Tacoma Water's routine and preventive maintenance program, including the existing emergency response plan, and documents that the latter will be common throughout all water systems owned by Tacoma Water.

A.3.6 Direct Service Program

Direct Service requires the transfer of system ownership and operational responsibilities from either an existing or new water system to the City of Tacoma. The SSMA direct service option allows Tacoma Water to assume complete responsibility for water systems at any location throughout the approved water service area.

Under the direct service option, the applicant and system customers will be subject to Tacoma Water's current ordinances, conditions, customer service policies, technical standards and specifications and the extension policies in effect at the time of application approval.

System development charges, water rates, surcharges, and other standard charges will be imposed in accordance with Tacoma Water's most current schedule of charges and fees. Depending upon the amount and extent of system upgrade work and other expenses associated with system operation and/or transfer to Tacoma Water, an additional assessment may be levied by the City.

In general, Tacoma Water will require extension of water mains to any proposed development. For any proposed residential development under 20 lots in size, and where the shortest route from the proposed development and connection to the water system is greater than 1,000 feet, Tacoma Water will consider other options to serve including main extension or SMA operation until main extension occurs.

A.3.6.1 SSMA Direct Service Request Procedures

A general description of Tacoma Water's SSMA direct service application and review procedure, used in evaluating applicant requests for SSMA direct service, follows.

The process begins with the initial contact between the applicant and Tacoma Water. During the initial contact, applicants will discuss their water system needs with Tacoma Water and receive a copy of specific policies and procedures that outline Tacoma Water's SSMA program and how their request for direct service will be addressed and resolved. The applicant's written letter of request will initiate Tacoma Water's formal evaluation of system needs, capabilities, and deficiencies. Tacoma Water will then request specific data and background information needed to survey the water system and evaluate the utility's ability to implement its SSMA direct service option. A survey form has been developed to assist in the system evaluation.

A.3.6.2 SSMA Direct Service Policy and Procedures

Tacoma Water's policy and procedures for implementing SSMA direct service follow:

1. Tacoma Water is the lead agency within its approved service area boundary as designated by the Pierce County 2001 CWSP.
2. As lead agency, Tacoma Water accepts ultimate responsibility for providing water service within its approved service area boundary.
3. Tacoma Water may assist water systems within its designated service area by owning and/or operating them as satellite systems if they are unable to remain financially viable and meet county, state and federal standards.
4. SMA direct service can be provided by Tacoma Water for both Group A and B systems as defined by DOH.
5. Purchase of private water systems is at Tacoma Water's discretion, will require a financial feasibility analysis, must be based on an assessed value of the system, and must be approved by Pierce County.
6. Systems that are certified to meet Tacoma Water, TPCHD and DOH standards during construction will not be subjected to the survey and upgrade process. Systems that may desire direct service from Tacoma Water at some point in the future should meet the following requirements during design and construction:
    - Group A – The system must be designed and constructed in accordance with the Technical Standards and Specifications of Tacoma Water.
    - Group B – The system must be designed and constructed in accordance with standards contained in the Group B Water System Workbook published by DOH.
    - The design and monitoring of construction for all new systems must be coordinated with Tacoma Water.
    - Prior to transfer of ownership of a new system to Tacoma Water, the designer of the system must certify that it has been built in accordance with the approved design. Stamped engineering drawings of the new system shall be provided.
7. For systems that have not been certified as being constructed in accordance with Tacoma Water's standards, a survey and engineering evaluation will be conducted and a schedule will be developed to accomplish system upgrades that are required to meet applicable utility, county, state and federal standards. Certain improvements, especially deficiencies related to water quality, safety and system reliability, may be required to be completed prior to or in conjunction with a system transfer to Tacoma Water.
8. Capital improvements and purchase costs will be financed by the system's owner(s)/customers through rate surcharges, assessments, SDCs, and/or Tacoma Water arranged financing. Tacoma Water financing options may include State and federal grants, cash contributions, Local Improvement District (LID) bonds, or other similar financing mechanisms.
9. Major system improvements may require the formation of an LID or similar financing arrangement.
10. An estimate of the cost of required capital improvements will be provided to and agreed upon by the existing customers before Tacoma Water assumes ownership or operational responsibilities. All systems not installed under the certification process outlined above

will be handled on a case-by-case basis to determine charges for the preliminary survey and engineering evaluation.

11. Tacoma Water's attorney will establish the appropriate authorization and legal documents required for the transfer of system ownership to Tacoma Water. The authorization and documents will then be reviewed and approved by the Public Utility Board and City Council.

A.3.6.3 SSMA Direct Service Review and Approval Procedures

Tacoma Water's review and approval procedures for implementing SSMA direct service are as follows:

1. When applicable, Tacoma Water will require a deposit for survey and engineering work associated with establishing direct service for a water system before Tacoma Water will start the evaluation and upgrade process. The survey will establish the system's capabilities deficiencies, and compliance with appropriate regulatory and operational criteria. In addition, the survey will be used to determine the estimated cost of needed system improvements and anticipated operation and maintenance expenses. Tacoma Water has developed a Water System Preliminary Survey Checklist to assist in the system evaluation.
2. A meeting or other appropriate methods will be used to review the survey results and preliminary cost estimates with the system owner(s)/customers. The owner(s)/customers may either withdraw the request for direct service or continue the process by authorizing Tacoma Water to prepare an engineering evaluation to more accurately determine the work and costs required to bring the system up to the required utility, county, state, and federal standards.
3. Tacoma Water's engineering evaluation will include a detailed analysis of the system's operation, required capital improvements, and projected cost of operation and maintenance. It will contain a preliminary financing plan for improvements and a proposed rate structure based upon:
    - Minimum improvements required to meet quality, safety, and reliability standards
    - Improvements required to upgrade the system to the technical standards and specifications of Tacoma Water.
    - Source, storage, metering, fire flow, and other desired improvements
4. After a review of the engineering evaluation is conducted with the system owner(s)/customers, they may either withdraw their request for direct service or, with the assistance of Tacoma Water, initiate proceedings to transfer ownership.

    An example of a preliminary contract for transfer of system ownership has been included as an attachment to this SSMA Program.
5. Improvements required to upgrade the system to Tacoma Water standards (particularly those associated with water quality, safety, and reliability) may be completed prior to or in conjunction with system transfer. Some improvements may be deferred until normal repair or replacement occurs.
6. If capital costs for necessary improvements can be financed reasonably by the system owner(s)/customers, then the transfer of ownership may be contractually established. A

list of items necessary to accomplish a transfer of ownership may include but is not limited to:

- Bill of Sale
- Title Report and Property Deeds for the System
- Assignments of Easements, if Required
- Assignment of Water Rights
- Authorization to Collect Rates and Fees
- Hold Harmless Clause
- List of Owner(s)/Customers/Shareholders (with complete addresses/telephones)
- Maps, Records, Equipment Manuals and Data, Billing Records, and Other Information

7. If necessary and found to be economically feasible, Tacoma Water may create a LID in accordance with Title 54 RCW after an Agreement is signed. The ownership of specified facilities, equipment, and data will be transferred to Tacoma Water as specified in the Agreement.

New systems whose initial design, construction, and approval have been completed in conformance with Tacoma Water's design standards and inspection requirements will not require a preliminary survey or engineering evaluation. The transfer of ownership may occur either contractually or by LID formation as described above in paragraphs 6 and 7, respectively. The system must be certified in accordance with Chapter 246-290 WAC to verify that it was built and approved in conformance with the requirements of DOH, TPCHD and Tacoma Water prior to the transfer of ownership.

A.3.7 Contract Service Program

Major limitations on proper operation of any utility are the availability of funds and access to qualified professionals. The contract service program enables Tacoma Water to provide professional support to existing or new systems at a reasonable cost to improve system operation, reliability, and compliance with State and federal requirements. Qualified Tacoma Water staff can provide a variety of services throughout the County to both individual and community systems.

A service agreement or contract is used to establish the frequency, duration, cost, and specific responsibilities of Tacoma Water in performing services. Services can be contracted on a continuous basis to provide routine system operation and maintenance, periodic well performance monitoring, scheduled repair activities, on-call emergency assistance, record keeping, reporting, and other tasks. A sample agreement for contract services, including a listing of available services, has been included as an attachment to this SSMA Program.

A.3.7.1 Contract Service Policy and Procedures

Listed below are the major policy and procedural considerations for contract services:

1. System improvements may be required to eliminate deficiencies associated with system reliability, safety, and water quality. Improvements required by Tacoma Water will be completed prior to Tacoma Water initiating service unless Tacoma Water agrees to accomplish the improvements as part of the contract.

2. Contract services will be limited to systems where such services are cost-effective for Tacoma Water.
3. Financing for system improvements is the applicant's responsibility.
4. Tacoma Water will only provide services to systems where facilities are located on property owned by the system, public rights-of-way, utility easements, or where authorization for unrestricted access for all facilities that may require servicing, maintenance, repair, or replacement can be obtained.
5. If the applicant proposes any significant system changes, such as system expansion, Tacoma Water must approve the change or be given the option to discontinue contract services. All construction and permitting costs would be paid by the applicant.
6. The applicant must designate a reasonable available individual to be an official contact with Tacoma Water.
7. Contract assistance will be for a minimum of 1 year with an option for contract extension for additional specified time periods (with the approval of both parties).
8. Tacoma Water must receive, as appropriate, the legal authority from the applicant to contract, assess costs, and be held harmless from service activities during the normal course of operations.

A.3.7.2 Contract Services Review and Approval Procedures

Tacoma Water's review and approval procedures for implementing SSMA contract services are as follows:

1. Once applicants have requested contract service assistance, they will be required to pay a fee to Tacoma Water for the cost of conducting a preliminary system survey. Tacoma Water must receive this survey fee and all requested system data before conducting a preliminary survey of the system. The survey is designed to identify all existing material defects, public health deficiencies, and operational problems.
2. Tacoma Water will provide the applicant a list of all required improvements with an estimate of the costs associated with those improvements.
3. After reviewing the survey results and evaluating the cost estimates, the applicant may either withdraw the request for contract service or authorize Tacoma Water to establish firm costs for the particular details of requested service. When determined, firm costs will be reviewed with the applicant.
4. If the costs are acceptable, the applicant will complete specified system improvements and enter into an agreement with Tacoma Water. The agreement will specify the details, duration, and costs of the service program.
5. If the applicant withdraws the request for service at any time in the process, the survey fee will be retained by Tacoma Water.

City of Tacoma, Department of Public Utilities, Water Division

Satellite System Management & Operations Agreement

This agreement is made this _____ day of _____, 20___, between

_____

(the "Water System") and the City of Tacoma, Department of Public Utilities, Water Division ("Tacoma Water"), a municipal corporation organized under the laws of the State of Washington.

Tacoma Water is authorized to provide satellite system management services as a State-approved Satellite Management Agency (SMA) under WAC 246-295 and the Pierce County Coordinated Water System Plan. Additionally, Tacoma Water is committed to providing efficient management, operation and maintenance services to satellite water systems requesting service in Pierce County.

The Water System is interested in entering into an agreement for services specified herein and believes it is in the best interest of the members of the Water System. Therefore, the Water System and Tacoma Water agree as follows:

A. Services Furnished by Tacoma Water:

1. Basic Service Provided: Tacoma Water will perform basic services outlined herein for the set monthly cost given in Section C. The services stated hereafter are included in the basic plan unless specifically stated as additional services. Additional services can be provided at the Water System's request at the rates listed in Section C.

2. General System Maintenance: Tacoma Water will perform routine and preventative scheduled maintenance to insure safe, reliable operation of the Water System's facilities and their neat appearance, including grounds maintenance, troubleshooting, minor electrical and mechanical repairs of a routine nature. This service is limited to eight hours per month or 96 hours per year on site. The Water System will reimburse Tacoma Water for labor costs beyond the basic eight hours at the rates shown in Section C.

The basic service does not include plant modifications, pump or motor replacement, water main breaks, emergency repairs, significant electrical work, noteworthy capital expense, correction of pre-existing substandard conditions or other non-routine work. Minor parts, materials and supplies used for routine and preventative maintenance are included in the basic services.

Whenever possible, the Water System shall be notified by Tacoma Water if routine maintenance takes the water system out of service. Tacoma Water will maintain an on-site facility log and an office historical file, and provide the Water System with historical updates when requested.

3. Water Quality Monitoring: Tacoma Water will complete all routine radiological, chemical, and bacteriological water sampling, testing and reporting requirements to comply with health regulations. This includes required notifications to the health departments, customers and the public, and the cost of basic laboratory tests required by health regulations. This service assumes that all initial tests (and periodic tests if applicable) for potential contaminants have been conducted for the Water System and the results do not exceed health standards.

The cost of any additional tests to resolve maximum contaminant level violations or water quality problems need to be reimbursed to Tacoma Water. Water systems with special treatment facilities, such as chlorination or ozonation, may be charged additional costs for sampling, testing and reporting.

4. Management: Tacoma Water will provide, under basic services, technical advice for resolution of problems including regulatory compliance and provide timely information on emerging regulations potentially impacting the Water System. Tacoma Water will act as the personal representative of the Water System, if requested, in matters concerning issues with Federal, State or local health authorities or other regulatory agencies. Tacoma Water will provide technical advice for water system planning and system additions or expansions. Such consultations and assistance shall not exceed 40 hours per year. Outside consultants costs will be billed at actual cost.

Tacoma Water can provide construction management services for new water systems approved for construction in its approved Satellite Management area. Charges for this service will be on a negotiated basis.

5. New Water Services and Hydrants: Tacoma Water will install new water service connections with meters and fire hydrants for the charges stated in the current Water Rates and Regulations ordinance of Tacoma Water.

6. Emergency Services: Tacoma Water maintains a 24 hour, 7 day per week Water Control Center for responding to emergencies. This benefit is included in the basic service. As requested, the Water Control Center will dispatch a crew or individual as required for an emergency. The actual costs for response and repairs will be billed at the rates shown in Section C.

In general, an emergency shall exist when action is required to protect public health or maintain continuous positive pressure throughout the distribution system. Whenever possible, the Water System will be notified before Tacoma Water proceeds with emergency repairs. However, if prior contact is not possible, Tacoma Water will proceed with necessary corrective action without prior approval. The Water System will be promptly notified of the emergency, the corrective action taken and the cost incurred. The Water System agrees to reimburse Tacoma Water for the expenses incurred in addressing or resolving the emergency.

7. Conservation Program: The basic service includes assistance from Tacoma Water's conservation representative in researching, planning, implementing and evaluating water conservation opportunities. Many educational materials are available on request.

8. Contractors and Consultants: Tacoma Water may contract with qualified independent contractors and professionals for specialized service work, engineering consulting or other services at Tacoma Water's discretion. Whenever possible, the Water System will be consulted prior to the use of independent contractors or consultants.

9. Inventory: Tacoma Water agrees to maintain an inventory of materials and supplies necessary to meet normal maintenance requirements. Other than routine minor parts, materials and supplies necessary for system maintenance, the cost of these items shall be reimbursed to Tacoma Water.

10. When Services Performed: All services to be provided by Tacoma Water under this Agreement shall be performed during normal working days and hours of Tacoma Water, except when emergency conditions arise.

11. What is not included in the basic services:

a. General accounting and bookkeeping.
b. Preparation of tax returns.
c. Water quality testing and monitoring caused by deficiencies, contaminant violations, or other water quality problems to the extent these requirements are beyond the routine scheduled for testing specified earlier.
d. Significant capital repairs, equipment replacement or system modifications.
e. Water main breaks or significant system failures.
f. New water service connections with meters, water main extensions, or new source, storage, pumping or distribution facilities.
g. Management assistance and technical advice and in excess of 40 hours per year.
h. Legal costs.
i. Outside contractors and consultants.
j. Any other service not specifically mentioned in this agreement.
k. Electricity or telemetry costs.

B. Water Systems Obligations:

1. Customer List: After execution of this Agreement, the Water System shall promptly provide Tacoma Water with a current list of customers of the Water System. The list shall include names, addresses and telephone numbers of the customers.

2. Historical Data: After execution of this Agreement, the Water System shall promptly provide Tacoma Water with all past records related to management, operation and maintenance of the Water System. The records shall include as-built drawings, water

quality monitoring records, water right permits, water system plans, maintenance records and other pertinent historical information.

3. Access: The Water System shall provide Tacoma Water with reasonable access to water lines, pump stations, reservoirs and other related facilities or demonstrate it has sufficient easements to enter upon property to perform these services.

4. Regulatory Compliance: If at the time of signing this Agreement, the Water System is functioning with a red operating permit from the State Dept. of Health, or operating under any contaminant or regulatory violation, the Water System agrees to make the necessary improvements or corrections at its expense to remedy such violations. The Water System agrees to continue operating in compliance with all regulatory provisions as a condition of Tacoma Water continuing to provide services under this Agreement. If desired by the Water System, Tacoma Water will assist the Water System to achieve compliance with technical advice, planning and corrective measures at terms and costs negotiated between the Water System and Tacoma Water.

C. Compensation:

1. Basic Services: The Water System agrees to pay Tacoma Water $_____ per month for providing the basic management, operations and maintenance services described in Sections A.1 through A.11 of this Agreement. The basic services include normal expenses such as wages, employee benefits, taxes, computers and supplies, postage, transportation, tools, minor supplies, and office space.

2. Emergency and Optional Services: For services performed that are not a past of Basic Services, the Water System agrees to reimburse Tacoma Water for the actual costs incurred by Tacoma Water including taxes, insurance, wages, employee benefits, etc. plus an administrative charge of 20% on the actual costs. One hour of service personnel time currently costs approximately $50 including transportation, overhead and administrative charges. The actual wages will depend on the job classification of the individual(s) performing the work.

3. Parts and Materials: For parts and materials used but not included in the basic services, the Water System agrees to reimburse Tacoma Water for the actual cost of the parts and materials plus 15% administrative charge.

4. Contractors and Consultants: For services performed by outside contractors and consultants, the Water System agrees to reimburse Tacoma Water for the contractor or consultant charges plus a 15% administrative charge.

5. Time of Payment: All amounts to be paid or reimbursed to Tacoma Water shall be made within twenty-five (25) days after presentation of a statement to the Water System for such amounts. Any overdue amounts may bear interest according to Tacoma Water policies.

6. Annual Review of the Basic Services Charge: The Basic Services charge is an estimate of what Tacoma Water will expend for providing the basic services to the Water System. Tacoma Water and the Water System shall review the sufficiency of the charge each year and adjust the charge for the next year to cover Tacoma Water's anticipated costs. At such time, basic services to be provided may be added, or deleted as mutually agreed by Tacoma Water and the Water System. Any change in services provided must be in writing.

D. Special Conditions

1. Terms of Agreement: The effective date of this Agreement shall be the date of Tacoma Water's signature to this Agreement. This Agreement shall remain in effect for a period of one (1) year from the effective date. Thereafter, this Agreement shall automatically renew for a period of one (1) additional year every year unless either Tacoma Water or the Water System gives ninety (90) days notice to the other party of Agreement termination.

2. Insurance: Tacoma Water will carry an appropriate amount of general liability insurance or self insurance funds to cover operation of its vehicles and equipment, material installations and completed operations. Tacoma Water will provide workman's compensation coverage for its employees while they are performing services under this Agreement.

3. Indemnification: Tacoma Water will use its best efforts to effectively manage and maintain the Water System. With respect to any claims against Tacoma Water by customers or third parties, the Water System agrees to indemnify, protect and hold harmless Tacoma Water and its agents, contractors, employees, officers and directors from and against any and all claims and demands, actions, causes of action, lawsuits or assertions for injury or death to any and all persons and damage to property, which may arise out of, result from, or be caused by any action by Tacoma Water or its agents, servants, employees, officers or directors in the performance of its obligations under this Agreement, that are not caused by the negligence, and/or intentional tortuous act(s), sole or concurrent, of Tacoma Water, its agents, contractors, servants, employees, officers or directors. Such indemnification shall include all costs and expenses of defense, including attorney fees expended by Tacoma Water, its agents, contractors, servants, employees, officers or directors.

4. Attorney Fees: In the event either party initiates legal action to enforce the terms of this Agreement, the prevailing party shall be entitled to reasonable attorney fees.

5. Mediation and Arbitration: In the event legal action is initiated, the parties agree to first use mediation and, if then necessary, arbitration pursuant to the mandatory rules and procedures in Pierce County, WA.

6. Jurisdiction and Venue: Jurisdiction and venue for any dispute shall lie exclusively in Pierce County, WA.

7. Entire Agreement: This Agreement contains the entire understanding between the parties and supersedes any oral or written agreement. All modifications or waivers whatsoever shall be in writing and approved by both parties.

8. Notices: All notices, periodic statement and reports required under this Agreement shall be in writing, and shall be deemed communicated as of the date of deposit in the United States mail. Any written communications to Tacoma Water shall be addressed as follows:

Tacoma City Water
PO Box 11007
Tacoma WA 98411
Attn: Water Superintendent

Written communications to the Water System shall be addressed to:

9. Binding Effect: At all times this Agreement will inure to the benefit of and constitute a binding obligation on the parties and their respective successors and assigns.

IN WITNESS WHEREOF, Tacoma Water and Water System have each caused this Agreement to be executed by their duly authorized officers on the dates shown below:

Water System

By: _____ date: _____
(Title)

_____ date: _____
(Title)

City of Tacoma, Department of Public Utilities
Water Division

By: _____ date: _____
(Title)

(attach a Notary statement)

Contract for Transfer of Water System Ownership

Tacoma Public Utilities

CONTRACT # _____

This is an agreement between the Tacoma Public Utilities, hereinafter called the City, and _____
Address: _____
City _____ State_____ Zip _____
herein called the Applicant. This agreement is for the transfer of ownership of the _____ Water System to the City.

I
TRANSFER OF OWNERSHIP

The terms of this contract are herewith binding on the owner(s) and all customers of the _____ Water System. Effective as of the date of this contract, the ownership and operation responsibility for the _____ Water System is transferred at no cost to the Tacoma Public Utilities. All existing and future customers will be required to abide by the General Terms, conditions and Policies of the City. In addition, the documents identified below and appended in this contract are binding and in force for this transfer:

1. Property Title
2. Easements
3. Restrictive Covenants
4. Transfer of Water Rights
5. Bill of Sale

II
OUTSTANDING LIENS OR OBLIGATIONS

The seller warrants that there are no liens or taxes or other purposes outstanding at the time of this purchase against the property of the said system or lawsuits pending against the said system.

APPENDIX B

WATER SYSTEM PLAN REVIEW CHECKLISTS

Appendix II

Plan Content Checklist

The following checklist summarizes the topics which are discussed in each section of this handbook. It is intended to serve as a checklist for the purveyor, assuring that key topics are included in the draft WSP. DOH will use this checklist during the plan review process.

Water System Planning Handbook Chapter	WSP Chapter (If Applicable)	WSP Page (If Applicable)
Chapter 1 - Description of Water System		
Ownership and Management		
System Name	2	
Type of Ownership	2	
Management Structure	8	
Water Facilities Inventory Report Form	6	
System Background		
History of Water System Development and Growth	2	
Geography	2	
Neighboring/Adjacent Purveyors	2	
Ordinances/By Laws	3	
Inventory of Existing Facilities		
Description of Facilities and Major Components	7	
Number of Service Connections (Existing and Approved)	4	
Existing Interties	2	
Related Plans		
List of Related Plans	2	
Comments From Agencies and Adjacent Purveyors	Appendix D	
Responses to Comments	Appendix D	
Existing Service Area and Characteristics		
Existing Service Area Map	2,4	FIGURE 2-1
Zoning and Land Use	4	
Future Service Area		
Future Service Area Map	2	FIGURE 2-1
Zoning and Land Use	4	
Service Area Agreements	2	
Service Area Policies	3	
Satellite Management	2	
Condition of Service Policies	3	

Chapter 1 - Description of Water System (Cont.)	**WSP Chapter (If Applicable)**	**WSP Page (If Applicable)**
Complaints	8	
Policy	8	
Recordkeeping	8	
Chapter 2 - Basic Planning, Data and Water Demand Forecasting		
Current Population, Service Connections, Water Use, and Equivalent Residential Units		
Current Population	4	
Total Service Connections	4	
Water Use Data Collection	5	
Equivalent Residential Units	5	
Projected Land Use, Future Population, and Water Demand		
Projected Land Use	4	
Projected Population	4	
Projected Non-Residential Water Needs	5	
Projected Non-Revenue Water	5	
Water Rates and Rate Impacts on Water Demand	5	
Water Demand Forecasting	4,5	
Chapter 3 - System Analysis		
System Design Standards	3	
Water Quality Analysis	9	
Historical Review of Trends	9	
Future Requirements	9	
System Description and Analysis		
Source	6,7	
Water Treatment	7,9	
Storage	7,10	
Distribution System/Hydraulic Analysis	10	
Identification of System Improvements	1,6,10,11	
Assessment of Alternatives	1,6,10,11	
Prioritizing Improvements	1,6,10,11	
Selection of Alternatives	1,6,10,11	
Chapter 4 - Conservation Program, Water Right Analysis, System Reliability and Interties		
Conservation Program Development and Implementation		
Required Measures For All Systems	6	

Chapter 4 - Conservation Program, Water Right Analysis, System Reliability and Interties - (Cont.)	**WSP Chapter (If Applicable)**	**WSP Page (If Applicable)**
Other Measures and Level of Implementation	6	
Conservation Program Outline	6	
Regional Conservation Programs	6	
Source of Supply Analysis		
Enhanced Conservation Measures	6	
Water Right Changes	n/A	
Interties	2, 8	
Artificial Recharge	6	
Use of Reclaimed Water, Reuse, and other Non-potable Sources	2, 6	
Treatment	9	
Water Right Evaluation		
Permits, Certificates, Claims and Applications .- Narrative	6	
Existing Water Right(s) Status (Table 3)	6	
Forecasted Water Right(s) Status (Table 4)	6	
Water Rights, Current Water Usage and Projected Needs	5, 6	
Water Reservations	n/A	
Assessment of Need for Additional Water Rights	6	
Water Supply Reliability Analysis		
Summary of System Reliability Efforts	6, 8	
Water Shortage Response Planning	2, 8	
Monitoring Well Levels	8	
Interties		
Existing Interties	2	
New Intertie Proposals	2	
Intertie Agreements	2	
Identification of System Improvements	1, 6, 10, 11	
Assessment of Alternatives	1, 6, 10, 11	
Prioritizing Improvements	1, 6, 10, 11	
Selection of Alternatives	1, 6, 10, 11	
Chapter 5 - Source Water Protection		
Wellhead Protection Program		
Overview	9	
Completed Susceptibility Assessment Form(s)	9	
Wellhead Protection Area Information	9	

Chapter 5 - Source Water Protection (Cont.)	**WSP Chapter (If Applicable)**	**WSP Page (If Applicable)**
Delineation of Wellhead Protection Area(s)	9	
Contaminant Source Inventory	9	
Notification of Findings	9	
Contingency Plan	8	
Spill Response Plan	9	
Regional Implementation Efforts	9	
Implementation Strategies	9	
Watershed Control Program		
Watershed Description/Characteristics	Volume II	
Identification of Activities/Land Uses Detrimental to Water Quality	Volume II	
Watershed Management and Control Measures	Volume II	
Monitoring Program	Volume II	
System Operations	Volume II	
Periodic Watershed Evaluations/Updates	Volume II	
Identification of System Improvements	Volume II	
Assessment of Alternatives	Volume II	
Prioritizing Improvements	Volume II	
Selection of Alternatives	Volume II	
Chapter 6 - Operation and Maintenance Program		
Water System Management and Personnel	8	
Operator Certification	8	
System Operations and Control		
Identification of Major System Components	8	
Routine System Operation	8	
Preventative Maintenance Program	8	
Equipment, Supplies and Chemical Listing	8	
Comprehensive Monitoring (Regulatory Compliance) Plan		
Monitoring Plan Elements	8	
Source	8	
Distribution	8	
Treatment	8, 9	
Adjustments to Monitoring Programs	8	
Emergency Response Program		
Water System Personnel Emergency Call-Up List	8	

Chapter 6 - Operation and Maintenance Program (Cont.)	**WSP Chapter (If Applicable)**	**WSP Page (If Applicable)**
Notification Procedures	6	
Vulnerability Analysis	6	
Contingency Operational Plan	6	
Safety Procedures	6	
Cross-Connection Control Program	6	
Customer Complaint Response Program	6	
Recordkeeping and Reporting	6	
O & M Improvements	6	
Identification of System Improvements	6	
Assessment of Alternatives	6	
Prioritizing Improvements	6	
Selection of Alternatives	6	
Chapter 7 - Distribution Facilities Design and Construction Standards		
Project Review Procedures	3	
Policies and Requirements for Outside Parties	3	
Design Standards (Performance Standards and Sizing Criteria)	3	
Construction Standards (Materials and Methods)	3	
Construction Certification and Follow-up Procedures	3	
Identification of System Improvements	10	
Assessment of Alternatives	10	
Prioritizing Improvements	10	
Selection of Alternatives	10	
Chapter 8 - Improvement Program		
Improvement Schedule (Table 5)	11	
Chapter 9 - Financial Program		
Water Systems with 1,000 or More Connections (Not Regulated by UTC)		
Past and Present Financial Status	12	
Available Revenue Sources	12	
Allocation of Revenue Sources	12	
Program Justification	12	
Assessment of Rates	12	
Water Systems with Less Than 1,000 Connections (Not Regulated by UTC)		
Past Financial Status		

Chapter 9 - Financial Program (Cont.)	**WSP Chapter (If Applicable)**	**WSP Page (If Applicable)**
Improvement Program Financing		
Financial Viability Test		
Rate Structure Analysis		
Water Systems Regulated by UTC		
Historical Financial Information		
Future Financial Planning Information		
Chapter 10 - Miscellaneous Documents		
Supportive Documents		
State Environmental Policy Act	Appendix C	
Other Documents		
Agreements	Appendix F	
Comments on WSP from County	Appendix I	
Comments on WSP from Adjacent Utilities	Appendix D	

CONSERVATION PLANNING REQUIREMENTS FOR PUBLIC WATER SYSTEMS WITH MORE THAN 25,000 SERVICE CONNECTIONS

The checklists below are for use by public water systems in their efforts to develop a water conservation plan in accordance with the Guidelines and Requirements for Public Water Systems regarding Water Use Reporting, Demand Forecasting Methodology, and Conservation Programs (Conservation Planning Requirements). Ecology and Health staff in reviewing conservation plans required from public water systems will also use these checklists. Conservation plans consist of three elements: data collection and reporting; demand forecasting for future water needs, and; conservation program development and implementation. THESE CHECKLISTS IDENTIFY THE REQUIREMENTS FOR EACH OF THESE THREE COMPONENTS OF A CONSERVATION PLAN FOR PUBLIC WATER SYSTEMS WITH 10,001 - 25,000 SERVICE CONNECTIONS. Please note that systems that will be pursuing water rights within the next 20 years must also comply with the source of supply analysis requirements pursuant to chapter 246-290-100 WAC. An additional checklist defining the source of supply requirements is included as attachment H. Please refer to the Conservation Planning Requirements and the Water System Planning Handbook for additional details.

CONSERVATION PLANS ARE REQUIRED COMPONENTS OF WATER SYSTEM PLANS REQUIRED BY THE DEPARTMENT OF HEALTH (HEALTH), AND ARE REQUIRED BY THE DEPARTMENT OF ECOLOGY (ECOLOGY) PRIOR TO THE ISSUANCE OF WATER RIGHTS TO PUBLIC WATER SYSTEMS. Implementation of conservation plans may be conditions of approval of water system plans and for water right permits. Where water system plans are required, Health will be the lead agency in reviewing conservation plans. Health will coordinate review of conservation plans with Ecology. If you have any questions about the Conservation Planning Requirements contact the Health Regional Office Planner for your area, or if your system is not required to complete a water system plan, the Ecology Regional Office for your area. The cost-benefit analysis that is required for evaluating various conservation measures should be commensurate to the water system size and water supply status of the individual water system and the area watershed.

For additional resources to assist in the development of your conservation plan, please refer to the Water Conservation Handbook for Public Water Systems developed by Ecology and Health. Additionally, the Planning Handbook - A Guide for Preparing Water System Plans is available from Health to assist in the development of your overall water system plan. Finally, the Water Conservation Bibliography for Public Water Systems published by Health provides references to additional water conservation information and literature which can be obtained from the library and other sources. All of these documents are available from Ecology or Health.

NOTE: The information in this handout provides an overview of the specific requirements in the Conservation Planning Requirements. You should not rely on this handout exclusively to prepare your conservation plan. Please refer to the Conservation Planning Requirements to determine the specific guidelines and requirements for your conservation plan.

WATER USE DATA COLLECTION REQUIREMENTS CHECKLIST

This checklist summarizes the water use data reporting requirements in the Conservation Planning Requirements. Unless otherwise noted, data should be reported in cubic feet. The Conservation Planning Requirements establish. 1991 as the initial year for water use data collection and reporting. If available, data should be shown for the past 5 years. Systems are encouraged to collect more than the minimum required data.

To meet the minimum requirements of the Conservation Planning Requirements, plans must contain currently available data on water usage for the categories of use listed below. If the data has not been collected for any of the categories below, you will be required to make a commitment in your conservation plan to begin collecting the data as required. This commitment must include a schedule for when the data will begin to be collected, and what improvements if any will be made to ensure the data is collectable. Systems which make this commitment to collect data, but do not follow through and collect the information may be unable to receive subsequent water system plan approval or approval for additional water rights, until data consistent with the checklist below is collected.

All data elements must be reported or a commitment must be made (for each data element not collected) to collect and report the data prior to the next water system plan update. Where available, daily, monthly and annual totals must be reported, not averages. Please read the footnotes to obtain additional information.

Water Use Data	Data Collected		
1. Source of Supply Meter (monthly totals from each source)[1]	Yes ✓	No	
2. Total Annual Use - Each source (annual totals)	Yes ✓	No	
3. Emergency Interties - Amount Imported (monthly totals from each intertie)	Yes	No	None Imported ✓
4. Wholesale - Amount Purchased (annual totals from each wholesaler)	Yes	No	None Purchased ✓
5. Peak Day / Peak Month Usage (peak monthly totals)	Yes ✓	No	
6. Unaccounted for Water (annual totals)	Yes ✓	No	
7. Accounted for Non-Revenue Water annual totals)[2]	Yes ✓	No	None

8. Service Meter Usage (monthly totals)[3]

Single-Family	Yes ✓	No ____	
Multi-Family	Yes ✓	No ____	
Commercial/Governmental/Industrial	Yes ✓	No ____	
Agricultural	Yes ✓	No ____	None Served ____

9. Emergency Interties - Amount Exported (monthly totals provided to each intertie)	Yes ✓	No ____	None Exported ____
10. Wholesale - Amount Sold (monthly totals provided to each wholesale customer)	Yes ✓	No ____	None Sold ____
11. Population Served. (required to be reported - annual totals)[4]	Yes ✓	No ____	
12. Conservation Data (report the type of measure, level of implementation, duration and date begun - to be included in conservation plan, not reported with other data).[5]	Yes ✓	No ____	
13. Existing Rate Schedules	Yes ✓	No ____	

Data Collection Commitment

14. Unreported Data Elements (for all data elements where data was not collected, the system is required to make a commitment to initiate and continue to collect data)[6]	Yes ____	No ____	All Reported ✓

1. Those systems which do not have source meters will be required to estimate usage.

2. Accounted for non-revenue water *includes* uses which can be accounted for, but *where* revenue is not collected. Examples include fire, protection, system flushing and other designated uses.

3. Those systems required to collect data which do not have service meters, will be required to estimate how much each of these users has consumed. Include the number of connections in each category of user. Data may be collected through normal billing procedures. Monthly data may be estimated if customers are billed *less* frequently.

4. Report the number of connections and customers in the residential class, and number of connections for the other customer classes. Population served must be reported, a commitment to include the information in the next water system plan update is inadequate. Data on population per household is available from the, State Office of Financial Management.

5. If no previous conservation efforts have been undertaken, development of a conservation plan consistent with the Conservation Planning Requirements will be acceptable.

6. System must either have collected all data or made a written commitment to initiate and continue data collection or the conservation plan cannot be approved.

DEMAND FORECASTING REQUIREMENTS CHECKLIST

This checklist summarizes the demand forecasting factors which must be considered when forecasting future water needs. Demand forecasts must include demands from wholesale customers. To meet the minimum requirements of the Conservation Planning Requirements demand forecasts must incorporate the four factors, listed below. Other factors determined to be appropriate by the system may be included as is appropriate. Demand forecasts must show demand for 6 and 20 year projections for both average daily demand and peak day demand, which depict future usage with and without conservation savings obtained from the conservation program (i.e. that factor in target water saving projections identified in the conservation program).

Factors Required to be Included	Included	
1. Projected Population (based on information from local government and/or Office of Financial Management)	Yes ✓	No ____
2. Land Use/Zoning/Capacity (adopted land use and zoning regulations)	Yes ✓	No ____
3. Conservation Savings (water projected to be saved through the water conservation program must be factored into demand projection)	Yes ✓	No ____
4. Per Capita Water Use and Other Non-Residential Water Use (based on documented water usage - when available)	Yes ✓	No ____
5. Water Rates (incorporate effects of rates on water demand)	Yes ✓	No ____
6. Demand forecasts prepared for all four customer classes.	Yes ✓	No ____

WATER CONSERVATION PROGRAM REQUIREMENTS CHECKLIST

Conservation programs must include conservation objectives, evaluation of conservation measures, identification of selected conservation activities, and target water saving projections as discussed below. Please refer to the Conservation Planning Requirements for additional details.

Conservation Objectives. Goals and objectives of the conservation program shall be identified. These objectives should be designed to meet the needs of the specific water system (e.g., attain maximum utilization of current supplies, reduce peak daily consumption, reduce peak monthly consumption, reduce total annual consumption, promote long term efficiency with accelerated conservation on a short term basis, reduce usage from a specific customer class, develop public education and awareness, etc.). EACH WATER SYSTEM WILL NEED TO DEVELOP CONSERVATION OBJECTIVES WHICH LOGICALLY MEET ITS NEEDS.

Evaluation of Conservation Measures. Public water systems must evaluate all recommended conservation measures identified in the Conservation Planning Requirements and implement those that are required and those that meet the public water systems' needs. The specific measures to be evaluated depend upon the size of the system. However, systems are encouraged to evaluate measures above the minimum requirements. The system must explain decisions not to implement measures it is required to evaluate.

Identification of Selected Conservation Activities

Description. Description of conservation measures being implemented. (including required measures).

Schedule. Schedule of when the conservation measures will be implemented (emphasis on 6 year implementation schedule).

Budget. Projected budget for each selected conservation measure. Schedule and budget information should be shown together.

Monitoring Requirements. Description of how the system will monitor the success of its conservation measures (e.g., documented reduction in water usage, distribution of conservation materials, implementation of specific measures).

Target Water Savings Projections. Each system will identify a percentage savings goal, based on the measures chosen for implementation, which the entire water conservation program will attempt to save. Because different systems may have already implemented different levels of conservation, and the conservation needs of each system are different, no percentage savings goal has been established in the Conservation Planning Requirements. This percentage savings goal must be factored into the demand forecast.

To meet the minimum requirements of the Conservation Planning Requirements, all required measures must be planned to be implemented within six years, and all recommended measures must be evaluated and implemented if cost effective.

The following checklist summarizes the water conservation measures which are required to be implemented, and measures which are required to be evaluated and implemented where cost effective. In the absence of clear evidence to the contrary, estimates on the costs and benefits of conservation measures (i.e. selection of non-mandatory measures for implementation) will not be challenged. Please refer to the footnotes for additional information.

Required Conservation Measures[9]	Measure Included
1. Program Promotion	Yes ✓ No ____
2. Install Source Meters	Yes ✓ No ____

All recommended measures listed below must be evaluated for implementation in the conservation plan to meet the minimum requirements in the Conservation Planning Requirements.

Recommended Conservation Measures	Measure Evaluated
3. School Outreach	Yes ✓ No ____
4. Speakers Bureau	Yes ✓ No ____
5. Theme Shows and Fairs	Yes ✓ No ____
6. Purveyor Assistance	Yes ✓ No ____
7. Customer Assistance	Yes ✓ No ____
8. Conduct Technical Studies	Yes ✓ No ____
9. Utilize Bill Showing Consumption History	Yes ✓ No ____
10. Install Service Meters	Yes ✓ No ____
11. Develop Unaccounted Water/Leak Detection Program	Yes ✓ No ____
12. Single-Family/Multi-Family Kit Distribution Program	Yes ✓ No ____
13. Development of Nurseries/Agricultural Conservation Program	Yes ✓ No ____
14. Development of Landscape Management/Xeriscaping Program	Yes ✓ No ____
15. Conservation Pricing	Yes ✓ No ____
16. Utility Financed Retrofit	Yes ✓ No ____
17. Seasonal Demand Management	Yes ✓ No ____
18. Water Recycling/Reuse	Yes ✓ No ____

[9] Program promotion is required to be implemented for all public water systems. Source metering is required to be implemented by all systems prior to receiving additional water rights. If additional water rights are not being sought, this measure must be evaluated and implemented if cost effective. If unaccounted for water is greater than 20 percent, a leak detection program must be initiated.

OTHER REQUIREMENTS CONTAINED IN THE CONSERVATION PLANNING REQUIREMENTS

In addition to developing a conservation plan as delineated above, the Conservation Planning Requirements also require that all public water systems preparing a water system plan identify existing rate schedules (include schedules for various customers classes if they are different), and inventory major potential sources and uses for reclaimed water.

Other Requirements	Information Included
1. Inventory of Sources and Uses for Reclaimed Water.[10]	Yes ✓ No _____

[10] A list of potential sources and uses of reclaimed water is contained in the Conservation Planning Requirements. Only those systems with more than 25,000 service connections will be required to evaluate water reuse as a conservation measure.

Attachment 2: Municipal Water Law Water System Plan/Small Water System Management Program General Approval Checklist

For each element, please identify where in your Water System Plan (WSP) or Small Water System Management Program (SWSMP) submittal the requirements of the Municipal Water Law identified in the column labeled "Element" are addressed.

The "Application" column identifies the type of plan (WSP or SWSMP) and the size of system the element applies to.

Application	Element	Addressed in plan on pages indicated	Documentation Attached
Water rights and system capacity			
WSP and SWSMP All size systems	The water rights self-assessment you have included in your WSP and SWSMP must be complete and must adequately reflect your water right status. Please review your self-assessment for completeness, accuracy and consistency with your water rights. If there are factors (i.e. supplemental, seasonal, etc.) to your water right that are not addressed in the self-assessment format, provide additional statements on how those factors affect your self-assessment.	Page(s) 6-2 to 6-10	
WSP and SWSMP All size systems	The system capacity analysis must incorporate the water right quantity parameters (QaQi) found in your water rights self-assessment. Identify the number of connections, population served, and/or Equivalent Residential Units (ERUs) that you are currently serving and identify your current instantaneous and annual water usage. Water use demand should not exceed existing water right QaQi.	Page(s) 4-1, 5-6, 5-7	6-2
WSP All size systems	The system capacity analysis must incorporate the water right quantity parameters (QaQi) found in your water rights self-assessment. For a 6-year planning horizon, evaluate the number of connections, population served, and/or Equivalent Residential Units (ERUs) that you are planning on serving, utilizing historical water usage and future population projections. Water use demand projections should not exceed existing water right QaQi.	Page(s) 6-15,	6-16
Service Area Delineation			
WSP and SWSMP All size systems	Provide a map and description of the water system service area. The map must delineate your retail service area (existing and future) as well any other service area (existing and future) you wish to include in your water right place of use. Provide clear differentiation between the two boundaries.	Page(s) 2-13, 2-14	Figure 2-1
WSP and SWSMP All size systems	Provide a copy of the land use map(s) for jurisdictions served by your system.	Page(s) Appendix J	

Application	Element	Addressed in plan on pages indicated	Documentation Attached
Conservation			
WSP and SWSMP All size systems	New language has been added to RCW 70.119A, which states, "…municipal water suppliers shall continue to meet the existing conservation requirements of the department and shall continue to implement their current water conservation programs." Describe what, if any, previous efforts will be discontinued. For discontinued efforts, identify why continuation of these efforts would be ineffective or provide documentation that the discontinued program had a prescribed end date or savings level.	6-21 Page(s) _____	
WSP All size systems	Must meet current conservation requirements. Please review the requirements (attached) and provide identification of where in your current WSP each of the elements is included.	Page(s) 6-22 6-23	
SWSMP All size systems	Provide a completed Water Conservation Program (Element 14 of the SWSMP).	Page(s) _____	N/A
WSP Systems serving 1000 or more connections	Describe the projects, technologies, and other cost-effective measures that comprise your water conservation program.	Must be attached	Table 6-4 Chapter 6
WSP Systems serving 1000 or more connections	Describe the improvements in the efficiency of water system use resulting from implementation of your water conservation program over the last six years.	Page(s) _____	Appendix H
WSP Systems with inchoate water rights serving 1000 or more connections	Provide a demand forecast for the next 6-years based on the water savings expected from the planned conservation measures.	Page(s) _____	5-8 to 5-14
WSP Systems with inchoate water rights serving 1000 or more connections	Provide a demand forecast for the next 6-years based on the water savings expected if implementing additional conservation measures that were considered cost-effective, including those that were not chosen to be implemented at this time.	Must be attached	
Reclaimed Water			
WSP Systems with greater than 1000 connections	Exploring opportunities for water reclamation is an element of the Municipal Water Law that must be addressed in this plan Systems > 1000 Connections must complete Attachment 9: Water Reclamation Checklist for Systems with 1,000 or more Connections or provide comparable documentation.	Page(s) _____	6-17 to 6-19

Appendix B

Application	Element	Addressed in plan on pages indicated	Documentation Attached
Duty to Serve			
WSP All size systems	Describe how your system responds to requests for new water service by providing: 1. The process for service requests, including timeframes 2. How you determine that your system's capacity is adequate to provide new water service (including sufficient water rights) 3. Conditions of a non-technical nature that may affect your ability to provide new water service (annexation procedures, water rights issues, local ordinances, etc.) 4. Your system's procedures for granting or requesting extensions of time during a water service related project, and describe your procedure for handling disputes and appeals when water service requests are denied	Must be attached	Page 3-7
Local Government Consistency			
WSP or SWSMP All size systems	*Consistency with applicable adopted local plans, regulations and policies must be determined prior to plan submittal. For each appropriate planning agency provide a completed "Consistency Statement Checklist" or analogous documentation.*	Must be attached	Appendix E
Watershed Coordination			
WSP or SWSMP All size systems In Watershed Planning Process per RCW 90.82	If your system is located in an area developing a watershed plan per RCW 90.82, describe your efforts to coordinate with the local planning unit. We have attached a list of Water Resource Inventory Areas (WRIA) where watershed plans are currently in development along with contact names for each area.	May need to be attached.	2-29

Attachment 4: Current Conservation Planning Requirements for Water System Plans (WSPs)

The following items need to be addressed and included in WSP comment letters.

Any conservation measures that have been part of the water system's past conservation efforts should be continued unless these efforts would be ineffective or their water conservation program prescribed it to end at a certain time or savings level.

Water Use Reporting

Item	Comment	Authority	Reference
1	Provide a summary of historical average and peak water usage. CHAPTER 5	– WAC 246-290-221(1) – WAC 246-290-480 (2)(e)(v)	– Memorandum of Understanding with Ecology (MOU) – Conservation Planning Requirements (pg.7) – Design Manual (5.3)
2	Source meters are required. If the water system's sources are lacking a source meter, provide a schedule for installing a source meter within the next six years. N/A	– WAC 246-290-415(3) & (5) – WAC 246-290-480 (1)(e)(v) – WAC 173-173-040 – WAC 246-290-130(4)(g)	– MOU – Conservation Planning Requirements (pg.16, 17) – Planning Handbook (pg.19)
3	Provide a breakdown of the system's unaccounted for water. The breakdown should identify the difference between the total unaccounted for water and the non-revenue water that can be identified (or estimated). CHAPTER 5	– RCW 90.44.110 – RCW 90.03.005 – WAC 246-290-480(2)(e)(v)	– MOU – Conservation Planning Requirements (pg.8, 15) – Planning Handbook (pg.19)
4	If unaccounted for water is 20% or greater, provide a plan to decrease it. N/A	– RCW 90.03.005 – RCW 90.03.400 – RCW 90.44.110 – WAC 246-290-415(3) & (5)	– MOU – Conservation Planning Requirements (pg.15) – Planning Handbook (pg.19)
5	Systems that do not collect water use data must provide a schedule as to when acceptable data collection will occur during the next six years. N/A	– WAC 246-290-100(4)(d)(iii) – WAC 246-290-480(1)(e)(v), (2)(d),& (2)(e)(v)	– MOU – Conservation Planning Requirements (pg.7) – Planning Handbook (pg.10)

Demand Forecasting

Item	Comment	Authority	Reference
1	Consecutive 6-year and 20-year water demand forecasts (for both Average Day Demand (ADD) and Maximum Day Demand (MDD)) must be provided. CHAPTER 5	– WAC 246-290-100(4)(b)(ii) & (4)(d)(ii) – WAC 246-290-221(1)	– MOU – Conservation Planning Requirements (pg.12) – Planning Handbook (pg. 12)

Conservation Program

Item	Comment	Authority	Reference
1	Include an evaluation that identifies the cost-effectiveness of conservation measures (as determined by the utility) and determine which conservation measures will be implemented. Provide details of analysis. CHAPTER 6	– RCW 90.03.005 – WAC 246-290-100(4)(d)(i)	– MOU – Conservation Planning Requirements (pg.4, 17) – Planning Handbook (pg.20)
2	For each conservation program element chosen, describe how and when the element will be implemented. Measures must be in the Capital Improvement Program and financial program (if substantive). CHAPTER 6	– WAC 246-290-100(4)(d)(i) & (g)	– MOU – Conservation Planning Requirements (pg.5) – Planning Handbook (pg.20)
3	Provide a copy of the system's rate structure. Provide an evaluation of the rate structure that looks at (1) the feasibility of adopting and implementing a rate structure that promotes water conservation, and (2) the affordability of water rates. CHAPTER 12	– WAC 246-290-100(4)(d)(i), & (4)(h)(iv)	– Conservation Planning Requirements (pg.15, 23) – Planning Handbook (pg.12, 69)

Municipal Water Supply—Efficiency Additional Requirements:

Item	Comment	Reference
1	Describe what, if any, previous efforts will be discontinued. For discontinued efforts, identify why continuation of these efforts would be ineffective or provide documentation that the discontinued program had a prescribed end date or savings level. CHAPTER 6	RCW 90.03.386, Section 7 (8)
2 > 1,000 conn.	Describe the projects, technologies, and other cost-effective measures that comprise the water conservation program. CHAPTER 6	RCW 90.03.386, Section 5 (3)(a)
3 > 1,000 conn.	Describe the improvements in the efficiency of water system use resulting from implementation of your water conservation program over the last six years. CHAPTER 6	RCW 90.03.386, Section 5 (3)(b)
4 > 1,000 conn. Inchoate Water	Provide a demand forecast for the next six years based on the water savings you expect from the planned conservation measures. CHAPTER 5	RCW 90.03.386, Section 5 (3)(c)
5 >1,000 conn. Inchoate Water	Provide a demand forecast for the next six years based on the water savings expected if implementing additional conservation measures that were considered cost-effective, but not chosen to be implemented. CHAPTER 5	RCW 90.03.386, Section 5 (3)(c)

Recommended WSP Comments:

Item	Comment	Reference
1	The WSP checklists from the MOU for Water Use Data Collection, Demand Forecasting, and Water Conservation Planning Requirements should be completed and included in the plan. Appendix B	– MOU – Planning Handbook (pg.12)
2	A 6-year and 20-year water demand forecast (for both ADD and MDD) should be provided which includes the changes in demand due to conservation savings. Chapter 5	– MOU – Conservation Planning Requirements (pg.12) – Planning Handbook (pg.12)
3 Chapter 6	Conservation program promotion should be implemented on an annual basis. **Note:** Will be required if part of their past program unless considered ineffective or prescribed to end.	– MOU – Conservation Planning Requirements (pg.24) – Planning Handbook (pg.19)
4	Please evaluate all of the recommended conservation measures (in the Conservation Planning Requirements) for your size system. If pursuing additional water rights in the next 20 years, as part of your source of supply analysis, evaluate all recommended measures from the next larger system size category. Chapter 6	– MOU Attachment H – Conservation Planning Requirements (pg.16, 23) – Planning Handbook (pg.21)

Attachment 9: Water Reclamation Checklist for Systems with 1,000 or more Connections

The Municipal Water Supply - Efficiency Requirements Act, Chapter 5, Laws of 2003 (Municipal Water Law), amended Chapter 90.46 of the Revised Code of Washington (RCW) to require public water systems serving 1000 or more connections to evaluate opportunities for reclaimed water when completing their water system plans (WSP). This checklist may be used to ensure that your WSP includes sufficient information about opportunities for reclaimed water and your system's efforts to develop those opportunities.

Water System Name: TACOMA WATER Date: Aug 4, 2006

PWS ID: _____

1. An evaluation of water reclamation opportunities is found in the WSP on pages:
   At a minimum, include the following in your evaluation of reclamation opportunities:
   - An inventory of large water users. PAGE 2-24, 2-25
   - Identification of potential reclaimed water users.
   - Estimates of how much water could be saved by development of reclaimed water projects
   - Identification of opportunities that your system intends to pursue within the next six years
   - A brief analysis of the financial and operation feasibility of identified opportunities

   The form on the opposite side of this page is provided to assist you in conducting an inventory of potential users and estimate savings. Use of this form is optional. 6-17 to 6-19

2. Provide the results of that evaluation.
   If new or additional reclaimed water opportunities are available, include a brief description of activities you are considering undertaking or those activities you will undertake to pursue development of those opportunities. NOT AVAILABLE

   If reclaimed water opportunities are not available, include a brief description of the interaction with the local wastewater facility (or other entity within the area you serve that may be a generator of reclaimed water) to evaluate opportunities to develop reclaimed water. PAGE 6-17 to 6-19, 6-26

3. If evaluation of water reclamation is not included because such an evaluation has been completed by the wastewater facility, or other entity, please include a copy of that evaluation. N/A

4. If water reclamation is mandated for this water system through local government agreement, contract, local regulations, ordinances, or other mechanism, please provide a copy of the governing mechanism. N/A

5. If reclaimed is available within the service area of your water system please include the following information: N/A
   - Name of Facility
   - Class of Water Received (A, B, C or D)
   - Reclamation Permit Number
   - Amount of Reclaimed Water received
   - A brief description of how this water is used, including information on cross connection control
   - Date when your utility began receiving reclaimed water

APPENDIX C

SEPA CHECKLIST

DETERMINATION OF NON-SIGNIFICANCE

Description of Proposal: This proposal is a non-project action involving the approval of the Tacoma Water Comprehensive Water Plan 2006 Update by the Washington State Department of Health, the Tacoma Public Utility Board and the City of Tacoma and King County Councils. The 2006 Update evaluates future water supply and infrastructure projects and operations and maintenance activities for Tacoma Water's complete water system for the period 2007 through 2012, and beyond, as required based upon the plan's forecast of future water demands. Tacoma Water is required to update its water system plan every six years under Department of Health regulations. The 2006 Update has been prepared in accordance with Department of Health requirements and under the direction of a registered professional engineer.

Proponent: City of Tacoma - Tacoma Public Utilities, Water Division
SEPA Public Information Center File No. 40000084756

Location: Tacoma Water's retail service area in Pierce County includes the area within the corporate boundaries of the City of Tacoma, some areas immediately adjacent to the corporate boundaries, and in some areas to the south and east of Tacoma city limits and includes the cities of University Place and Ruston. Approximately 93 percent of the service area is in Pierce County, with seven percent in King County. Retail water service in King County includes service within the City of Federal Way and in the community of Cumberland.

Tacoma Water is contracted to provide wholesale water to 14 water purveyors operating in Pierce and King counties and has recently entered into a wholesale water contract with the Cascade Water Alliance. Tacoma Water is operator of, and a participant in, a new regional water sharing partnership with the Lakehaven Utility District, the Covington Water District and the City of Kent. The Green River in eastern King County is Tacoma Water's primary source of water supply.

Lead Agency: City of Tacoma – Tacoma Public Utilities, Water Division

The lead agency for this proposal has determined that it does not have a probable significant adverse impact on the environment. An environmental impact statement (EIS) is not required under RCW 43.21C.030(2)(c). This decision was made after review of a completed environmental checklist and other information on file with the lead agency. This information is available to the public during the regular business hours of Tacoma Water at the Tacoma Public Utilities Administration Building, 3628 S 35th Street.

This DNS is issued under WAC 197-11-340(2). The lead agency will not act on this proposal for 15 days from the date of issuance below. Written comments may be submitted to the address listed below and must be received by 5 p.m. on December 21, 2006.

This Determination is part of a Phased Review under the provisions of SEPA - WAC 197-11-060(5). Subsequent project-specific environmental review will be conducted as individual capital improvements contemplated in the 2006 Update are pursued.

Responsible Official: John Kirner, Water Superintendent
Lead Agency: Tacoma Water
PO Box 11007
Tacoma, Washington 98411-0007
(253) 502 8208

Date of Issue: December 6, 2006
Comment Deadline: December 21, 2006

_____
John Kirner, Water Superintendent

Unless modified by the City, this determination will become final following the above comment period. Appeals of this determination may be filed at the Superior Court of the State of Washington for Pierce County within 21 days from the date of issuance as listed above. Appeals to the Superior Court shall be taken in accordance with procedures and limitations set forth in RCW 43.21C.075. A copy of the appeal shall be filed with the Department of Public Works, 747 Market Street, Tacoma Washington 98402.

NOTE: The issuance of this DNS does not constitute project approval. Future project applicants must comply with all other applicable requirements of the City of Tacoma and other agencies with jurisdiction prior to receiving development permits.

A. BACKGROUND

1. Name of proposed project, if applicable:

Tacoma Water Comprehensive Water Plan 2006 Update, consisting of the Tacoma Water Comprehensive Water Plan Update, Agency Review Draft, August 2006, Volume I and II, and December 4, 2006 Errata Sheet (Response to Comments Received on the Tacoma Water Comprehensive Water Plan Update, Agency Review Draft, August 2006).

2. Proponent/applicant--Name and phone number:

Susan Clark
Water Resource Planning Coordinator
253 502 8204

Proponent/applicant--Address:

Tacoma Public Utilities – Tacoma Water, Water Resource Planning Division
3628 South 35th Street
Tacoma WA 98409-3192

3. Contact Person--Name and phone number:

Susan Clark
Water Resource Planning Coordinator
253 502 8204

Contact Person--Address:

Tacoma Public Utilities – Tacoma Water, Water Resource Planning Division
3628 South 35th Street
Tacoma WA 98409-3192

4. Date checklist prepared:

December 4, 2006

5. Agency requesting checklist:

City of Tacoma; Washington State Department of Health; King County

6. Proposed timing or schedule (including phasing, if applicable):

Tacoma Water is required to update its water system plan every six years under Washington State Department of Health (DOH) regulations. Tacoma Water's last water system plan (Comprehensive Water Plan 2000 Update) was approved by DOH on

September 15, 2000. The Tacoma Water Comprehensive Water Plan 2006 Update (2006 Update), comprised of the Tacoma Water Comprehensive Water Plan Update, Agency Review Draft, August 2006, Volume I and II, and December 4, 2006 Errata Sheet, evaluates future water supply and infrastructure projects and operations and maintenance (O&M) activities needs for Tacoma Water's complete water system for the period 2007 through 2014 as based upon the plan's forecast of future water demands. Implementation of the proposed plan will be phased. The 2006 Update will be submitted to the following agencies/bodies for review and approval: DOH, the Tacoma Public Utility Board, Tacoma City Council, and King County Council.

7. Do you have any plans for future additions, expansion, or further activity related to or connected with this proposal? If yes, explain.

The 2006 Update provides a foundation for future infrastructure improvements. Tacoma Water operates under the guidance of a ten-year business plan, updated every other year as a first step in establishing the upcoming biennial budget. The 2006 Update schedule of capital improvements will be evaluated and may be reprioritized based upon current needs and available funding as the Tacoma Water business plan is updated. Environmental review, as applicable, will occur at the time capital projects are specifically proposed and begin the design and permitting process.

DOH requires an update of Tacoma Water's water system plan every six years. Any future updates of the proposed plan will undergo environmental review under SEPA.

The 2006 Update includes ongoing water programs and maintenance activities. Future programs and maintenance projects to implement the proposed plan will undergo environmental review at the time projects are specifically proposed, to the extent applicable.

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

Additional environmental investigations may be required for capital improvements as proposed by the 2006 Update on a project-by-project basis.

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.

There are no other applications pending for governmental approvals of other proposals directly affecting this proposal. In the future, individual projects related to the 2006 Update may require governmental approvals. Such required approvals will be sought, as applicable, for the individual projects prior to construction. Because this proposal is a non-project action - a water system plan covering service to a large geographical area – other unrelated public or private proposals and government approvals may be pending

that could affect Tacoma Water's water service area and Tacoma Water's ability to provide water service.

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

DOH approves six-year updates of water system plans, as required under Washington Administrative Code 246-290-100. The 2006 Update will be submitted to DOH for review and approval.

The 2006 Update will undergo review and approval by Tacoma Public Utility Board and Tacoma City Council.

King County Municipal Code Chapter 13.24 requires water purveyors operating in, or obtaining water from, unincorporated King County to obtain King County Council approval of comprehensive water system plans. The 2006 Update will undergo the King County Council review and approval process.

The Pierce County Coordinated Water System Plan (CWSP) requires Pierce County to review water system plans for consistency with the CWSP. Pierce County does not have water system plan approval authority, however.

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.

The proposal is a non-project action involving the approval of the 2006 Update by DOH, the Tacoma Public Utility Board and the City of Tacoma and King County councils. The 2006 Update serves as a tool to assist Tacoma Water in making the best use of available resources in order to provide quality water services and protect the health of its customers. The 2006 Update accomplishes the following objectives:

- Provides Tacoma Water with a guide to evaluate the impacts of future proposed development and land use changes on the water system.
- Identifies existing and potential water resources available to Tacoma Water.
- Provides a review of existing water quality data for Tacoma Water's system and discusses existing and forthcoming regulatory requirements as they apply to the water system.
- Conducts a water system inventory, including a description of supply, storage and distribution facilities operation.

- Establishes water system policies that will help Tacoma Water make decisions and manage the water system, incorporating the requirements discussed in the water resource, water quality, water supply and water distribution sections of the Plan.
- Documents Tacoma Water's Satellite System Management program.
- Documents planning and design criteria used by Tacoma Water.
- Identifies existing and potential future water system deficiencies by conducting storage and transmission/distribution system analyses.
- Develops a program of capital improvements, including priorities for construction and provides a financial evaluation to support the identified water system improvements.
- Documents Tacoma Water's commitment to implementing an enhanced conservation plan as an element of the overall Tacoma Water resource mix.
- Documents Tacoma Water's Green River Watershed Control Program.
- Responds to new water system planning requirements resulting from the 2003 Municipal Water Law (HB 1338).
- Incorporates Tacoma Water's ten- year Business Plan Strategic Initiatives into the water system plan.

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. If a proposal would occur over a range of area, provide the range or boundaries of the site(s).

Tacoma Water provides direct retail water service to customers; wholesale water service to other water systems; is a participant in a new regional water sharing partnership and; has been approved as a satellite system management agency. The 2006 Update demonstrates how Tacoma Water will address present and future needs for water supply services within the geographical areas described below.

The Green River in eastern King County is Tacoma Water's primary source of water supply. The Green River originates in the upper Cascade Mountain range. The Green River Watershed is located in the central Cascade Mountain Range, approximately 25 miles north of Mount Rainier. Tacoma Water's Green River intake is located approximately 30 miles east of Tacoma at an elevation of approximately 900 feet. The Green River Watershed lands, located above the Tacoma Water intake facilities, comprise approximately 147,290 acres. Tacoma Water currently owns approximately ten percent of the watershed area, primarily land adjacent to the Green River and its main tributaries. Public agencies and private companies own the remainder.

Tacoma Water's retail service area in Pierce County includes the area within the corporate boundaries of the City of Tacoma, some areas immediately adjacent to the corporate boundaries, and in some areas to the south and east of Tacoma city limits.

Approximately 93 percent of the service area is in Pierce County, with seven percent in King County. The service area generally follows Tacoma Water's pipelines and is roughly bounded on the south by the military bases; on the north by 272nd Street in southern King County; on the west by Puget Sound; and on the east by the Cascade foothills. In addition to providing retail water service to the residents of the City of Tacoma, Tacoma Water also provides retail water service to residents of the cities of University Place and Ruston. Retail water service is also provided to portions of the cities of Lakewood, Orting, Bonney Lake and Puyallup.

Retail water service in King County includes approximately 3,250 services in the City of Federal Way and 94 services in unincorporated King County southwest of the community of Cumberland.

Tacoma Water is contracted to provide wholesale water to 14 water purveyors operating in Pierce and King counties and has recently entered into a wholesale water contract with the Cascade Water Alliance: an alliance of King County water purveyors. Additionally, as a regional water system, the 2006 Update also addresses future water service to other potential wholesale customers not currently served.

Tacoma Water is operator of, and a participant in, a new regional water sharing partnership with the Lakehaven Utility District, the Covington Water District and the City of Kent. The regional water system is operated under the terms of the Second Supply Project Partnership Agreement.

13. Assessor Parcel Number:

Not Applicable.

B. ENVIRONMENTAL ELEMENTS

1. Earth
a. General description of the site (circle one): Flat, rolling, hilly, steep slopes, mountainous, other:

The proposal is a non-project action. More specific information regarding the earth will be determined during project level environmental review.

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

The proposal is a non-project action. Specific information regarding steep slopes will be determined during project level environmental review.

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.

The proposal is a non-project action. Specific information regarding soil types will be determined during project level environmental review.

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

The proposal is a non-project action. Specific information regarding unstable soils will be determined during project level environmental review.

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

The proposal is a non-project action. Filling and/or grading activity could occur in association with future capital improvement and/or 0&M projects. This issue will be addressed for each water system project, as applicable.

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

The proposal is a non-project action. More specific information on the potential of erosion occurring will be determined during environmental review and permitting of individual projects.

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

The proposal is a non-project action. The amount of impervious surfaces resulting from the construction of capital projects will be identified during design and environmental review when individual projects are proposed. All future projects will comply with applicable stormwater requirements.

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

The proposal is a non-project action. Measures to reduce or control erosion will be identified during design, permitting and environmental review of individual projects. All future projects will comply with applicable stormwater and other regulatory requirements.

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.

The proposal is a non-project action. This issue will be addressed for each water system project, as applicable.

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

The proposal is a non-project action. This issue will be addressed for each water system project, as applicable.

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

The proposal is a non-project action. This issue will be addressed for each water system project, as applicable.

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.

The proposal is a non-project action involving the approval of the 2006 Update by DOH, the Tacoma Public Utility Board and the City of Tacoma and King County councils. Tacoma Water's primarily source of water supply to its customers is the Green River, located in eastern King County. The 2006 Update anticipates a capital project to address treatment for *Cryptosporidium* will occur after 2009 within the Green River Watershed. The 2006 Update also anticipates a combination renewal and replacement project involving a portion of Pipeline No. 1 in the Puyallup River valley. Specific information on surface water bodies located near individual water system projects will be determined during project level environmental review.

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

The proposal is a non-project action involving the approval of the 2006 Update by DOH, the Tacoma Public Utility Board and the City of Tacoma and King County councils. The 2006 Update anticipates a combination renewal and replacement project involving a portion of Pipeline No. 1 in the Puyallup River valley. The project will replace the pipeline bridge crossing of the Puyallup River and a section of pipe that crosses a wetland on piers. Specific information on surface water bodies located near individual water system project will be determined during project level environmental review.

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.

The proposal is a non-project action involving the approval of the 2006 Update by DOH, the Tacoma Public Utility Board and the City of Tacoma and King County councils. Specific information on the amount of fill and dredge material that would be placed in or removed from surface waters or wetlands during construction of a water system project, if applicable, will occur during individual project level environmental review.

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

The proposal is a non-project action involving the approval of the 2006 Update by DOH, the Tacoma Public Utility Board and the City of Tacoma and King County councils. The 2006 Update demonstrates how Tacoma Water will address present and future needs for water supply services. In the case of Tacoma Water, providing water supply services requires the use of surface waters as described below.

Tacoma Water's primary source of water supply to its customers is the Green River. Tacoma Water diverts water from the Green River 30 miles east of Tacoma near Palmer, in South King County. Diversion of water from the Green River began in 1913, at a rate of approximately 65 cubic feet per second. Tacoma Water's First Diversion Green River water right claim consists of a senior water right claim of 73 million gallons per day or 113 cubic feet per second. Tacoma Water has a Second Diversion Green River water right permit for up to 65 millions gallons per day that was granted in 1986 and is subject to State established Green River in-stream flow requirements. This water right is also conditioned by a 1995 agreement with the Muckleshoot Indian Tribe.

Tacoma Water currently diverts water from the Green River in accordance with existing regulations, permits, agreements and water rights. The 2006 Update does not anticipate the diversion of additional surface waters, beyond existing water rights. Under the 2006 Update, Tacoma Water will implement an enhanced water conservation program, which will reduce the potential for new surface water diversions.

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

The proposal is a non-project action involving the approval of the 2006 Update by DOH, the Tacoma Public Utility Board and the City of Tacoma and King County councils. Individual capital projects contained in the 2006 Update may lie within a 100-year flood plain. For example, the 2006 Update anticipates a combination renewal and replacement project involving a portion of Pipeline No. 1 in the Puyallup River valley. Information regarding project location within a floodplain will occur during project level environmental review. All projects will comply with any floodplain regulations, where 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.

The proposal is a non-project action involving the approval of the 2006 Update by DOH, the Tacoma Public Utility Board and the City of Tacoma and King County councils. Individual capital projects contained in the 2006 Update may result in the discharge of waste materials to surface waters. Information regarding the discharge of waste materials will occur during project level environmental review. All projects will comply with jurisdictions' waste discharge regulations, where applicable.

b. Ground:

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

The proposal is a non-project action involving the approval of the 2006 Update by DOH, the Tacoma Public Utility Board and the City of Tacoma and King County councils. The 2006 Update demonstrates how Tacoma Water will address present and future needs for water supply services. In order to provide water service, Tacoma Water diverts surface waters (see answer to 3.a.4 above) and withdrawals groundwater, as described below.

In addition to surface and groundwater sources in the Green River Watershed, Tacoma Water owns 24 wells located in and around the city. (Note: The water supplied by Tacoma Water's Green River First Diversion water right can be replaced with water from seven wells located along the North Fork of the Green River when water in the river is too turbid.) Tacoma Water's wells have a short-term combined pumping capacity of approximately 60 million gallons per day. These groundwater sources supply approximately 15 percent of total annual water requirements. In some cases, Tacoma Water wells have not yet been fully developed to utilize the individual water rights associated with the various sources of supply.

Tacoma Water currently withdrawals groundwater in accordance with existing regulations, permits, agreements and water rights. The 2006 Update anticipates additional groundwater withdrawals from existing Tacoma Water sources consistent with existing water rights. Under the 2006 Update, Tacoma Water will implement an enhanced water conservation program, which will reduce the potential for new groundwater withdrawals. The 2006 Update does not anticipate Tacoma Water applying to the Department of Ecology for new groundwater withdrawals. Instead, Tacoma Water will pursue the acquisition of existing groundwater rights, where available, to meet new demands for water.

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.

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.

The proposal is a non-project action. More specific information on the potential for runoff and the identification of receiving waters, if present, will be determined during environmental review and permitting of individual projects. All projects will comply with stormwater runoff regulations, where applicable.

2) Could waste materials enter ground or surface waters?

The proposal is a non-project action. The construction of capital improvements as recommended in the 2006 Update could temporarily discharge waste materials, which will be controlled with project and site-specific best management practices and other project-specific mitigation measures.

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

The proposal is a non-project action. The construction of capital improvements as recommended in the 2006 Update could temporarily discharge materials during the construction period. Project and site-specific best management practices and other project-specific mitigation measures will be implemented during the construction period.

4. Plants

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

The proposal is a non-project action addressing water service to a large geographical area. More specific information will be determined during project level environmental review.

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

The proposal is a non-project action. More specific information will be determined during project level environmental review. The majority of the construction and maintenance activities conducted by Tacoma Water will occur in improved rights-of-way or newly constructed rights-of-way and will, therefore, result in minimal removal of vegetation.

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

The proposal is a non-project action addressing water service to a large geographical area. More specific information in regards to the presence of threatened or endangered vegetation will be determined during project level environmental review.

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

The proposal is a non-project action. More specific information will be determined during individual project design, permitting and environmental review.

5. Animals

a. Underline 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:

The proposal is a non-project action addressing water service to a large geographical area. More specific information will be determined during project level environmental review.

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

The proposal is a non-project action addressing the provision of water service to a large geographical area. More specific information would be determined during project level environmental review.

The Green River Watershed, the location of Tacoma Water's primary source of supply, is known to, or may be, frequented by the following species:

- Gray Wolf (Listed as Endangered)
- Bald Eagle, Marble Murrelet, Northern Spotted Owl, Grizzly Bear, Canada Lynx, Chinook Salmon and Bull Trout (Listed as Threatened)
- Dolly Varden Trout (Proposed as Threatened)
- Oregon Spotted Frog (Candidate for Listing)

Tacoma Water has an approved Habitat Conservation Plan, and, therefore, a 50-year incidental take permit, for its water supply operations on the Green River. The permit will assure that Tacoma Water operates in full compliance with the requirements of the Endangered Species Act and allows Tacoma Water to continue to withdraw water from the Green River. The Habitat Conservation Plan covers 32 species of fish and wildlife that are known to either use or have the potential to use the Green River Watershed. The covered species included those previously listed.

In addition to preparing its HCP, Tacoma Public Utilities, in 2001, obtained ESA coverage for a wide variety of utility maintenance activities by adopting and implementing the federally approved "Regional Road Maintenance Endangered Species Act Program Guidelines." Tacoma Water has modified its operations to obtain coverage under this program for many of its day to day operations.

c. Is the site part of a migration route? If so, explain.

The proposal is a non-project action addressing water service to a large geographical area. More specific information will be determined during project level environmental review.

d. Proposed measures to preserve or enhance wildlife, if any.

The proposal is a non-project action addressing water service to a large geographical area. More specific information would be determined during project level environmental review.

Tacoma Water's Habitat Conservation Plan identifies 64 habitat conservation measures that Tacoma Water is committing to implement over the 50-year duration of the plan.

Because many of the areas surrounding recommended capital improvement projects and/or O&M projects are in urban areas that have been previously developed and native vegetation removed, the potential for impacts on threatened or endangered species is low at such urban locations. Potential impacts to, and mitigation for, threatened and endangered species will be examined during future project specific environmental review and permitting.

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:

Current Tacoma Water facilities use electricity, natural gas and/or petroleum. The programs and future projects contained in the 2006 Update are not anticipated to require any major increases in regional long-term energy use.

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.

Included in the 2006 Update is the Tacoma Water Conservation Plan. In addition to water savings, implementing water conservation program measures also results in energy savings due, for example, to the more efficient use of hot water.

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.

The proposal is a non-project action involving the approval of the 2006 Update by DOH, the Tacoma Public Utility Board and the City of Tacoma and King County councils. The 2006 Update demonstrates how Tacoma Water will provide high quality water to its existing and new customers and includes Tacoma Water's water quality plan. Implementation of the 2006 Update will protect overall drinking water quality. The 2006 Update anticipates a capital project to address treatment for *Cryptosporidium* will occur after 2009. Additionally, the 2006 Update anticipates that the existing McMillin Reservoir open basins will be replaced with covered tanks starting in 2009.

1) Describe special emergency services that might be required.

Not applicable.

2) Proposed measures to reduce or control environmental health hazards, if any:

The proposal is a non-project action. Tacoma Water implements an operations and maintenance program to prevent environmental health hazards from occurring. Protocols for control and disposal of hazardous materials associated with individual projects will be evaluated during environmental review of individual projects.

b. Noise

1) What types of noise exist in the area which may affect your project, (for example: traffic, equipment, operation, other)?

The proposal is a non-project action. More specific information on potential sources of noise which may impact specific projects will be determined during environmental review and permitting of individual projects.

2) What types of levels would be created by or associated with the project on a short-term or long-term basis (i.e., traffic, construction, operation, other)? Indicate what hours noise would come from the site.

The proposal is a non-project action. Noise impacts associated with construction activity could occur as specific recommended projects are constructed. Tacoma Water will evaluate project and site-specific impacts and propose appropriate mitigation measures, when necessary, during environmental review and permitting for individual water system projects.

3) Proposed measures to reduce or control noise impacts, if any.

The proposal is a non-project action. Tacoma Water will evaluate project and site-specific impacts and propose appropriate mitigation measures, when necessary, during environmental review and permitting for individual water system projects.

8. Land and Shoreline Use

a. What is the current use of the site and adjacent properties?

The proposal is a non-project action. More specific information on current uses of individual sites will be determined during project-level environmental review. In general, the Tacoma Water retail service area is characterized by urban uses in the Tacoma area and suburbs and more rural uses in unincorporated Pierce and King counties. The Green River Watershed is mostly undeveloped.

b. Has the site been used for agriculture? If so, describe.

The proposal is a non-project action. More specific information on current uses of individual sites will be determined during project-level environmental review.

c. Describe any structures on the site.

The proposal is a non-project action. More specific information on current uses of individual sites will be determined during project-level environmental review.

d. Will any structures be demolished? If so, what?

The proposal is a non-project action. More specific information on current uses of individual sites will be determined during project-level environmental review.

e. What is the current zoning classification of the site?

The proposal is a non-project action involving the approval of the 2006 Update by DOH, the Tacoma Public Utility Board and the City of Tacoma and King County councils. The 2006 Update demonstrates how Tacoma Water will provide water service within its service area into the future based upon the zoning and land use patterns established by individual land use authorities. The 2006 Update contains the zoning and/or comprehensive land use plan maps of the jurisdictions within which retail water service is provided. Specific information on current zoning of individual sites will be determined during design, permitting and project-level environmental review.

f. What is the current comprehensive plan designation of the site?

The proposal is a non-project action involving the approval of the 2006 Update by DOH, the Tacoma Public Utility Board and the City of Tacoma and King County councils. The 2006 Update demonstrates how Tacoma Water will provide water service within its service area into the future based upon the comprehensive plan land use designations established by individual land use authorities. The 2006 Update contains the comprehensive land use plan and/or zoning maps of the jurisdictions within which retail water service is provided. Specific information on current comprehensive plan designations of individual sites will be determined during design, permitting and project-level environmental review.

g. If applicable, what is the current shoreline master program designation of the site?

The proposal is a non-project action. Specific information on the status of the designation of individual sites as covered by an individual jurisdictions'' shoreline master program will occur during design, permitting and project-level environmental review.

h. Has any part of the site been classified as an "environmentally sensitive" area? If so, specify.

The area served by Tacoma Water contains environmentally sensitive areas. The projects recommended in the 2006 Update could affect environmentally sensitive areas and would, therefore, be subject to local critical areas regulations. Critical areas can include geologic and seismic hazards, flood prone areas, riparian corridors, wetlands, fish and wildlife habitat conservation areas, and abandoned landfills and mines. Critical areas are mapped by the local jurisdiction. The presence of potential critical areas and site-specific impacts and mitigation will be evaluated when projects are reviewed under future SEPA and permitting.

Completion of Tacoma Water's wellhead protection activities have been coordinated with the ongoing activities associated with the South Tacoma Groundwater Protection District (STGPD). The STGPD program was established in 1988 (City Ordinance No. 24083, Tacoma Municipal Code 13.09) and the special protections for groundwater supplies within the district are enforced by the Tacoma-Pierce County Health Department. The TPCHD activities within the protection district include permitting, inspection/consultations, tank removals, tank installations and cleanup oversight.

As part of its update of the Critical Areas Preservation Ordinance in 2004 and 2005, Tacoma worked to bring best available science to the designation of critical areas, including the designated Aquifer Recharge Area (ARA). Soils maps were collected and superimposed on the modeled one, five and ten year-time-of-travel boundaries, and the area so identified was the first basis for the ARA. The current STGPD and the new boundary of the susceptible soil and five year time-of-travel overlay were very close, with the new boundary encompassing a slightly larger area. The Tacoma City Council is currently considering the adoption of this area as the new designated ARA.

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?

It is anticipated that implementation of the 2006 Update will not result in the displacement of any people. Potential displacement impacts and any necessary mitigation measures will be evaluated during future design and environmental review when individual projects are pursued.

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 use and plans, if any.

The proposal is a non-project action involving the approval of the 2006 Update by DOH, the Tacoma Public Utility Board and the City of Tacoma and King County councils. The 2006 Update demonstrates how Tacoma Water will provide water service within its service area into the future based upon the comprehensive plan land use designations established by individual land use authorities. Growth and development patterns established by individual jurisdictions have been considered.

Prior to the construction of any 2006 Update recommended projects, Tacoma Water will apply for and obtain applicable land use permits and approvals.

9. Housing

a. Approximately how many units would be provided, if any? Indicate whether high, middle, or low-income housing.

The proposal is a non-project action. The implementation of the 2006 Update will not result in the additional of housing units available to the general public.

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?

The proposal is a non-project action. Future water system projects proposed in the 2006 Update involve the modification of existing Tacoma Water facilities and/or involve work on underground pipe. The height, size and building materials of new or modified water facilities will be evaluated during design and environmental review of individual projects. All projects will be subject to the height restrictions of the local zoning code and development regulations of the applicable jurisdiction.

b. What views in the immediate vicinity would be altered or obstructed?

The proposal is a non-project action. The height, size and building materials of new or modified water facilities will be evaluated during design and environmental review of individual projects. All projects will be subject to the height restrictions of the local zoning code and development regulations of the applicable jurisdiction.

c. Proposed measures to reduce or control aesthetic impacts, if any.

The height, design, and size of water system projects will meet the applicable development regulations of the applicable local jurisdiction and will be determined during project-specific design, permitting and environmental review.

11. Light and Glare

a. What type of light or glare will the proposal produce? What time of day would it mainly occur?

The proposal is a non-project action. Implementation of the 2006 Update is not anticipated to result in the introduction of new major sources of light or glare. New lighting may be required on a project-specific basis, resulting in potential localized effects. Lighting requirements will be determined during design and will comply with current lighting standards associated with the applicable jurisdiction's development regulations.

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?

The proposal is a non-project action. The existence of off-site sources of light or glare impacting specific water system projects will be determined at time of project-specific environmental review.

d. Proposed measures to reduce or control light and glare impacts, if any.

Lighting requirements will be determined during design and will comply with current lighting standards associated with the applicable jurisdiction's development regulations.

12. Recreation

a. What designation and informal recreational opportunities are in the immediate vicinity?

The proposal is a non-project action. The existence of recreational opportunities will be identified during project specific environmental review.

b. Would the proposed project displace any existing recreational uses? If so, describe.

The implementation of the water projects recommended in the 2006 Update will not result in the displacement of any existing recreational uses.

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?

The proposal is a non-project action. The existence of sites of historical significance will be identified during project specific environmental review.

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.

The proposal is a non-project action addressing the provision of water service to a large geographical area. Specific information regarding public streets and highways serving project sites will occur during project level environmental review.

b. Is site currently served by public transit? If not, what is the approximate distance to the nearest transit stop?

The proposal is a non-project action addressing the provision of water service to a large geographical area. Specific information regarding public transportation serving project sites will occur during project level environmental review.

c. How many parking spaces would the completed project have? How many would the project eliminate?

The proposal is a non-project action. Information regarding parking spaces associated with water system projects will be identified during project-specific design, permitting and environmental review.

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).

The proposal is a non-project action addressing the provision of water service to a large geographical area. The construction or maintenance of Tacoma Water's infrastructure often involves work in rights-of-way. Information regarding the need for new roads or

improvements to existing roads or streets will be addressed during environmental review of specific water system improvement projects.

e. Will the project use (or occur in the immediate vicinity of) water, rail, or air transportation? If so, generally describe.

Projects recommended in the 2006 Update may occur in the vicinity of existing railroad lines. For example, replacement of existing transmission lines in the Port of Tacoma is anticipated to occur. Additional information will be developed during environmental review of specific water system improvement projects.

f. How many vehicular trips per day would be generated by the completed project? If known, indicate when peak volumes would occur.

Future projects anticipated under the proposed plan will generate minimal traffic during operation, if any.

g. Proposed measures to reduce or control transportation impacts, if any.

Construction of projects will include mitigation measures to reduce short-term impacts on affected roadways and other transportation facilities.

15. Public Services

a. Would the project result in an increased need for public services (i.e., 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. Underline utilities currently available at the site: electricity, natural gas, water, refuse service, telephone, sanitary sewer, septic system, other.

The proposal is a non-project action. Specific information on utilities available at individual sites will be determined during project level design, permitting and environmental review.

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.

The proposal is a non-project action involving the provision of water service by Tacoma Water throughout a large geographical area. Construction activities carried out by Tacoma Water could impact other utilities on a short-term basis. Any needed utilities and any potentially impacted utilities will be identified during project specific design, permitting and environmental review.

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 of Proponent/Applicant:

Date:

SUPPLEMENTAL SHEET FOR NONPROJECT ACTIONS
(Do not use this sheet for project actions.)

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?

Capital improvement projects and/or maintenance projects proposed in the 2006 Update may result in temporary construction equipment exhaust, dust and noise.

Proposed measures to avoid or reduce such increases are:

This issue will be addressed for each capital improvement project and/or maintenance project during individual project permitting and environmental review.

2. How would the proposal be likely to affect plants, animals, fish or marine life?

Capital improvement projects and/or maintenance projects proposed in the 2006 Update will generally occur in already distributed areas, such as rights-of way, therefore minimal effects on species are expected.

Proposed measures to protect or conserve plants, animals, fish or marine life are:

This issue will be addressed for each capital improvement project and/or maintenance project during individual project permitting and environmental review.

3. How would the proposal be likely to deplete energy or natural resources?

Tacoma Water currently diverts surface water and withdraws groundwater in accordance with existing regulations, permits, agreements and water rights.

Proposed measures to protect or conserve energy and natural resources are:

Under the 2006 Update Tacoma Water will implement an enhanced water conservation program. Tacoma Water will continue to divert surface water and withdraw groundwater consistent with existing regulations, permits, agreements and water rights.

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?

This issue will be addressed for each capital improvement project and/or maintenance project during individual project permitting and environmental review.

Proposed measures to protect such resources or to avoid or reduce impacts are:

Tacoma Water will implement its Habitat Conservation Plan. Additionally, utility maintenance activities will be carried out consistent with the federally approved "Regional Road Maintenance Endangered Species Act Program Guidelines".

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?

The 2006 Update is consistent with and supports implementation of applicable individual jurisdictions' adopted comprehensive land use plans.

Proposed measures to avoid or reduce shoreline and land use impacts are:

Not applicable.

6. How would the proposal be likely to increase demands on transportation or public services and utilities?

The 2006 Update is consistent with and supports implementation of applicable individual jurisdictions' adopted comprehensive land use plans.

Proposed measures to reduce or respond to such demand(s) are:

Under the 2006 Update Tacoma Water will continue to implement a water conservation program.

7. Identify, if possible, whether the proposal may conflict with local, state, or federal laws or requirements for the protection of the environment.

Not applicable.

APPENDIX D

CORRESPONDENCE AND PLAN COMMENTS

STATE OF WASHINGTON
DEPARTMENT OF HEALTH
20435 72nd Ave. S. , Suite 200, K17-12• Kent, Washington 98032 -2358

April 23, 2007

JANE EVANCHO
TACOMA WATER DIVISION, CITY OF
PO BOX 11007
TACOMA WA 98411

RE: Tacoma Water Division, City of, ID#86800
Pierce County
Water System Plan
Submittal # 06-1208

Dear Ms. Evancho:

Thank you for submitting the draft Water System Plan (WSP) for Tacoma Public Utilities (TPU), received in this office on December 8, 2006. We have reviewed the plan and offer the following comments. The comments must be adequately addressed prior to approval.

System Description

1. Please provide a Local Government Consistency Statement from Pierce County.
2. Please provide a retail service area map with larger resolution and more boundary line detail. Include land use and zoning designations within your retail service area and identification of Tacoma's urban growth boundary.

Water Demand

3. Future Demands 5.3.3 indicates that 'average day demands are expected to increase from 65.46 MGD in 2006 to 88.06 MGD in 2020. This represents an annual increase of 2.3%; your WSP indicates that population is projected to grow by 1.5% for this comparable period. Please explain the reasons for this increase in water demand.

System Analysis

4. It appears that the Cumberland zone is deficient in storage. Are there any plans for additional storage in this zone? Cumberland storage could not be found in the CIP.
5. Please provide a summary of hydrant calibration flow data for the hydraulic model.

Water Rights/Source of Supply Analysis

6. Please complete the attached Water Rights Self Assessment form and include it as an element of your WSP.
7. Enclosed is a copy of Department of Ecology's review and comments on the TPU WSP. Please review and respond where appropriate.
8. Please provide a copy of the "Water Availability Study" referenced in the WSP.

Operations & Maintenance

9. Provide an updated Coliform Monitoring Plan.
10. Provide a copy of your cross connection control program that summarizes how the minimum acceptable requirements contained in WAC 246-290-490(3) are met. For those elements not yet implemented, please provide a schedule for their implementation.
11. Please provide a schedule for demolition of the Tacoma water (brown) house at Friday Creek.

Other Documentation

12. Please provide a copy of construction standards and/or developer extensions for the purposes of receiving a submittal exception for distribution.
13. Please be aware that it appears the following Capital Improvement Projects will require DOH review and approval prior to construction.
    - Well 2C construction
    - McMillan Reservoir covering
    - New Prairie Ridge storage
    - South Tacoma Wells fluoridation facilities
    - Cryptosporidium pilot study

We hope that you have found these comments to be clear, constructive and helpful in the development of your final draft WSP. We ask that you submit the revised WSP on or before July 25, 2007. In order to expedite the review of your revised submittal, please include a cover letter summarizing how each of the above comments was addressed in the revised WSP and where each response is located (i.e., page numbers, Appendices, etc.)

Regulations establishing a schedule for fees for review of planning, engineering and construction documents have been adopted (WAC 246-290-990). Please note that we have included an invoice in the amount of $5,305.00 for the review of the Water System Plan. This fee covers our cost for review of the initial submittal, plus the review of one revised document. Please remit your complete payment in the form of a check or money order within thirty days of the date of this letter to: **DOH, Revenue Section, P.O. Box 1099, Olympia, WA 98507-1099.**

Thank you again for submitting your draft Water System Plan for our review. If you have any comments or questions concerning our review, please contact me.

Sincerely,

Richard Rodriguez
WSDOH Regional Planner
(253) 395-6771

Enclosures

cc: John Ryding, DOH
Deb Hunemuller, DOE, SWRO
Gary Porter, TPCHD
Tim Ramsaur, Pierce County Dept. of Public Works
Dave Monthie, King County UTRC

STATE OF WASHINGTON
DEPARTMENT OF ECOLOGY
PO Box 47775 • Olympia, Washington 98504-7775 • (360) 407-6300

February 6, 2007

Richard Rodriquez
NW Drinking Water Operations
Washington State Department of Health
20435 72nd Ave. S., Suite 200
Kent WA 98032

Dear Mr. Rodriquez:

Re: Tacoma Public Utilities' Water System Plan, Project # 06-1208

Thank you for the opportunity to review the 2006 draft Comprehensive Water System Plan (WSP) for Tacoma Water. Consistent with the Memorandum of Understanding between our agencies, I reviewed the relevant portions of the WSP and offer following comments.

Overview

Because Tacoma Water's main water right is based on an unadjudicated claim, Ecology cannot provide the Department of Health with a firm, reliable quantification of Tacoma Water's water rights. However, Ecology notes that Tacoma Water will reduce the claim from the Green River (Claim #002298) from the 400 cfs claimed to the 113 cfs diversion that is currently developed.

An overview of the demand requirements for the next 20 years in Table 5-8 and 5-9 show a peak demand of approximately 144,984 afy by 2020 (high growth scenario). It appears that Tacoma Water's water rights as a whole are likely adequate for the future demand through the year 2020. However, it is difficult to determine from the data provided the adequacy of future demand from each source.

Water Rights Self-Assessment Table

Chapter 6, Water Resources, includes Table 6-2 which lists the water rights for Tacoma Water's system; however, the WSP does not include a Water Rights Self-Assessment Table. A completed self assessment table is a valuable tool that shows the relationship between the water rights, how much water is currently being used from each water right, and how much water is expected to be used in the next 20 years, including any excess or deficiency. The table also allows for a listing of interties and any new applications that are filed with Ecology.

Table 6-2 is helpful to show all the water rights and how they relate to each other; however, it lacks information on current and projected water use from the sources. Though the table includes the developed capacity, the footnote indicates this is the maximum historic instantaneous flow and annual quantity that has been used. This does not necessarily indicate current or future use.

- A Water Rights Self-Assessment Table should be included in the WSP showing the relationship between the water rights and current and projected water use from the sources.

Additional Systems

Page 2 of the WSP Executive Summary shows Tacoma Water has recently acquired three water systems, Southeast Tacoma Mutual, Hyada Mutual, and Day Island. The water right summary shows some additional water rights for the SE Tacoma wells that were not included in previous WSP's. Apparently, along with the Southeast Tacoma system, Tacoma Water purchased its water rights.

According to revised Chapter 90.03.RCW, if a water system is in compliance with the terms of a water system plan that has been approved by the Department of Health (DOH), the place of use of the water right includes the service area of the water right and the service area approved by DOH. Therefore, no applications for change are needed to change the service areas of the Southeast Tacoma water rights pending approval of this WSP. However, any other changes, such as adding or replacing wells, will require either a Showing of Compliance with RCW 90.44.100, or applications for change.

There is no indication in the WSP that Tacoma Water purchased water rights or wells along with the other two systems. However, Ecology's records show water rights on file for Hyada Mutual and Day Island Yacht Club.

- Since no formal change is required to adjust the place of use on these water rights, it would be helpful if the service area map identifies the locations of the newly purchased water systems.

Surface Water Application

Table 6-3, Surface Water Rights, shows Application 13735 from the Green River. According to Ecology's records, this application was cancelled in 1993.

- Application 13735 should be removed from the water rights for Tacoma Water's system.

New Applications for Change

Ecology's records show that four Applications for Change were recently filed to change industrial water rights to municipal uses. These applications are requesting to change the place of use, purpose of use, and points of withdrawal of Ground Water Certificate Numbers 1449, 1028, 6850, and 2217 to the Tideflats Well #2.

- The final WSP should include these applications as part of the water right assessment.

Please contact me at (360) 407-0290 if you have questions regarding my comments.

Sincerely,

Deb Hunemuller
Water Resources Program

cc: John Ryding, ODW

Pierce County
Public Works and Utilities

Brian J. Ziegler, P.E.
Director
Brian.Ziegler@co.pierce.wa.us

Environmental Services
9850 64th Street West
University Place, Washington 98467-1078
(253) 798-4050 Fax (253) 798-4637

December 6, 2006
U-85631

Susan Clark, Water Resources Planner
Tacoma Public Utilities
PO Box 11007
Tacoma WA 98411-0007

SUBJECT: Draft Comprehensive Water Plan Update, August 2006

Dear Ms. Clark:

As the lead agency in the implementation of the Pierce County Coordinated Water System Plan (CWSP), Pierce County Public Works and Utilities, is responsible for reviewing water system plans for consistency with the CWSP and the Pierce County Comprehensive Plan. I have reviewed the Tacoma Water, Draft Comprehensive Plan Update, dated August, 2006 and offer the following comments:

CHAPTER 2: WATER SYSTEM BACKGROUND

Figure 2-1
I am unable to determine at this time if the retail and wholesale service areas depicted on Figure 2-1of the draft plan are consistent with the Pierce County Water Purveyor Map/CWSP and the Standard Service Agreements on file with the County. Additional work will be required to make this determination and I will follow-up with a letter communicating the results.

CHAPTER 3: POLICIES AND DESIGN CRITERIA

Page 3-5, Table 3-1
Tacoma Water rates for retail and wholesale customers located outside the corporate boundaries of the City of Tacoma are 20% higher than rates for customers inside City limits. The text in the Table states that Tacoma Water maintains utility service reliability and rates such that they are an "inducement" for future annexation. Since a significant portion of the service area is located outside of the city's corporate limit (and Urban Growth Area/Potential Annexation Area), it would be helpful if this chapter contained a discussion of the rational behind a cost differential between customers located inside and outside city limits. A specific water rate policy addressing this differential is not included.

CHAPTER 4: POPULATION & LAND USE

Table 4-3 and Table 4-4
This chapter of the plan contains a considerable amount of discussion regarding historical population and projected growth scenarios. Unfortunately, it is not clear what growth rate has been chosen for purposes of projecting future water demand (Chapter 5). Please indicate which growth rate is being used within the unincorporated portions of Pierce County and how this rate is consistent with the County's growth projections. If using a different growth rate than the County, please provide rationale supporting the chosen rate.

CHAPTER 6: WATER RESOURCES

Page 6-15
The 2000 Tacoma WSP listed Pierce County's Chambers Creek Properties water rights as a potential new groundwater source to meet future demand. However, in Section 6.7 Summary/Recommendations of the Draft update, we noticed that the Pierce County Chambers Creek water resources have been excluded from consideration as a potential future source for Tacoma Water and its customers. The CWSP identifies the County's water resources located at the Chambers Creek Properties as a potential source of supply for Central Pierce County and that the County should take steps toward development of the groundwater resources and enter into discussions with Tacoma and other systems having an interest in the water supply. The CWSP also includes a recommendation that the City of Tacoma, Pierce County and purveyors explore the concept of wheeling water through the Tacoma system and develop a contract for this purpose.

Tacoma Water has previously recognized the importance of the Chambers Creek Properties water resources for the greater Central Pierce County region. This recognition is evident from the discussions that have occurred between Pierce County and Tacoma Water regarding purchase of water and the letter of support provided to the Department of Ecology on behalf of the County concerning our request for a schedule extension to develop the water right.

If Tacoma Water is interested in purchasing water from the County, we recommend that the draft Comprehensive Water System Plan be amended by adding the Chambers Creek Water Resources back into the discussion of potential future sources of water supply. In addition, we recommend that Tacoma Water include a population and demand forecast specifically related to the current and, potential future, Chambers Creek Properties water supply. This information will be necessary for future water rights approval from the Department of Ecology. We also think that the Water System Plan should include policies for wheeling of water to other systems. Whether Tacoma Water purchases water supply directly from the County, or wheels the water to other

Pierce County purveyors, the importance of the resource and Tacoma Water's role in its utilization, is significant.

The County has expended a considerable amount of resources developing the Chambers Creek water supply and is moving forward with capital projects that will enable the County to put the water to full beneficial use. It is hoped that Tacoma Water will continue to be a participant in this process.

Thank you for considering the above comments. Please contact me at (253) 798-6169 with any questions.

Sincerely,

MARY AUSBURN, AICP
Senior Planner – Water Utility

cc: Tim Ramsaur, Wastewater Utility Manager
Richard Rodriguez, DOH
Bard Harp, TPCHD

MA:pc
Cors/U85631-MA

CLEAN, FLOWING WATERS FOR WASHINGTON

The Center for
Environmental Law & Policy

October 19, 2006

Ms. Susan Clark
Tacoma Water
P.O. Box 11007
Tacoma, WA 98411

Re: Tacoma's Comprehensive Water System Update

Dear Ms. Clark:

The Center for Environmental Law & Policy (CELP), a non-profit membership organization, works to defend and develop ecologically and socially responsible water laws and policies. CELP speaks for the overall public interest in the public's water; its mission is to leave a legacy of clean, flowing water for Washington. CELP believes responsible water management will lead to increased protection of threatened and endangered species as well as provide sufficient water for Washington's residents to enjoy recreationally, aesthetically, and for everyday necessity.

CELP appreciates the opportunity to review Tacoma's 2007 Water System Plan Update. Thank you for sharing it with us. CELP applauds any effort a government or municipality undertakes to fulfill its responsibility to protect both the environment and the public through proactive and prospective planning. Therefore, we thank Tacoma for the Plan's implicit acknowledgment that water is a finite resource and that curtailment of water use may ultimately be necessary in the future. We also appreciate your recognition that: 1) Water conservation requires public outreach efforts and other measures such as pricing and billing structures to control demand; and, 2) Water saved via conservation, and water lost as a result of climate change must both be taken into account when calculating future water supply. We especially appreciate that Tacoma has metered all service connections since 1954, and that you intend to continue this important water management practice.

Every resident of the state owns the waters of Washington, and those charged with managing it are given an enormous responsibility. This responsibility is owed not only to present citizens, but to future generations as well. Tacoma has an opportunity in developing its Water System Plan to set a high standard of excellence in resource conservation and to exert great leadership in the area of sustainable water management. We encourage you to do so by displaying in your water planning efforts the strongest possible resource conservation ethic.

Thank you for sharing your draft Water System Plan with us. We look forward to a continuing dialogue and relationship between CELP and Tacoma Water.
Sincerely,

2400 North 45th Street, Suite 101 ξ Seattle WA 98103 ξ 206.223.8454 ξ fax 206.223.8464 ξ www.celp.org

Shirley Waters Nixon
Senior Counsel & Acting Executive Director
snixon@celp.org

Rebecca Berman Phelps
Staff Attorney

Parametrix

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August 23, 2006
PMX No. 216-1992-001

Ms. Susan Clark
Water Resources Planning Coordinator
Tacoma Public Utilities
3628 South 35th Street
Tacoma, WA 98409-3192

Re: Comprehensive Water Plan Update Comments

Dear Ms. Clark:

Thank you for allowing Fruitland Mutual Water Company (FMWC) the opportunity to review the draft Tacoma Water Comprehensive Water Plan Update. We have elected to review only those portions of the Plan that specifically pertain to FMWC as it is our understanding that Pierce County (consistency with county-wide planning issues) and the Washington State Department of Health (regulatory compliance) will review the Plan in more detail.

FMWC has one comment regarding the factual content of the draft Plan.

1. The number of current connections (5,465) identified in Section 2.4.9 is not correct. In 2005, FMWC had a total of 3,508 individual connections. The higher number reflects the total number of units served, which includes multi-tenant customers.

FMWC has two additional clarifications for you to consider regarding Section 2.4.9 when preparing the final version of the Plan.

1. In mid-August, FMWC submitted to DOH a final Water System Plan Update that addressed initial DOH comments. It is likely that the FMWC Plan will receive final DOH acceptance by the time Tacoma Water submits a revised version of its Plan.

2. A draft wholesale water purchase agreement between the Lakewood Water District and FMWC was included in the final Plan submittal to DOH. It is anticipated that the water purchase agreement will be finalized in October/November 2006.

Feel free to contact me with any questions or concerns regarding these comments.

Sincerely,

PARAMETRIX

Matthew DeBoer, P.E.

MD:kb

cc: Audrey Christoff (FMWC)
Dave Roberts (Parametrix)
Project File

Clark, Susan

From: John Bowman [JBowman@lakehaven.org]
Sent: Thursday, October 19, 2006 4:44 PM
To: Clark, Susan
Cc: Don Perry
Subject: Tacoma's Comprehensive Water Plan Update - Agency Review Draft

Susan,
Thanks for allowing Lakehaven to review your draft Comprehensive Water Plan Update.
The plan is very good, we only had a couple of editorial comments listed below.

Editorial comments:
Page 2-10, Table 2-3: Missing LUD's SSP#3 at 356th between LUD and TW. We prefer that address locations of interties and turnouts not be published.

Page 2-16, Sec. 2.4.2: LUD has 24 wells, and our average day demands are about 11.5 mgd.

Thanks again.

John Bowman

TACOMA WATER

3628 S 35th Street
Tacoma, Washington 98409-3192

TACOMA PUBLIC UTILITIES

April 30, 2007

Richard Rodriguez
DOH/NW Drinking Water Operations
20435 72nd Ave. S. Suite 200
Kent WA 98032

Re: Request for Additional Information – Tacoma WSP – Project #06-1208

Dear Mr. Rodriguez:

Thank you very much for your April 23, 2007, comments on the draft Tacoma WSP. As requested, Tacoma Water has attached two (2) copies of the March 2006 Water Availability Study as is referenced on Page 6-14. A response to DOH's additional comments, including a revised WSP, will be forwarded by July 25, 2007.

Should you have any questions, I can be contacted at 253-502-8204.

Sincerely,

Susan Clark
Water Resource Planning Coordinator

SC:nd
Enclosure

cc: Katherine Brooks, Pierce County
Dave Monthie, King County UTRC

TACOMA WATER

3628 South 35th Street

Tacoma, Washington 98409-3192

TACOMA PUBLIC UTILITIES

April 24, 2007

Katherine Brooks
Pierce County Public Works and Utilities
9850 64th Street West
University Place, WA 98467-1078

RE: Tacoma Water Service Area Maps - Tacoma Water Comprehensive Water Plan Update

Dear Ms. Brooks:

At the time of review of the Tacoma Water Comprehensive Water Plan, Agency Review Draft by your predecessor, Mary Ausburn, Pierce County was unable to determine if Tacoma Water's service area was consistent with the service area on record with Pierce County. Thanks to the work of Stefan Kamieniecki, on March 21, 2007, Tacoma Water received a list of four specific areas that were found to be inconsistent with County records. Tacoma Water is in agreement regarding the inconsistencies in three of the four areas and will provide a revised service area map for review by Pierce County in this regard very shortly.

In the case of the area generally defined as "Bonney Lake area approximately from 95th Street East southerly to Highway 410 between 234th Avenue East and the city limits of Buckley", Tacoma Water records indicate Tacoma Water's service area does not cross Highway 410. However, this area is shown as Tacoma Water's service area on the County water service area map. Instead, Tacoma Water records indicate the area in question is within the service area of the Marion Water Company. Currently, Marion Water Company has a draft water system plan undergoing review by the Department of Health. According to "Figure 1-3 Adjacent Purveyors" contained in the December 2006 draft Marion Water Company Water System Plan, the area in question is within Marion Water Company's Pierce County Coordinated Water System Plan service area, but currently contains Marion Water Company water mains. Given Marion Water Company mains exist in this area, it appears to be inconsistent to also label the area as Tacoma Water service area. Tacoma Water will work with the Marion Water Company to see that this area is correctly identified and will inform Pierce County of any needed mapping changes.

Following receipt of our revised service area map, we would appreciate a signed "Consistency Statement" for incorporation into our water system plan. Should you have any questions, please feel free to contact me at 253-502-8204.

Sincerely,

Susan Clark
Water Resource Planning Coordinator

SC:nd
cc: Richard Rodriguez, DOH

TACOMA WATER

3628 South 35th Street

Tacoma, Washington 98409-3192

TACOMA PUBLIC UTILITIES

December 18, 2006

Mary Ausburn
Pierce County Public Works and Utilities
9850 64th Street West
University Place WA 98467-1078

Subject: Pierce County's review of the Tacoma Water Comprehensive Water Plan Update, Agency Review Draft, August 2006

Dear Ms. Ausburn:

Thank you very much for your comments. On December 6, 2006, Tacoma Water submitted the Agency Review Draft and a December 4, 2006 Errata Sheet (Response to Comments Received on the Tacoma Water Comprehensive Water Plan Update, Agency Review Draft, August 2006, Volume I and II) to the Washington State Department of Health for review and approval. Revisions Tacoma Water included in the December 4, 2006 Errata Sheet which address several of Pierce County's comments are noted in the attached *Tacoma Water Response to Pierce County's December 6, 2006 Comments* and have been included as a separate attachment. The December 4, 2006 Errata Sheet was provided to Pierce County under separate cover.

Should you have any questions regarding Tacoma Water's response to Pierce County's comments, please feel free to contact me at 502 8204.

Sincerely,

Susan Clark
Water Resource Planning Coordinator

Enclosure

cc: Richard Rodriguez, DOH

TACOMA WATER RESPONSE TO PIERCE COUNTY'S DECEMBER 6, 2006 COMMENTS

Tacoma Water's General Response:

The Municipal Water Law of 2003 requires water systems to document consistency with local land use plans for areas to which retail water service is provided. Tacoma Water's request for comments on the Agency Review Draft included a "Consistency Statement" as developed by the Washington State Department of Health. This requirement is not referenced in your review letter. In order to address this requirement with the Washington State Department of Health, Tacoma Water needs to understand Pierce County's position on signing a consistency statement.

Tacoma Water's Specific Response:

Figure 2-1

Comment: "...unable to determine at this time if the retail and wholesale service areas depicted on Figure 2-1 of the draft plan are consistent with the Pierce County Water Purveyor Map/CWSP and the Standard Service Agreements on file with the County."

Tacoma Water's Response: Tacoma Water's retail water service area map was derived based upon the County's GIS information and should, therefore, be consistent with County records. The Pierce County CWSP does not establish wholesale service areas for utilities operating within Pierce County; therefore, Tacoma Water's wholesale water service area is not "on record" with Pierce County. As Pierce County investigates the Tacoma Water retail water service area, Tacoma Water would be happy to assist as may be necessary.

Page 3-5, Table 3-1

Comment: "...it would be helpful if this chapter contained a discussion of the rational behind a cost differential between customers located inside and outside city limits."

Tacoma Water's Response: Chapter 12 currently contains an explanation of Tacoma Water's rationale behind a cost differential between customers located inside and outside city limits, regardless of location inside or outside the City of Tacoma's urban growth area. Specifically, page 12-5 states: "The Tacoma Water rate structure also incorporates a 20 percent differential for all charges to customers located outside the city versus inside the city. This outside of city differential is designed to collect the additional costs of business associated with such factors as longer distance to service customers, additional costs for franchise fees and fire protection. Fee differentials of this type have been recognized and provided for in state statutes."

Comment: "A specific water rate policy addressing this differential is not included."

Tacoma Water's Response: Although summarized in table 3-1, rather than quoted verbatim, the City of Tacoma Comprehensive Plan, Utilities Element Policy U-GD-2 states: "Continue to maintain utility construction and service rates as an inducement for future annexation." Policy U-GD-2 is a City of Tacoma general rate policy which applies to all City-owned utilities, not just to Tacoma Water. Tacoma Water's specific water rate policy, supported by the general Comprehensive Plan Policy U-GD-2 and addressing an in city vs. outside city cost differential, is included in table 3-1. Tacoma Water, Water Rate Policy C.8 states: "Rates for retail and wholesale customers located outside the corporate boundaries of the City of Tacoma will be 20 percent higher than rates for inside City limits." This wording is currently contained in table 3-1.

Chapter 4: Population and Land Use

Comment: "Please indicate which growth rate is being used within the unincorporated portions of Pierce County and how this rate is consistent with the County's growth projections. If using a different growth rate than the County, please provide rationale supporting the chosen rate."

Tacoma Water's Response: Tacoma Water's future water demands are predicted from forecasts of the number of future accounts by customer class (single-family residential, multi-family residential, commercial, industrial etc.) and are, therefore, based upon forecasts of growth in (single-family and multi-family) households (and employment for other customer classes) rather than predicted from population growth rates "by themselves". Two sets of growth assumptions were used to forecast growth in future accounts: 2002 Puget Sound Regional Council (PSRC) small area forecasts and Tacoma Water's historical customer growth adjusted for regional trends. The two sets of growth assumptions led to the development of two separate demand forecasts: The "expected growth" demand scenario (Tacoma Water's historical growth adjusted for regional trends) and the "high growth" demand scenario (PSRC's forecast of growth).

Table 4-4 on page 4-6 contains the annual population growth rates for inside city and outside city used in the "high growth" demand scenario. According to Pierce County Code 19A.20.100, the County's municipal allocation and unincorporated UGA allocation average annual growth rate for the years 2002-2022 – a 20-year time period - is 1.6 percent. Tacoma Water's "high growth" demand scenario outside city 30-year average population growth rate is 1.24 percent. However, because the Tacoma Water demand forecast is based upon increases in customer accounts it is also important to note the outside city 30-year average growth rate in number of households of 1.42 percent. (It is also important to note that a direct comparison to Pierce County's growth rate as contained in Pierce County Code 19A.20.100 is complicated by the fact that the Tacoma Water service area "outside city" includes areas within municipal boundaries, within the County's comprehensive urban growth area, within Pierce County's "rural" area and within King County.)

Because Tacoma Water found that the PSRC forecasts for outside city customers were significantly below those observed by Tacoma Water for the past ten years, Tacoma Water developed the following assumptions for the "expected growth" demand scenario outside city customer growth:

- Historical growth rates were used for years 2003-2010;
- A transition from 2010 to 2020 to gradually achieve a 50/50 mix of outside and inside city growth rate;
- For years 2020 to 2040 the historical growth rates were adjusted by proportional reduction in PSCR forecasts to account for long-term trends assumed by PSRC.

(Note: The PSRC forecasts for inside-city customers exceeded recent historical growth rates; different assumptions than those listed above were used for the inside-city customers "expected growth" demand scenario.)

In summary, Tacoma Water has not used Pierce County's 2002-2022 average annual growth rate of 1.6 percent (municipal allocation and unincorporated UGA allocation), 0.5 percent (rural allocation) or 1.2 percent (County total) for projecting water demands. Instead, Tacoma Water's demands are based upon growth in customer accounts (as opposed to growth in population) which were derived from two growth assumptions: 2002 PSRC small area forecasts and Tacoma Water's historical customer growth adjusted for regional trends. PSRC small area forecasts are developed in partnership with Pierce County and the municipalities within Pierce County and are, therefore, an acceptable source of small area forecasts. Pierce County does not develop small area population, household or employment forecasts needed to develop water demand forecasts for areas smaller than "unincorporated UGA" or "rural". Taken individually, small area forecasts may not reflect the exact population growth rate "allocated" to larger geographical areas of Pierce County. As noted in the Agency Review Draft, Tacoma Water will continue the practice of monitoring actual demands versus forecasted demands and will make adjustments, including preparing new demand forecasts, as may be needed.

Chapter 6 – Water Resources

Page 6-15 Comment: "However, in Section 6.7 Summary/Recommendations of the Draft update, we noticed that the Pierce County Chambers Creek water resources have been excluded from consideration as a potential future source for Tacoma Water and its customers." "If Tacoma Water is interested in purchasing water from the County, we recommend that the draft Comprehensive Water System Plan be amended by adding the Chambers Creek Water Resources back into the discussion of potential future sources of water supply."

Tacoma Water's Response: Tacoma Water has been supportive of Pierce County's activities to develop the Chambers Creek Properties water resources by providing letters of support when requested and participating in discussions regarding purchase of water. Tacoma Water is committed to continuing discussions with Pierce County to determine how Tacoma Water and Pierce County could jointly pursue the development of the

Chambers Creek Properties water resources for ultimate use by existing and future Tacoma Water retail or wholesale customers. Section 6.7.2 will be revised to add a discussion of Chambers Creek Properties water resources as attached.

Comment: "In addition, we recommend that Tacoma Water include a population and demand forecast specifically related to the current and potential future, Chambers Creek Properties water supply. This information will be necessary for future water rights approval from the Department of Ecology."

Tacoma Water's Response: Tacoma Water's existing 2003 water demand forecast and 2006 water availability study justify the importance of the County's existing municipal water rights to providing water service within Tacoma Water's regional water service area. The 2003 Tacoma Water Demand Forecast forecasts retail and contracted wholesale customer demand in the Tacoma Water existing service area under two growth scenarios. The Tacoma Water 2006 Water Availability Study compares demand, including the Cascade Water Alliance wholesale commitment not included in the 2003 demand forecast, to identified water available to serve demand from Tacoma Water's existing sources. The 2006 water availability study indicates that under the PSRC growth projections (the high growth scenario), Tacoma Water will experience shortfalls in 2025 and 2030. This indicates the importance to Tacoma Water of obtaining additional resources since the utility is unable to meet future wholesale customer needs without acquiring additional resources.

Currently, the Central Puget Sound Water Supplier's Forum is developing a multi-county water demand forecast through a multi-stakeholder planning process. Tacoma Water encourages Pierce County to be an active participant in the Forum's current work to ensure Pierce County's needs for a regional water demand forecast are met. Due to the inclusive nature of the Forum's multi-stakeholder process, the resulting regional water demand forecast is more likely to be supported by stakeholders than would a regional water demand forecast prepared by one utility. Alternatively, the Pierce County CWSP contains a 1999 County-wide water demand forecast that could be updated, under the guidance of Pierce County and with the participation of members of the Pierce County Water Utilities Coordinating Committee which includes Tacoma Water.

Comment: "We also think that the Water System Plan should include policies for wheeling of water to other systems. Whether Tacoma Water purchases water supply directly from the County, or wheels the water to other Pierce County purveyors, the importance of the resource and Tacoma Water's role in its utilization, is significant."

Tacoma Water's Response: Currently Tacoma Water does not wheel water. In the event Tacoma Water is requested to wheel water through its water system, Tacoma Water will negotiate a case-specific agreement with the applicable water system(s). Table 3-1 will be revised as attached. Currently, Tacoma Water is negotiating a wheeling agreement with Firgrove Mutual. It is envisioned that the resulting agreement with Firgrove Mutual will serve as a model for other wheeling agreements as may be needed in the future.

Table 3-1
DOH Service Area Policies

DOH POLICY NAME	POLICY DESCRIPTION	TACOMA WATER POLICY	SOURCE
WHOLESALING OF WATER	Conditions which must be met to obtain a wholesale agreement, including the conditions of service for wholesaling water.	Wholesale service may be made available to all water purveyors operating in compliance with DOH regulations and in accordance to resource availability. Wholesale service is subject to the City's conservation and curtailment plan and system development charge. Wholesale customers may elect to take service under a short-term contract or with firm long-term supply assurance.	Customer Service Policy 15 Tacoma Municipal Code 12.10.400.F
WHEELING OF WATER	Conditions met for water to another system, i.e., compatible water quality, engineering, etc.	Tacoma Water does not wheel water through its water system at this time. In the event Tacoma Water is requested to wheel water through its water system, Tacoma Water will negotiate a case-specific wheeling agreement with the applicable water system(s).	n/a
ANNEXATION POLICY	How city annexation relates to the provision of water service.	Availability of service within the established annexation area and the Division's service area will depend on a potential customer's willingness to sign a petition agreeing to support future annexation.	Customer Service Policy 5.
DIRECT CONNECTION AND REMOTE SYSTEM POLICY	New developments directly connect to existing water system, or whether satellite systems will be allowed.	Tacoma Water is approved to provide SMA direct service within its retail service area. In general, Tacoma Water will require extension of water mains to any proposed development. For any proposed residential development under 20 lots in size, and where the shortest route from the proposed development and connection to the water system is greater than 1,000 feet, Tacoma Water will consider other options to serve including main extension or SMA operation until main extension occurs.	Satellite System Management Plan

6.7 Summary / Recommendations

6.7.1 Summary

Under the Tacoma Water Expected Growth Demand scenario, including additional demands associated with the Cascade Water Alliance, the March 2006 Water Availability Study projects a surplus of available water through the year 2030. However, should a higher level of demand occur as projected in the PSRC demand scenario, the water availability study projects demands will not be met in years 2025 and 2030. It is important to note that under both water demand scenarios, the underlying water model used in the water availability study incorporates well development at the South Tacoma Wellfield as an "existing" supply source available to meet demands.

Given the assumed use of additional water resources at the South Tacoma Wellfield to meet future demands, the following project is recommended for implementation:

South Tacoma Aquifer Additional Wells

The South Tacoma Wellfield currently contains 13 production wells, drawing water from three aquifers. The wells have water rights totaling 78 MGD, with nominal installed capacity of 66 MGD and an approximate sustained rate of 48 MGD. Tacoma Water believes the aquifer could sustain an additional withdrawal of 29 MGD in the summer months.

6.7.2 Additional Recommendations

It is becoming increasingly difficult to obtain new water rights. As a result, water purveyors are finding it necessary to find alternatives to new water rights in order to provide for increases in system demands. As a regional water system, Tacoma Water must be able to response to new requests for wholesale service. While the March 2006 Water Availability Study does take into account Tacoma Water's current contract commitments, the Water Availability Study does not account for increases in wholesale demands outside existing contracts. Under the Expected Growth Demand scenario, it is projected that an additional 2.2 MGD of supply will be available in 2025 and an additional 4.1 MGD of supply will be available in 2030. No additional supplies are available in 2025 or 2030 under the High Growth Demand scenario. It will be important for Tacoma Water to continue the practice of updating water demand forecasts and participating in regional water planning processes in order to ensure the ability to provide for new requests for wholesale service as such requests may occur in the future.

Tideflats Area

The addition of new wells and related facilities in the Tideflats area, consistent with existing water rights, should be implemented by Tacoma Water in the future as may be needed to meet new demands as follows:

Tacoma Water currently has two wells within the Tideflats area. Tideflats Well No. 1 was installed in 1927 and produces approximately 1.0 MGD. A second well has been developed, with a capacity of 1,250 gpm, but has not been tied into the water system. Based on a 1995 study, it is estimated that the aquifer below the Tideflats area is capable of producing an additional 5.0 MGD. Facilities to procure the additional water would include two wells and transmission piping to convey the water to Tacoma Water's distribution system in the Tideflats industrial area.

Cooperative Projects

Tacoma Water and the Lakehaven Utility District are currently partners in the Second Supply Project. As the Lakehaven Utility District pursues its OASIS project, Tacoma Water should continue to evaluate/consider how further partnering with the District could assist Tacoma to meet its long term water demand needs.

Currently, Tacoma Water is a participant in regional water supply planning activities through the Central Puget Sound Water Forum and other such venues. As the Cascade Water Alliance pursues necessary planning activities associated with the use of Lake Tapps, Tacoma Water should continue participation in such joint planning activities in an effort to determine how the Lake Tapps source could be incorporated into Tacoma Water future needs.

Reuse

At this time no reclaimed water is available within the Tacoma Water service area for off-setting the use of potable water sources. Tacoma Water will continue to monitor reclaimed water projects and/or reclaimed water planning activities of local wastewater facilities, such as those described above, and will participate in planning activities as they may occur in the future.

Conservation

Since the 1980s, Tacoma Water has been committed to an effective conservation plan as an element of their overall water resource plan. Tacoma Water will continue to be a leader in water conservation activities, including implementing the Water Conservation Program as contained in this Plan.

Acquisition of Available Water Rights

As water rights may become available for purchase, it is recommended that Tacoma Water pursue such opportunities provided that it is determined such an acquisition is consistent with Tacoma Water business practices.

Chambers Creek Properties Water Resources

As previously identified, the 2000 Tacoma Water Comprehensive Water System Plan listed Pierce County's Chambers Creek Properties water rights as a potential new groundwater source for Tacoma Water at an undefined period in the future. Since the 2000 WSP was developed, Pierce County successfully transferred approximately 2.5 MGD of industrial water rights to municipal water rights and has applied to Ecology for additional groundwater rights, consistent with what was formerly "on-paper". Tacoma Water has been supportive of Pierce County's activities to develop the Chambers Creek Properties water resources by providing letters of support when requested and participating in discussions with Pierce County regarding purchase of water. Tacoma Water should continue discussions with Pierce County to determine how Tacoma Water and Pierce County could jointly pursue the development of the Chambers Creek Properties water resources for ultimate use by existing and future Tacoma Water retail or wholesale customers.

APPENDIX E

CONSISTENCY STATEMENT

Attachment 5: Water System Plan and Small Water System Management Program Consistency Statement Checklist

This checklist is intended to ensure consistency of water system planning documents with adopted local comprehensive plans and development regulations. Each local planning jurisdiction in which the water utility provides service will review the relevant water system planning information and provide a signed consistency statement to the utility for submittal to the Department of Health. If the local planning agency will not respond, the highest authority within the utility (chair of governing body, executive director of private companies, etc.) must sign to verify consistency of the plan information.

Water System Name: Tacoma Water PWS ID: _____

Planning Document Title: Comprehensive WSP Update Plan Date: Aug 2006

Local Planning Jurisdiction: City of University Place

Consistency Statement (Reference Municipal Water Law Section 5 and 8, amendment to chapter 90.03.386 and chapter 43.20 RCW)	**Page(s) in Planning Document (completed by utility)**	**Yes – No – Not Applicable**
The retail service area, and any other areas not served by a separate public water system, and land use identified in the WSP is consistent with the *adopted comprehensive plan and adopted development regulations and policies.*		
For WSPs only: The growth projection used to forecast water demand for the retail service area is consistent with the adopted city/county's population growth projections (and commercial development projection if applicable). If a different growth projection was used, the alternative growth projection and methodology proposed is acceptable based on explanation given.		
For WSPs only: New potential large water users (that may have a significant impact on the water system) that the city/county is aware of have been identified in the WSP.		
For city-owned systems only: All policies regarding water service outside the corporate boundaries are included in this WSP. These policies are consistent with the adopted *comprehensive plan* and *development regulations.*		
Where the local planning agency is unable to sign a Consistency Statement: Provide documentation of efforts to coordinate with local agencies with a 60-day timeline for local agency to respond. Include: name of contact, date, type of effort attempted, and response from local agency.		

I certify that the above statements are true to the best of my knowledge and that these statements support the conclusion that the subject-planning document is consistent with adopted comprehensive plans, development regulations, and other policies.

D. Swindale 12/1/06

Signature Date

David Swindale, Dev. Svs. Dir. City of U.P.

Printed Name, Title, & Jurisdiction

****For any issues of inconsistency, please provide comments on how they can be resolved. ****

Attachment 5: Water System Plan and Small Water System Management Program Consistency Statement Checklist

This checklist is intended to ensure consistency of water system planning documents with adopted local comprehensive plans and development regulations. Each local planning jurisdiction in which the water utility provides service will review the relevant water system planning information and provide a signed consistency statement to the utility for submittal to the Department of Health. If the local planning agency will not respond, the highest authority within the utility (chair of governing body, executive director of private companies, etc.) must sign to verify consistency of the plan information.

Water System Name: Tacoma Water PWS ID: _____

Planning Document Title: Comprehensive WSP Update Plan Date: Aug 2006

Local Planning Jurisdiction: City of Tacoma

Consistency Statement (Reference Municipal Water Law Section 5 and 8, amendment to chapter 90.03.386 and chapter 43.20 RCW)	**Page(s) in Planning Document (completed by utility)**	**Yes – No – Not Applicable**
The retail service area, and any other areas not served by a separate public water system, and land use identified in the WSP is consistent with the *adopted comprehensive plan and adopted development regulations and policies.*	2.13	Yes
For WSPs only: The growth projection used to forecast water demand for the retail service area is consistent with the adopted city/county's population growth projections (and commercial development projection if applicable). If a different growth projection was used, the alternative growth projection and methodology proposed is acceptable based on explanation given.	4.1	Yes
For WSPs only: New potential large water users (that may have a significant impact on the water system) that the city/county is aware of have been identified in the WSP.	5.5	Yes
For city-owned systems only: All policies regarding water service outside the corporate boundaries are included in this WSP. These policies are consistent with the adopted *comprehensive plan* and *development regulations.*	3.1	Yes
Where the local planning agency is unable to sign a Consistency Statement: Provide documentation of efforts to coordinate with local agencies with a 60-day timeline for local agency to respond. Include: name of contact, date, type of effort attempted, and response from local agency.		

I certify that the above statements are true to the best of my knowledge and that these statements support the conclusion that the subject-planning document is consistent with adopted comprehensive plans, development regulations, and other policies.

[signature] 10/23/06

Signature Date

Planning Manager, City of Tacoma

Printed Name, Title, & Jurisdiction

****For any issues of inconsistency, please provide comments on how they can be resolved. ****

Attachment 5: Water System Plan and Small Water System Management Program Consistency Statement Checklist

This checklist is intended to ensure consistency of water system planning documents with adopted local comprehensive plans and development regulations. Each local planning jurisdiction in which the water utility provides service will review the relevant water system planning information and provide a signed consistency statement to the utility for submittal to the Department of Health. If the local planning agency will not respond, the highest authority within the utility (chair of governing body, executive director of private companies, etc.) must sign to verify consistency of the plan information.

Water System Name: Tacoma Water PWS ID: _____

Planning Document Title: Comprehensive WSP Update Plan Date: Aug 2006

Local Planning Jurisdiction: Fircrest

Consistency Statement (Reference Municipal Water Law Section 5 and 8, amendment to chapter 90.03.386 and chapter 43.20 RCW)	**Page(s) in Planning Document (completed by utility)**	**Yes – No – Not Applicable**
The retail service area, and any other areas not served by a separate public water system, and land use identified in the WSP is consistent with the *adopted comprehensive plan and adopted development regulations and policies.*		yes
For WSPs only: The growth projection used to forecast water demand for the retail service area is consistent with the adopted city/county's population growth projections (and commercial development projection if applicable). If a different growth projection was used, the alternative growth projection and methodology proposed is acceptable based on explanation given.		yes
For WSPs only: New potential large water users (that may have a significant impact on the water system) that the city/county is aware of have been identified in the WSP.		yes
For city-owned systems only: All policies regarding water service outside the corporate boundaries are included in this WSP. These policies are consistent with the adopted *comprehensive plan* and *development regulations.*		yes
Where the local planning agency is unable to sign a Consistency Statement: Provide documentation of efforts to coordinate with local agencies with a 60-day timeline for local agency to respond. Include: name of contact, date, type of effort attempted, and response from local agency.		yes

I certify that the above statements are true to the best of my knowledge and that these statements support the conclusion that the subject-planning document is consistent with adopted comprehensive plans, development regulations, and other policies.

Mark A. Burlingame 9/8/06

Signature Date

Mark A. Burlingame, Public Works Director – Fircrest

Printed Name, Title, & Jurisdiction

****For any issues of inconsistency, please provide comments on how they can be resolved. ****

Attachment 5: Water System Plan and Small Water System Management Program Consistency Statement Checklist

This checklist is intended to ensure consistency of water system planning documents with adopted local comprehensive plans and development regulations. Each local planning jurisdiction in which the water utility provides service will review the relevant water system planning information and provide a signed consistency statement to the utility for submittal to the Department of Health. If the local planning agency will not respond, the highest authority within the utility (chair of governing body, executive director of private companies, etc.) must sign to verify consistency of the plan information.

Water System Name: TACOMA WATER PWS ID: _____

Planning Document Title: Comprehensive WSP Update Plan Date: Aug 2006

Local Planning Jurisdiction: City of Puyallup

Consistency Statement (Reference Municipal Water Law Section 5 and 8, amendment to chapter 90.03.386 and chapter 43.20 RCW)	Page(s) in Planning Document (completed by utility)	Yes – No – Not Applicable
The retail service area, and any other areas not served by a separate public water system, and land use identified in the WSP is consistent with the *adopted comprehensive plan and adopted development regulations and policies.*		Y
For WSPs only: The growth projection used to forecast water demand for the retail service area is consistent with the adopted city/county's population growth projections (and commercial development projection if applicable). If a different growth projection was used, the alternative growth projection and methodology proposed is acceptable based on explanation given.		Y
For WSPs only: New potential large water users (that may have a significant impact on the water system) that the city/county is aware of have been identified in the WSP.		Y
For city-owned systems only: All policies regarding water service outside the corporate boundaries are included in this WSP. These policies are consistent with the adopted *comprehensive plan* and *development regulations.*		Y
Where the local planning agency is unable to sign a Consistency Statement: Provide documentation of efforts to coordinate with local agencies with a 60-day timeline for local agency to respond. Include: name of contact, date, type of effort attempted, and response from local agency.		NA

I certify that the above statements are true to the best of my knowledge and that these statements support the conclusion that the subject-planning document is consistent with adopted comprehensive plans, development regulations, and other policies.

_____ 9-6-06

Signature Date

DOUG MACLEAN WATER DIV. SPVR City of Puyallup

Printed Name, Title, & Jurisdiction

****For any issues of inconsistency, please provide comments on how they can be resolved. ****

APPENDIX F

WATER SERVICE AREA AGREEMENTS

APPENDIX F

WATER SERVICE AREA AGREEMENTS

Although not a requirement of the Pierce County Coordinated Water System Plan, Tacoma Water has entered into Service Area Agreements (supplemental to the coordinated water system plan boundary agreement) with its adjacent systems as follows:

- City of Bonney Lake dated March 10, 1998
- City of Buckley dated May 29, 1998
- Curran Road Mutual dated July 23, 1998
- City of Fircrest dated April 23, 1991
- Firgrove Mutual dated March 1998 (amendment of May 3, 1991 agreement)
- Fruitland Mutual dated December 15, 1997
- Marion Water Company dated April 2004 (amendment of April 2003 agreement)
- City of Milton dated August 1, 1994
- Parkland Light and Water dated December 30, 1997
- City of Puyallup dated November 1997 (amendment of April 18, 1988 agreement)
- Rainier View Water Company dated May 29, 1998
- Spanaway Water Company dated February 20, 1998
- Summit Water and Supply Company dated November 25, 1997

Additionally, Tacoma Water has used the Pierce County Coordinated Water System Plan Service Area Agreement process to identify its service area as follows:

- Boundary revision to incorporate former SE Tacoma Mutual service area into Tacoma Water retail service area – November 5, 2001
- Mutual boundary with the Town of South Prairie Agreement dated November 9, 1998

APPENDIX G

APPLICABLE REGULATIONS AND GUIDELINES

APPENDIX G

APPLICABLE REGULATIONS AND GUIDELINES

The following is a summary of the regulations that affect the City's operations of its water system.

- Pierce County Coordinated Water System Plan (CWSP), 2001
- South King County Coordinated Water System Plan, (CWSP), 1989
- State Wellhead Protection Program
- WAC 246-290, Washington State DOH, Drinking Water Regulations
- WAC 246-490, Washington State DOH, Cross-Connection Control
- Uniform Fire Code
- Uniform Plumbing Code
- City of Tacoma Ordinances and Codes
- Jurisdictional Ordinances and Regulations

APPENDIX H

PAST CONSERVATION ACCOMPLISHMENTS

APPENDIX H

PAST CONSERVATION ACCOMPLISHMENTS

1987	• Drought leads to mandatory outdoor watering restrictions. • Began working with Simpson Tacoma Kraft, resulting in usage reduced by nearly a third (30 MGD to 21 MGD from 1990-1999, or 9 MGD savings).
1989	• Helped Metro Parks Tacoma install latest central irrigation system technology at 20 parks. Resulted in savings of 30 percent at one park, and reduced maintenance costs. Expanded project in 1999 with similar changes at eight Public Utilities and Metro Parks Tacoma sites.
1991	• Developed water conservation plan. • Supported 1991 Washington State plumbing code changes, which conformed to 1992 Federal EPA act changes (1.6 gallon per flush toilets, 2.5 gallon per minute showerheads). Code changes alone estimated to have saved more than 1.1 million gallons per day (MGD). • Commission water reuse and reclamation studies for industrial customer(s). No measures cost-effective yet.
1992	• Revised residential and wholesale rate structure to include 25 percent higher summer rate. Eliminated declining block rate for commercial, industrial, parks, and irrigation customers. • Amended contract with Simpson Tacoma Kraft to encourage water use reduction without financial penalties. • Drought leads to water use restrictions and rate surcharge. Hired water conservation specialist.
1993	• Watt & Water program – showerhead and faucet aerator installations, plus toilet retrofit kits. 90 percent retention after six months, with estimated savings of 0.24 MGD.
1994	• Commission more water reuse and reclamation studies for industrial customers(s). None cost-effective yet. • Three industrial customers (Atlas Foundry, Pabco Roofing, PW Pipe) begin recirculating cooling water, resulting in 75 percent-97 percent savings. • Outdoor water use reduction campaign through mass media (bill enclosures, advertising, etc.) and personal contact (water conservation seminars for homeowners and landscape professionals).
1995	• Provided City of Tacoma and Pierce County with information about landscape policies for water conservation.

1996	• Continued normal program offerings
1997	• Conservation program assessment performed by CH2M Hill. Recommends program budget of $1.04 million. Recommended program elements include: o Indoor Water Audit Program would target ten of top 25 industrial water users, and 125 public buildings using over 1000 CCF/year. o Commercial/Institutional Low-flow Showerhead Program would distribute 10,000 showerheads to hotels, assisted living residences, schools, health clubs, and hospitals through direct contact and trade allies. Also provide showerheads to Indoor Water Audit and Toilet Rebate program participants. o Toilet Rebate Program would provide up to 1,000 rebates ($80, $200) to C/I customers with indoor usage greater than 1,000 CCF/year. o Landscape Rebate Program for outdoor water use in nearly all customer classes. Rebates from $50/sq. ft. for homes to $330/acre for commercial/public facilities for irrigation controls, audits, landscaping materials. Up to 50 visits to key sites. • More water reuse and reclamation studies for industrial customers(s). None cost-effective yet. • WashWise provides rebates for 400 efficient washing machines. Collaboration with other utilities through the Northwest Energy Efficiency Alliance.
1998	• Implemented 1997 CPA Landscape recommendation - Began customer survey of average and high user groups to determine differences in how groups care for lawns. Survey information used to develop appropriate information for varied residential groups. High water-use residential customers were notified of consumption patterns.
1999	• Implemented 1997 CPA ICI recommendation – Large industrial audit program for six biggest users (Pioneer Chlor-Alkali, US Oil, G-P Gypsum, Continental Lime, Nalleys and Tacoma Public Works incinerator). Audits provide information for tailoring attractive water savings options for businesses. Estimated savings potential is 1.14 MGD pending customer implementation. Several of these businesses subsequently ceased operations. • Sponsored Tacoma Public Library's Summer Reading Program.

2000	• 30-second video public service announcement citing "*Water is Too Precious to Waste*." The PSA was aired free 450 times on Click! stations. Another 6 minute video section was aired on *CityScape* via Tacoma's TV 12 in September, highlighting *"...Fall Yard Work Tips that Save $$ & Water"*. • Two *CityLine* appearances. Topics covered general water conservation, and the Fall Native plant sale at the Nature Center. • Placed a full-page advertisement in the Tacoma News Tribune featuring a nurse with a by-line that read, *"Your Prescription for a Long Hot Summer."* The ad ran eight times during the peak water use season (June, July and August.)
2001	• Inter-industrial recycle/reuse evaluation from 2000 Industrial Audit. Looked at combining waste water between Tide Flats industries to reuse. Preliminary estimates of $8.44 million with $73,500 O&M costs to save 1.1 MGD. (Several businesses which were the source of the reuse water have subsequently ceased operations.) • Implementation of 1997 CPA landscape recommendations – residential high-use customers were notified of conservation patterns and offered soil probes and rain gauges.
2002	• Coordinated with Tacoma Power to host pilot clothes washer rebate program. Provided 145 of the 319 TPU rebates. • Implemented 1997 CPA recommendation - Audits for second-tier large water users, including Tacoma/Pierce County Jail (pre-construction), Pt. Defiance Park, Tacoma General Hospital, St. Joseph's Hospital, two elementary schools, and the Tacoma Lutheran Home. Estimated water savings potential is 0.14 MGD pending customer implementation.
2003	• Continued with Tacoma Power to provide a clothes washer rebate program. Provided 217 of the 682 TPU rebates. • Sent conservation reminder letter to 2,125 residential high-use customers.
2004	• Continued with Tacoma Power to provide a clothes washer rebate program. Provided share of 349 TPU rebates. Over the three years Tacoma Public Utilities issued 1350 rebates. • Distributed 5,000 native plant posters and 1,500 books, which were very popular with customers. • Reprinted conservation literature, updated website, distribute and mail info. Conservation support for wholesalers. Various youth education events and public information campaigns. • Participated in regional public awareness radio campaign (Water Use It Wisely).

2005	• Provided consultation and $55,000 in funding for four new Tacoma Police substations that were designed with “Resource-Efficient Demonstration Gardens”. • Produced and distributed a second round of 5,000 native plants posters along with over 1,000 books on native plants to customers and Master Gardeners.
Ongoing	• Conservation messages conveyed to customers via utility bill enclosures, advertising campaigns, newspaper articles, community TV, brochures, booths at fairs and community events, speaking to community groups and water efficiency seminars. • Conservation support for wholesalers. • Classroom programs and teacher training on water conservation, various youth education events and public information campaigns. Supply rain gauges, soil probes, and literature at these events. • Supply faucet aerators and showerheads to customers.

APPENDIX I

REFERENCES

APPENDIX I

REFERENCES

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APPENDIX J

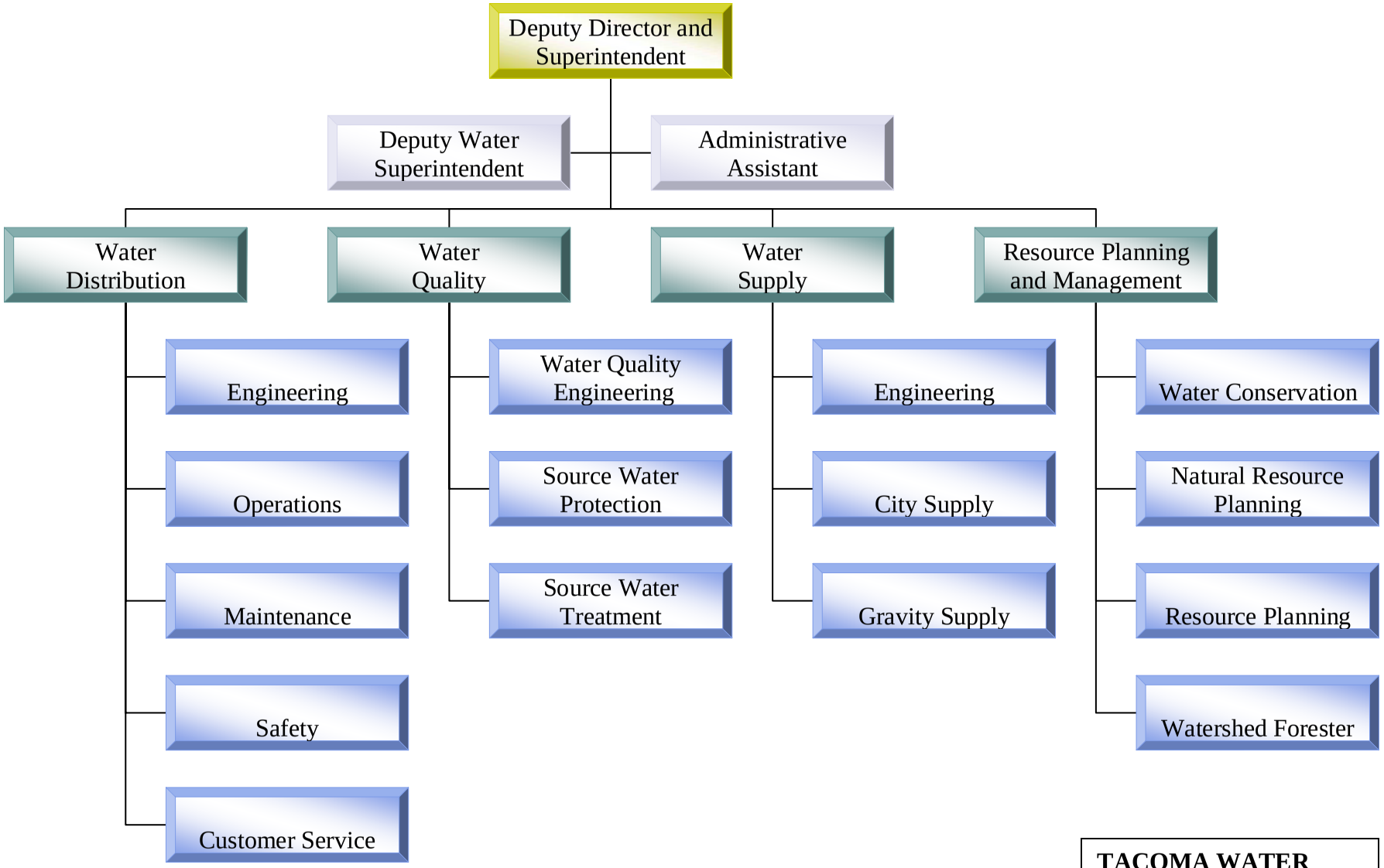
LAND USE MAPS

8½x11
color

10 pages

APPENDIX K

TACOMA WATER ORGANIZATION CHART


Deputy Director and Superintendent
Deputy Water Superintendent
Administrative Assistant
Water Distribution
Water Quality
Water Supply
Resource Planning and Management
Engineering
Operations
Maintenance
Safety
Customer Service
Water Quality Engineering
Source Water Protection
Source Water Treatment
Engineering
City Supply
Gravity Supply
Water Conservation
Natural Resource Planning
Resource Planning
Watershed Forester
TACOMA WATER
July 2006

APPENDIX L

TACOMA WATER SERVICE REQUEST PROCESS

APPENDIX L

TACOMA WATER SERVICE REQUEST PROCESS

Overview

New service requests fall into the following categories:

- Service Outside Tacoma's Retail Service Area
- Service Within Tacoma's Retail Service Area
- Wholesale Service
- Emergency Service
- Satellite System Management

The process for responding to these requests is detailed below. Tacoma Water's retail service area is shown in Figure 2-1. Retail water service is provided in both Pierce and King counties and in several incorporated cities, including Tacoma, University Place and Ruston to which Tacoma Water is the sole provider of water. Since much of the Tacoma Water service area is developed, main extensions to serve new developments typically do not have many, if any, off-site mains required to be constructed. Some large tracts of undeveloped land within the service area do exist, particularly in the eastern extents of the service area. In such circumstances, extensive water facilities will be required to provide service.

Tacoma Water's distribution system is constructed by the owners of properties benefited by the provision of water service. This is accomplished through Private Contracts, Water Main Charges and Local Improvement District assessments. Once the mains are constructed, maintenance and eventual replacements are funded through rates.

In accordance with the requirements of the Growth Management Act, a building permit cannot be issued until water is available to serve the proposed development. Water availability for all growth and development in the City of Tacoma is guaranteed. A "Certificate of Water Availability" is issued by Tacoma Water for development occurring outside Tacoma city limits and within its service area if there is sufficient water supply to meet the domestic water service and fire flow requirements of the applicant's proposed project. Tacoma Water tracks such commitments for water service to assure capacity is available prior to development occurring.

Service Outside Tacoma's Retail Service Area

A request for water service outside Tacoma Water's service area is first referred to the purveyor designated to serve the area as established by the Pierce County Coordinated Water System Plan. Should the designated purveyor relinquish the area, Tacoma Water will consider serving the area. In the event that the Tacoma Public Utility Board and Tacoma City Council support taking on the area, the service request would then proceed as described below for requests within Tacoma Water's retail service area.

If the subject area is not adjacent to Tacoma Water's service area, and based on a request from the property owner, Tacoma Water would consider offering Satellite System Management Services to the area. The request would then proceed as described below for requests for Satellite System Management.

Service Inside Tacoma's Retail Service Area

A new service request is responded to in accordance with the policies and fees set forth in Tacoma Municipal Code 12.10 – Water Rate Ordinance. Various factors will affect the process for new service and associated fees. Tacoma Water provides the engineering and inspection on all new mains and performs the installation of new services and meters, all at the expense of the service requestor. Service requests for small residential developments requiring off-site main extensions of more than 1,000 feet may be offered an option of satellite system management in place of off-site main construction. In these cases, the on-site mains required would be installed at the time of development and the system connected to Tacoma Water's distribution system when it gets built out to the subject location.

If a new service request is for a short plat, long plat or commercial development, new mains to service the development may be required. In these situations, Tacoma Water will design, engineer and inspect the main construction at the developer's expense. Tacoma Water's hydraulic model is used to design the required main. Upon completion of construction and satisfactory pressure test and water samples, individual water services can be installed by Tacoma Water crews. If the services required for the development are one-inch or smaller, the developer can choose to pay for service stubs only; service stubs, meter yokes and boxes; or, for the entire service and meter installations. Fixed prices are established in the Water Rate Ordinance for each of these options and are fixed based on actual costs to complete the work. Within two weeks of paying for the services, Tacoma Water will begin the service install work. Once work begins on a particular project, the assigned crews will continue until the project is completed. Should the developer of the raw land choose to install only the service stub or the stub, yoke and box, the purchaser of the undeveloped lot will have to pay for installation of the meter and/or the meter, yoke and box. A fixed price is established in the Water Rate Ordinance to cover the cost of this work. Additionally, when a meter is purchased, a System Development Charge (SDC) based on size of meter, customer class (ie residential, commercial) and location within or outside Tacoma City limits must be paid.

New services not requiring main extensions are responded to based on whether a permanent main is abutting the subject property or not. New service requests for all but single family residential connections require a plan check by a Tacoma Water engineer to size the domestic service and meter, to respond to fire flow requirements, to check for cross connections and to make blackflow protection requirements. All new domestic services three-inches and larger are required to be installed with Automated Meter Reading (AMR). Services requested for properties where there has been previous water service may be credited for the SDC and the service construction charge. The SDC credit will be given for the size of domestic service previously serving the property. A construction charge will not be charged if the same size service as was previously serving the property is adequate for the new use, or if the customer had previously authorized the abandonment of the service and meter.

New Service Requests for Parcels Abutting a Permanent Main

New services will be constructed by Tacoma Water crews upon payment of the Service Construction Charge. For services one inch and smaller, a fixed Service Construction Charge is applied, whereas for services one and ½ inches are larger, a time and materials Service Construction Charge is applied. For services located outside the City of Tacoma, a permit is required prior to installation of the service and meter from the appropriate jurisdiction. If the parcel has not contributed to the cost of the distribution main, a Main Charge will also be due. The Main Charge is a set amount per foot of property frontage and represents the cost to construct

a main in front of the benefiting parcel. For residential properties, the minimum frontage used to calculate the Main Charge is 50 feet and the maximum is 100 feet. Finally, all new services constructed after 1991 are required to pay an SDC. Following payment of the required fees, the service and meter is installed within two weeks.

New Service Requests for Parcels Not Abutting a Permanent Main

When a service request does not trigger a main extension (typically hydrants are near enough to provide the required fire flow) but a substandard main in the street abutting the property exists, such as a two-inch or four-inch main, or no main exists at all, required new service fees include a Service Construction Charge, a Water Main Charge and a SDC, provided no credits were available from previous service. The Main Charge under these conditions is based on the minimum frontage of 50 feet times the Water Rate Ordinance established front footage rate. The Main Charge is deposited in a fund called the Temporary Main Charge fund and is refunded to whomever constructs a permanent water main in the subject street in the future. The service and meter are installed within two weeks of payment of the fees

New services required off of transmission mains are provided if the customer is within the Tacoma Water service area and if there is an existing manifold with room to add the new service. The fees associated with such a new service are as listed above. If the property is located in unincorporated Pierce or King counties, the required property side shoestring service line can not be installed in the right-of-way. Instead, the property owner requesting service is required to obtain easements from neighboring property owners prior to Tacoma Water installing the service and meter in the obtained easement.

Wholesale Service

Wholesale service requests from water purveyors abutting Tacoma Water's transmission and distribution systems are considered based on available excess supply. With approval from the Tacoma Public Utility Board and Tacoma City Council a wholesale agreement is entered into with the requesting purveyor. The agreement identifies the amount of water to be purchased and conditions of service. The purveyor requesting the service must pay the Construction Charge for the service and meter and a calculated SDC. The SDC is calculated based on the average day usage, four-day maximum usage and peak day usage as requested by the purveyor. The SDC can be financed over ten years should the purveyor choose to take that option. All wholesale meters are required to be installed with Automated Meter Reading (AMR).

Emergency Intertie

Emergency intertie requests by abutting purveyors are encouraged. An agreement is entered in to by Tacoma Water and the abutting purveyor that spells out the conditions under which the service can be activated and how the costs for the installation will be shared. Typically the emergency intertie is constructed to be of value to both utilities and therefore the costs are shared. Emergency interties are constructed with a spool piece that would allow for a meter in the future if necessary.

Satellite System Management

Response to requests for satellite system management is in accordance with the procedures and policies established in the Tacoma Water Satellite System Management Program (as contained in Appendix A).

APPENDIX M

PUBLIC INFORMATIONAL MEETING MATERIAL

Tacoma Water 2006 Water System Plan Update and Conservation Plan Informational Meeting

TACOMA WATER
TACOMA PUBLIC UTILITIES

Tacoma Public Utilities Administration Building
South 35th Street and Union Avenue
Ground Floor Auditorium

Monday, October 9, at 7 p.m.

You are invited

to provide input into Tacoma Water's plan for the future. Learn about the new Tacoma Water Conservation Plan and how Tacoma Water intends to meet increasing demands for water, to address customer expectations for high quality water service and to meet environmental commitments. Participate in a water conservation goal-setting dialogue. Take home **free water conservation gadgets**.

We need your assistance to **help shape the 2006 Tacoma Water System Plan**, Tacoma Water's plan for the future.

Questions and comments can be directed to Daniel Muir, Water Conservation Specialist, 253-502-8723, or Susan Clark, Water Resource Planning Coordinator, 253-502-8204.

OCTOBER 2006

AUGUST 2006 AGENCY REVIEW DRAFT

TACOMA WATER
TACOMA PUBLIC UTILITIES

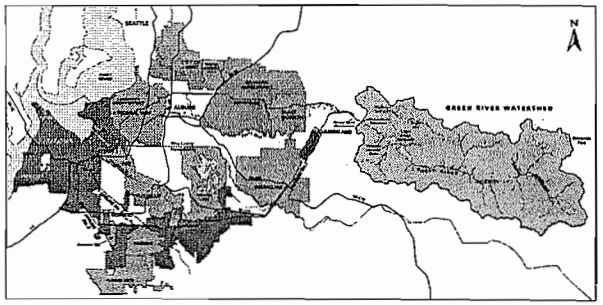
OUTLINE OF PRESENTATION

- Overview of the Tacoma water system
- What is a water system plan?
- What has changed since the 2000 WSP?
- What is Tacoma Water's plan for the future?
- How does water conservation fit into this future?
- How can input be provided?

OVERVIEW WATER SYSTEM

3

OVERVIEW WATER SYSTEM



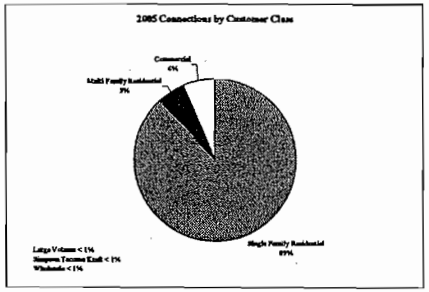
TACOMA WATER

Figure 2-1 Retail, Wholesale and 2nd Supply Partners Service Areas

4

OVERVIEW WATER SYSTEM

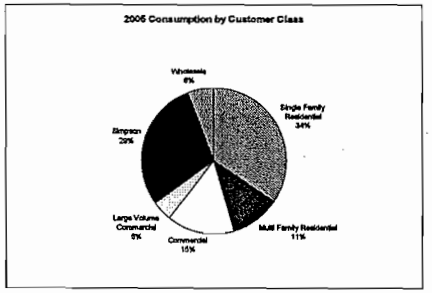
2005 Connections by Customer Class



5

OVERVIEW WATER SYSTEM

2005 Consumption by Customer Class



6

OVERVIEW WATER SYSTEM

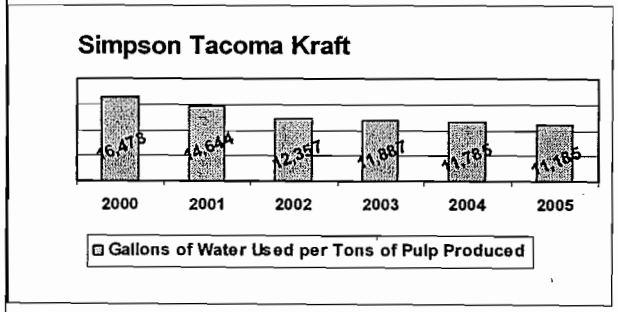
RESIDENTIAL PER CAPITA WATER USE

- 1990 = 92 gallons per day
- 1995 = 90 gallons per day
- 2000 = 86 gallons per day
- 2004 = 83 gallons per day
- 2005 = 76 gallons per day

Year 2005 lower per capita use can be explained, in part due to the implementation of Stage One of the four-stage Tacoma Water, Water Shortage Response Plan which began in March and ended in July

7

OVERVIEW WATER SYSTEM

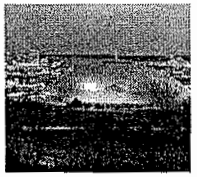


8

OVERVIEW WATER SYSTEM

2005 AVERAGE DAY CONSUMPTION - 51.9 million gallons

Takes 3 Days to Fill the Tacoma Dome



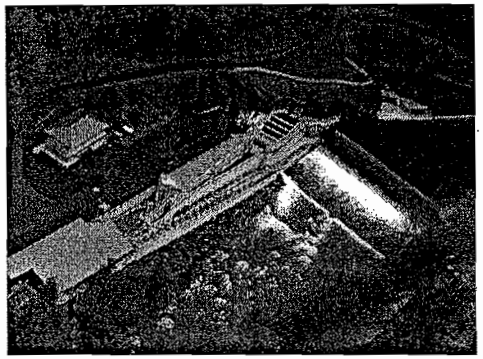
2005 RESIDENTIAL PER CAPITA WATER USE - 76 gallons per day

1 ½ 55 gallon drums

9

OVERVIEW WATER SYSTEM

Tacoma Green River Diversion Dam



10

OVERVIEW WATER SYSTEM

WATER RESOURCES

Green River Surface Water Sources:

- **1912 First Diversion** water right claim - allows for the use of up to 73 million gallons per day and can be replaced with groundwater from the North Fork wellfield
- **Second Diversion** water right - allows for the use of up to 65 million gallons per day and is a source shared by the Second Supply Partners
- **Second Diversion** water right also allows storage of water behind Howard Hanson dam for municipal water use via the Howard Hanson Dam Additional Storage Project - prior to the issuance of the water right HHD for flood control purposes only

11

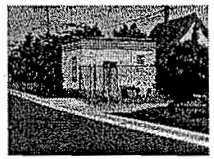
OVERVIEW WATER SYSTEM

Howard Hanson Dam and Eagle Gorge Reservoir

12

OVERVIEW WATER SYSTEM

WATER RESOURCES



Groundwater Resources (wells):

- 24 Wells
- 60 million gallons per day of combined short-term pumping capacity
- Wells provide 15 percent of annual water requirements
- Primarily used to meet summer demands when Green River flows are low
- Some wells currently have undeveloped water rights

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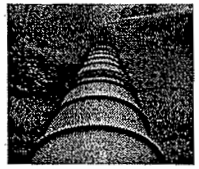
OVERVIEW WATER SYSTEM

- Transmission System - Green River to the service area plus 140 more miles
- Distribution System - 1,200 miles of pipe delivering water to customers



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OVERVIEW WATER SYSTEM

Alaska Street Reservoir

15

OVERVIEW WATER SYSTEM

SYSTEM FACILITIES

Surface Water Treatment Facilities:

- One of few surface water systems in the US not required to filter
- Green River Treatment Facilities: chlorination, fluoridation and pH adjustment
- Ozone Plant to be completed in 2007

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OVERVIEW WATER SYSTEM

Tacoma Water Mission

Our mission includes: protection of public health, support for t he region's economy, enhancement of people's quality of life and environmental stewardship

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OVERVIEW WATER SYSTEM

ENVIRONMENTAL COMMITMENTS

Habitat Conservation Plan:

- Green River operations' protection from a "taking" of an ESA-listed species
- Describes 64 measures Tacoma Water is committed to doing over the 50-year duration of the HCP (i.e, stream flow augmentation, wildlife habitat conservation projects, fish passage into and out of the upper Green River Watershed)

Green River Water Rights:

- Use of Green River water subject to instream flow rules and/or agreement reached with the Muckleshoot Tribe of Indians

Second Supply Project:

- Mitigation Work - habitat projects along pipeline and in upper watershed
- MOA with DOH and DOE requiring 10 percent reduction water use from 2000 to 2010

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WHAT IS A WATER SYSTEM PLAN?

19

WHAT IS A WATER SYSTEM PLAN?

- Water Utilities are regulated by Was hington State Department of Health
- Completion of a WSP every 6 -years for approval by DOH is required of large and/or expanding water systems
- WSPs document a system's ability to provide water ser vice to its designated service area
- WSPs document compliance with local, state and federal plans and regulations
- WSPs provide a road map for implementing necessary water system improvements

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WHAT IS A WATER SYSTEM PLAN?

KEY REQUIRED ELEMENTS INCLUDE:

- Water demand forecast
- Water conservation plan
- Documented coordination with local land use authorities
- 6-year capital improvement program
- Financial review/evaluation
- Description of operation and maintenance programs
- Water source availability evaluation
- Distribution system analysis
- Reclaimed water evaluation
- System design criteria
- Watershed control program (Volume II)

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WHAT HAS CHANGED SINCE THE 2000 WSP?

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WHAT HAS CHANGED SINCE 2000 WSP?

KEY CHANGES INCLUDE:

Internal:

- Second Supply Project began operating (10-20-05)
- Tacoma Water acquired 3 independent water systems (Day Island, Hyada and SE Tacoma Mutual)
- New wholesale water contracts reached
- Tacoma Water Habitat Conservation Plan was approved
- Tacoma Water developed its first 10-year Business Plan

External:

- New State planning requirements were enacted
- New Federal requirements to cover water reservoirs enacted
- Tacoma Water is required to remove or inactivate *Cryptosporidium* by 2012

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WHAT ARE THE KEY POINTS OF THE 2006 WSP?

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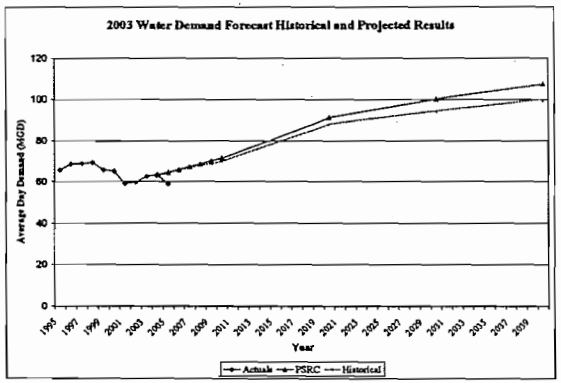
WHAT ARE THE KEY POINTS OF THE 2006 WSP?



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WHAT ARE THE KEY POINTS OF THE 2006 WSP?

TACOMA WATER'S ABILITY TO MEET FUTURE DEMANDS

Water Availability Study, March 2006

- Takes into account 2003 Demand Forecast
- Plus Cascade Water Alliance new wholesale demands
- Plus additional 1.67 MGD in wholesale commitments reached after the 2003 Demand Forecast was completed
- Does not include projection of additional wholesale requests

Conclusion:

- Year 2025 demand most difficult to meet due to wholesale commitments
- Expected Scenario: All demands met through 2030 (2.2MGD; 4.1MGD)
- High Demand Scenario: Shortfalls are projected in years 2025 and 2030 (2025 shortfall 2.5 MGD)

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WHAT ARE THE KEY POINTS OF THE 2006 WSP?

CLIMATE CHANGE

- Increased temperatures will result in rising snowline and reduced snowpack
- Higher winter flows in the Green River - less snowpack as storage
- Howard Hanson Dam Additional Storage Project manmade storage will help off-set loss of snowpack
- Second Supply Project improves operational flexibility (interties with other systems and storage element)
- Availability of groundwater resources puts Tacoma Water in a positive position
- Included in High Demand Scenario forecast (4 percent average; 8 percent peak increase 2040)

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WHAT ARE THE KEY POINTS OF THE 2000 WSP?

- Hydraulic Modeling identified areas experiencing low flows
- The system as a whole has excess storage, some individual service zones do not have adequate storage for anticipated growth
- Tacoma Water has a sound financial base that can finance capital improvements
- Bond ratings indicate a high degree of confidence in the utility's ability to repay related debt obligations
- Tacoma Water's conservation commitment is to reduce water use by 10 percent between 2000 and 2010

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WHAT ARE THE KEY POINTS OF THE 2006 WSP?

VOLUME II (Green River Watershed Management Plan)

- Documentation of the Green River Watershed Control Program - required of unfiltered systems
- Tacoma Water owns 10 percent of the Green River Watershed; public agencies and private companies own the remainder
- Tacoma Water maintains written agreements with the majority of the other landowners in the watershed
- Tacoma Water is required to identify watershed activities that may affect water quality (logging, road building/maintenance, 2 special permit hunts, fisheries and wildlife management)
- Tacoma Water is required to monitor and control activities that may affect water quality (done thru inspections of watershed activities, patrols for unauthorized entry, water quality monitoring, strict sanitation practices, access control and good communications with other landowners)

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WHAT IS TACOMA WATER'S PLAN FOR THE FUTURE?

30

WHAT IS THE PLAN FOR THE FUTURE?

Water Resources:

- Develop additional groundwater resources at South Tacoma Aquifer and Tideflats wellfields
- Cooperate in regional projects (i.e. OASIS, sewer utilities reclaimed water activities)
- Pursue acquisition of available water rights
- Change operations as necessary in reaction to gradual changes in climate
- Implement a Water Conservation Plan

CAPITAL FACILITIES

Transmission System Projects:

- Pipeline No. 1 in Puyallup Valley
- Pipeline No. 2 near Canyon Road
- Tideflats Trunk Main 1 near Tacoma Dome
- Pipeline No. 1 near Boise Creek
- Pipeline No. 2 along 128th Street

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WHAT IS THE PLAN FOR THE FUTURE?

CAPITAL FACILITIES

Distribution System:

- 1,200 miles of pipe
- Specific replacement projects to address WSP identified deficiencies include: Fife Heights; Stadium District; East Tacoma; North End; South L Street
- Tacoma Water will also continue to implement existing programs established to upgrade and renew distribution mains, hydrants, services and valves
- Each program incorporates a methodology for determining project priority
- Priorities can be impacted by such things as another jurisdiction's road project

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WHAT IS THE PLAN FOR THE FUTURE?

CAPITAL FACILITIES

Storage Facilities:

- McMillin Reservoir covering
- Prairie Ridge service zone storage expansion

CAPITAL FACILTIES

Water Treatment:

- *Cryptosporidium* Treatment by 2012
- Corrosion control and fluoridation facilities for South Tacoma Wells

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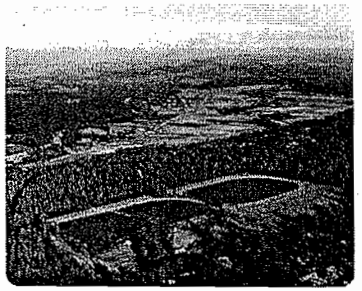
WHAT IS THE PLAN FOR THE FUTURE?



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WHAT IS THE PLAN FOR THE FUTURE?

VOLUME II (Green River Watershed Management Plan)

- Continue to acquire strategic properties in the watershed
- Pursue written agreements with landowners (changed ownership; PSE and Army Corps of Engineers)
- Exercise careful control of recreational activities
- Continue to provide oversight of watershed forest activities by reviewing forest practices applications
- Monitor potential water quality impacts that may be introduced by the transport of adult fish into the watershed and by the HHD Additional Water Storage Project

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WHAT IS THE PLAN FOR THE FUTURE

Financial Guidance:

Water Rate Policies

- Establish objectives for water rate decisions

10-Year Business Plan

- 7.5 percent rate increases are budgeted for 2007 and 2008

Capital project funding Alternatives include:

- Low interest loans
- New revenue bonds
- System Development Charge funds
- Increasing water service rates

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HOW DOES CONSERVATION FIT INTO THE PLAN FOR THE FUTURE?

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TACOMA WATER CONSERVATION PLAN

TACOMA WATER MISSION STATEMENT

Tacoma Water's mission is protection of public health, support for the region's economy, enhancement of people's quality of life and environmental stewardship.

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WHY BE EFFICIENT WITH WATER USE?

- Many different interests compete for water.
- We need to make sure we have enough water for our homes, business and parks; for fire protection; and to protect our precious natural resources.

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RESPONSIBLE FOR OWN SYSTEM EFFICIENCY

For the past 2 decades improvements to Tacoma Water's system has resulted in over 6 MGD of water savings.

- Transmission line leak and manifold connection repairs
- Reservoir rehabilitation and replacement
- System leak detection and repairs
- Large commercial meter testing
- Hydrant maintenance
- Unaccounted for water less than 10 percent

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PAST/PRESENT CONSERVATION EFFORTS

- Water audits for largest commercial/industrial customers
- Showerheads, aerators & toilet leak tests
- Efficient clothes washer rebates
- Outreach and education
  - Bill inserts
  - Seminars, events, and training
  - Youth education
  - Regional ad campaign

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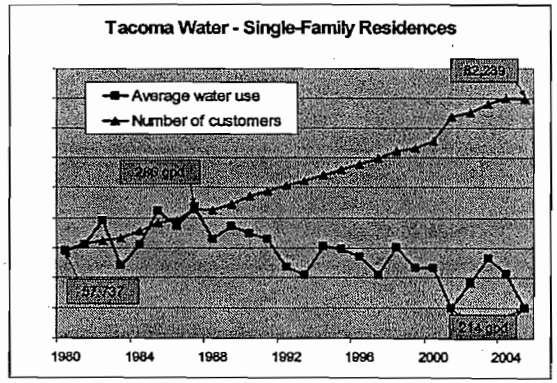
HISTORIC RESIDENTIAL WATER USE



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WATER CONSERVATION PROGRAM ASSESSMENT

- Qualitative screening
- Program Validation
- Program Packaging
- Implementation Strategies

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CONSERVATION PLAN IMPLEMENTATION 2007-2010

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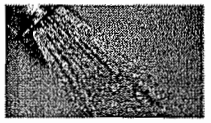
RESIDENTIAL PROGRAMS

- High-Efficiency faucet aerators & showerheads
- High-Efficiency toilets
- High-Efficiency clothes washers



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COMMERCIAL AND INDUSTRIAL

- Pre-rinse spray valves
- High-Efficiency urinals
- High-Efficiency Commercial Kitchen Equipment

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EDUCATION PROGRAMS

- Public Education
  - Summer watering message (print, bus boards), website, literature, youth education, Northwest Natural Yards Days, etc.
- Market transformation
- Regional cooperation

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WATER CONSERVATION GOAL SETTING BEYOND 2010

- New state municipal water law will require utilities to set conservation goals.
- Work with the public to develop goals.

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What to consider when setting conservation goals

- Tacoma Water benefit-to-cost.
- City of Tacoma (sewer, power) benefit-to-cost.
- Customer's benefit-to-cost.
- Societal benefits.
  - Business, industry, parks, people
- Environmental benefits.

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HOW CAN INPUT BE PROVIDED?

- Agency Review Draft currently available
- Comments due October 19, 2006
- Final Plan prepared to address comments received
- Final Plan submitted to DOH, Tacoma Public Utility Board, Tacoma City Council and King County Council for review and approval

Comments may be provided: tonight, as noted below or at a public meeting before the Utility Board or City Council

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APPENDIX N

TACOMA WATER CONSERVATION PLAN

TACOMA WATER CONSERVATION PLAN

Summary

As required by the Washington State Department of Health (DOH), the Tacoma Water Conservation Plan consists of three elements: data collection and reporting, demand forecasting for future water needs, and; conservation program development and implementation. Tacoma Water's current data collection and demand forecasting activities and commitments for continuation are detailed in the Tacoma Water Comprehensive Water Plan Update, 2006. The third element, the Tacoma Water Conservation Program, is emphasized here.

Taken together, the general goal of Tacoma Water's Conservation Plan is to protect and preserve present and future water resources and to maintain or reduce present per capita water usage levels in all customer classes. Tacoma Water's specific conservation goal is to reduce per capita water use by ten percent over the ten year time period 2000-2010. This goal is consistent with a Memorandum of Agreement Tacoma Water and its Second Supply Partners (the City of Kent, the Lakehaven Utility District and the Covington Water District) entered into with the Washington State departments of Ecology and Health in 2001.

Since the 1980s, Tacoma Water has been committed to implementing an effective conservation program as an element of the overall water resources plan. The focus has been on developing long-term sustained conservation activities in a balanced program including both supply management and demand management measures. The conservation measures have been designed to increase customer awareness of conservation issues, to provide incentives for reduced consumption and to reduce water losses within the system. Appendix A contains a complete summary of conservation activities undertaken by Tacoma Water beginning in the 1980s.

Background

As can be seen in Figure 1 below, Tacoma Water serves a customer base of primarily single-family residences, which account for nearly 90 percent of total customer accounts. The total average daily billed consumption for all Tacoma Water customers in 2005 was 51.1 million gallons (MG). This is lower than the 1995 average daily billed consumption (59.35 MG) despite the passage of ten years and an increase in customer connections of approximately 18 percent.

Tacoma Water customers use water in a variety of ways. Residential customers – both single-family and multi-family customer classes – used approximately 45 percent of all water delivered by the utility in 2005 while Simpson Tacoma Kraft Company (Simpson) used approximately 29 percent. Commercial and industrial customers used 20 percent and other customers used 6 percent. (See Figure 2.)

Figure 1

2005 Connections by Customer Class

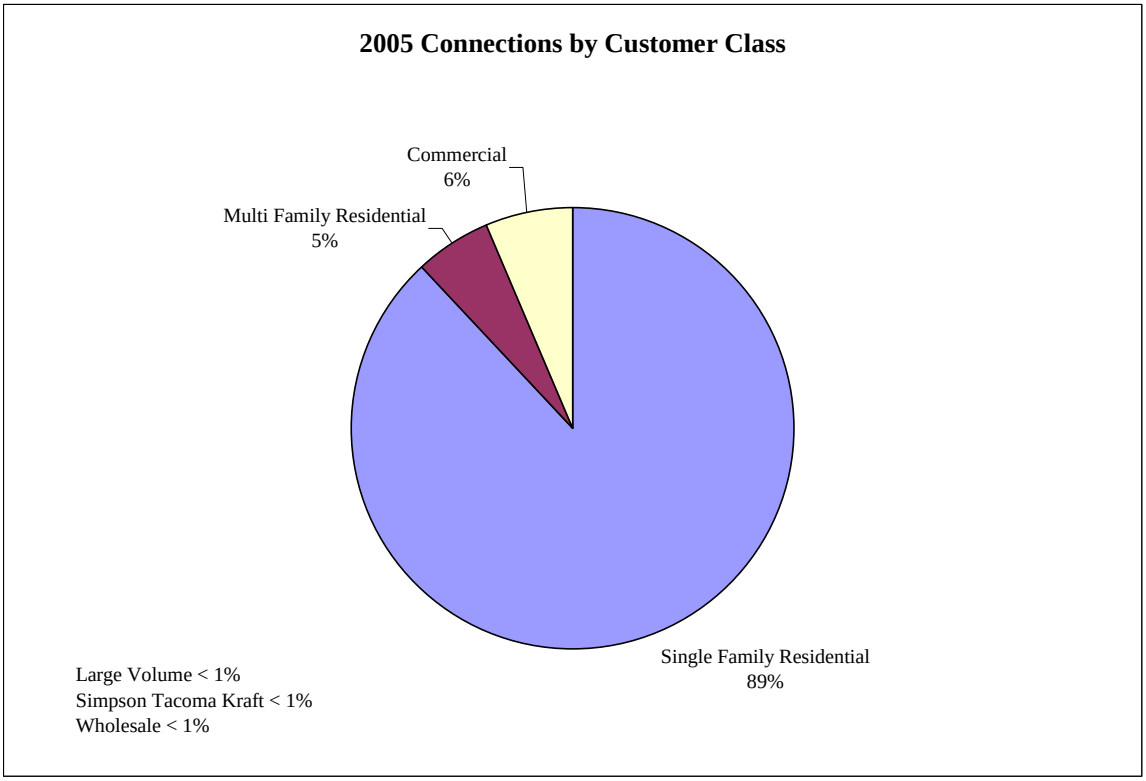
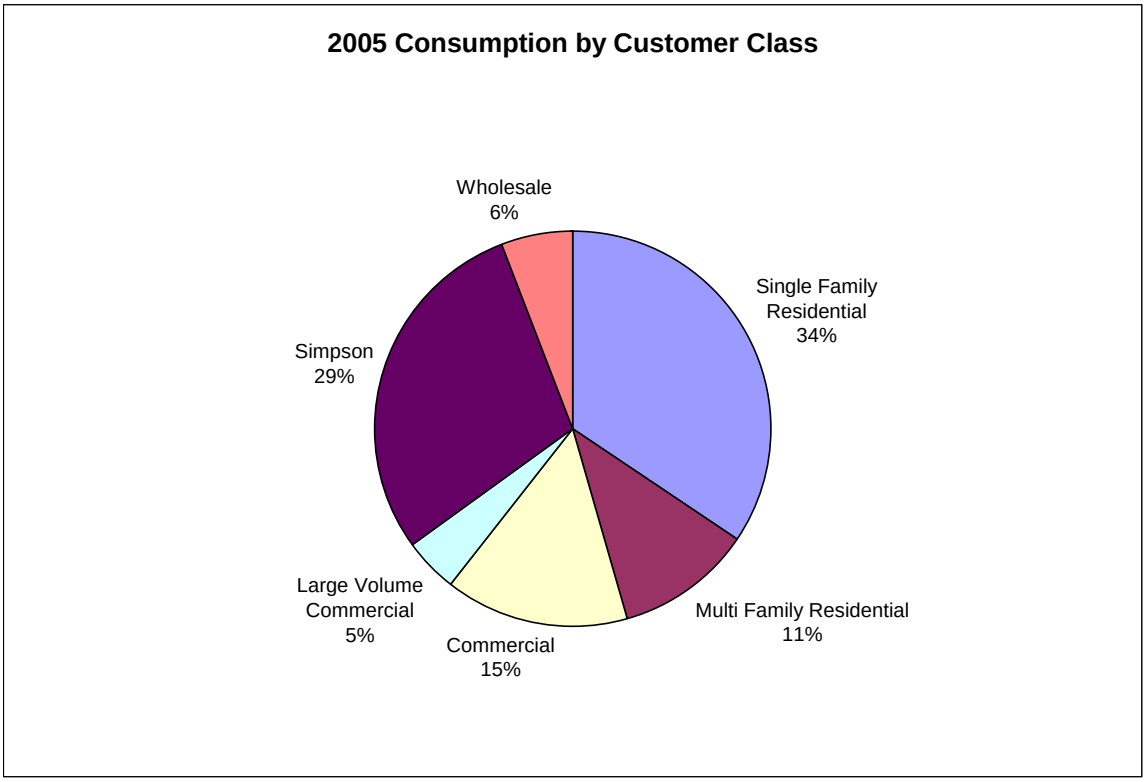


FIGURE 2
2005 Consumption by Customer Class



Tacoma Water's residential per capita water use has consistently dropped since 1990. Residential per capita water use was 92 gallons per day in 1990, dropped to 86 gallons per day in 2000 and was 76 gallons per day in 2005.

Maintaining the Tacoma Water system to keep unaccounted for water at less than ten percent of total supply has been a highly visible operating goal for Tacoma Water. Beginning in 1984, Tacoma Water began an all-out effort to identify and repair leaks within its water system. Tacoma Water's regular preventive maintenance on its mains, reservoirs, hydrants and other elements of its system continues to eliminate leaks while also protecting the integrity of the system and increasing its life span. Tacoma Water's unaccounted for water rate has averaged nine percent over the four-year period 2001-2005.

Simpson is the largest single water user in the Tacoma water system. Simpson has a corporate commitment to reduce fresh water use at their facility that dates to 1992. The most recent phase of their water conservation program was initiated in 2001 with a goal to reduce water consumption to less than 16 million gallons per day (MGD). Daily water use for 2000-2005 is shown below.

TABLE 1
Simpson Average Daily Water Use

Year	Million Gallons per Day
2000	18.8
2001	17.9
2002	15.6
2003	16.5
2004	14.6
2005	13.6

Another indication used by the company to track water use is “gallons of water per ton” of production. Table 2 tracks the water use by Simpson in this manner. Due to extensive conservation efforts, the amount of water used per ton of pulp slush has steadily decreased from year 2000 to 2005

TABLE 2
Simpson Water Consumption

Year	Pulp Slush Production (tons)*	Billed Water Consumption (gallons)	Gallons of Water per ton
2000	428,630	7,060,996,580	16,473
2001	440,110	6,444,984,172	14,644
2002	468,970	5,795,224,248	12,657
2003	472,450	5,616,157,036	11,887
2004	510,740	6,019,200,000	11,785
2005	486,440	5,440,950,000	11,185

* As provided by Simpson Tacoma Kraft Co.

In 2006, Tacoma Water and Simpson signed a new contract which discusses both parties commitment to conserving water at the Simpson mill. This includes a commitment by Tacoma Water to facilitate funding for water conservation programs that can be implemented at the Simpson mill. It also included assurance of a reduction to the pricing structure if successful installation of conservation measures occur.

Conservation Program Development

In 2006, Tacoma Water undertook a conservation program assessment to evaluate the existing water conservation program – which is based upon a 1997 conservation program

assessment – and to recommend elements to strengthen the program. The objectives of the 2006 Conservation Program Assessment include:

- To instill a long-term conservation ethic among customers (retail, wholesale and in regional supply area).

- To establish a 2000 base year on water use. This will enable the utility to measure the effectiveness of the conservation program in accordance with State guidelines.

- To establish criteria to assess the effectiveness of the conservation program including methods to establish savings, effectiveness of public information programs and measurements of economic benefits received.

- To identify conservation program activities which, if implemented by Tacoma Water, will result in water savings necessary to meet Tacoma Water's ten percent reduction goal.

A summary of the tasks completed for the 2006 Conservation Program Assessment follows. The *2006 Conservation Program Assessment Tacoma Water Summary Report* can be found in Appendix B.

Task 1 Qualitative Screening

The objective of Task 1 was to use a qualitative screening process to narrow down the number of presently feasible – or technically possible – water conservation measures to be analyzed further for possible implementation by Tacoma Water. Measures selected by this screening process were carried forward for a quantitative assessment of costs and benefits. A literature search of conservation sources such as the American Water Works Association, the California Urban Water Conservation Council and other professional sources was conducted to develop a list of 41 presently feasible demand-side water conservation measures. Twenty measures passed the screening selection threshold for consideration in Task 2. Each measure was screened, using the following criteria:

- Customer cost effectiveness
- Customer acceptance
- Customer class savings potential
- Savings certainty
- Peak season savings
- Ease of implementation
- Technological maturity

A public meeting to present the program assessment and receive feedback was held.

Task 2 Program Validation

The objective of Task 2 was to determine the cost-effectiveness to customers of the 20 qualitatively screened conservation measures carried forward from Task 1. The key steps in validating each measure potential included:

- Establishing economic parameters for the analysis, such as inflation and discount rates, current utility rates, and expected future escalation.
- Dividing measures identified in Task 1 into sectors, in cases where the economics for a measure varied significantly between customer classes (for example, new construction vs. retrofit, or single-family residential vs. commercial).
- Analyzing billing records, usage summaries, and multifamily residence information to establish base year (2000) and most recent year (2005) usage for all major customer classes. Average usage and number of accounts information from this exercise helped establish estimates of measure potential.
- Developing estimates of unit costs, unit savings (water, sewer, electric, gas, other), measure life, degradation rate, current penetration and achievable penetration rates, and measure population and benefit-cost ratios for each measure-class combination.
- Performing a thorough internal peer review process to discuss and refine key assumptions and estimation approaches.

Task 3 Program Packaging

The objective of Task 3 was to determine how the previously screened conservation measures could be packaged in a conservation program. To do so, the following tasks were accomplished.

- Conservation measures were grouped into program elements that likely would be packaged together in a program delivery scenario (for example, showerheads and faucet aerators).
- Delivery mechanisms for each program measure were selected, annual installation targets were estimated and unit installation costs were determined. More than one delivery mechanism was analyzed to determine which approach was more cost-effective.
- Program measures where the likelihood of co-funding from other utilities, such as Tacoma Power or Puget Sound Energy, was high were identified.
- Indirect costs for one-time activities (such as database development, program design, and program evaluation), as well as ongoing programmatic activities (such as program marketing, administration, and general public education) were assigned.
- Life-cycle benefits and benefit-cost ratios (BCRs) for each program measure and for the three program scenarios overall were calculated.

- An internal peer review process to discuss and refine key assumptions and estimation approaches was performed.

Task 4 Implementation Strategies

The objective of Task 4 was to develop a detailed water conservation program implementation strategy, utilizing the results of the previously completed tasks and taking into account Tacoma Water's conservation goal. For each of the program packages, the following information is provided:

- A description of the scenario.
- The critical tasks necessary to implement the scenario, listed roughly in order the tasks need to be accomplished.
- A list of resources needed to accomplish the critical tasks.
- Schedule and production rates, in which approximate time frames are recommended for beginning package design, as well as expected levels of production once the package is fully underway.
- The annual direct and indirect costs and water savings for each year between 2007 and 2010, as well as the full-time equivalent (FTE) labor required.

Conservation Program Implementation Strategy 2007-2010

Tacoma Water operates under the guidance of a ten-year business plan which is updated every two years as the first step in establishing the upcoming biennial budget and associated rate cases and to identify projected needs for the subsequent four biennial budget periods. Through the development of a business plan, the activities of Tacoma Water as it pursues operations and maintenance and capital improvements are prioritized and balanced against funding limitations. The highest priorities for the subsequent biennium are developed as strategic initiatives. The 2007-2016 Business Plan contains a strategic initiative titled "Implement Water Conservation Programs". During the development of future business plans, the water conservation program recommendations contained in the 2006 Conservation Program Assessment will be considered as the Water Conservation program budget is established.

The focus of the Tacoma Water Conservation Program is currently on the next four year time period – thru 2010 – in order to meet or exceed the ten percent water use reduction goal established in the Second Supply Project Memorandum of Agreement with the Washington State departments of Ecology and Health. The current Tacoma Water demand forecast, developed in 2003, estimates water savings from plumbing code changes and due to pricing effects for the years 2000 thru 2010. In addition to realizing these estimated savings, Tacoma Water will also need to implement water conservation measures to achieve an estimated 0.63 MGD of savings by 2010 in order to achieve the ten percent reduction goal.

Tacoma Water will select for implementation the conservation program packages that are cost effective for customers. Conservation program packages which passed the conservation program assessment screening process have a benefit-to-cost ratio of one or higher for the City of Tacoma which considers sewer, power and water savings. The societal and environmental benefits of the conservation program packages, when taken into account, result in higher benefit-to-cost ratios. At a minimum, Tacoma Water will implement the conservation program packages necessary to meet or exceed the ten percent reduction goal.

The conservation program packages Tacoma Water will consider implementing during the next four years are listed below. A detailed description of each conservation program package follows this section. The list of conservation program packages should be considered to be a "menu" of options; not all of the conservation program packages will necessarily be implemented. Additionally, the rebate amounts associated with many of the conservation program packages and all conservation program packages' schedules for implementation are also recommendations; therefore, Tacoma Water reserves the right to alter such details as needed in order to meet or exceed the ten percent reduction water savings goal while also staying within the Water Conservation Program budget. The Water Conservation Program proposed budget is approximately $930,000 annually.

The water conservation program packages that may be implemented include:

- Faucet Aerators & Low Flow Showerheads for Residential Customers
- High-Efficiency Toilets for Residential Customers
- Pre-Rinse Spray Valves for Commercial Customers
- High-Efficiency Clotheswashers for Residential Customers
- High-Efficiency Urinals for Commercial Customers
- High-Efficiency Commercial Kitchen Equipment
- Public Education
- Water Efficient Product and Service Promotion
- Intergovernmental & Regional Cooperation

Package A1 Aerators/showerheads - delivery on demand

DESCRIPTION

Advertise program through bill inserts, website, public events, other media. Deliver 0.5/1.0 gallon/minute aerators and/or 1.75/2.0 gallon/minute showerheads to interested customers in all sectors. Delivery of standardized kits and/or customized order can be by mail or dropoff, depending on quantity.

SCHEDULE AND PRODUCTION RATES

Simple, easy program to administer, so good one to start with. Start program design in late 2006, early 2007. Roll out program in middle of 2007. Once ramped up, program could serve 2,400 single-family and 1,000 multi-family households a year.

CRITICAL TASKS

1 - Select equipment vendors, establish customer eligibility requirements.
2 - Negotiate cost-sharing with other utilities.
3 - Design advertising materials.
4 - Roll out and publicize program.
5 - Set up database and process requests.
6 - Evaluate program effectiveness.

RESOURCES NEEDED

a) Conservation staff labor.
b) Support from graphic department (ads).
c) Support from IT department (database).
d) Funds to purchase and distribute equipment.
e) Funds to disseminate program materials.

COST AND SAVINGS SUMMARY

Year	Annual cost ($)	Annual savings (mgd)
2007	$123,317	0.025
2008	$120,344	0.050
2009	$120,344	0.050
2010	$120,344	0.050

Package A2 **High efficiency toilets - rebates/direct-install**

DESCRIPTION

Offer either or both: (a) rebates of approx. $150 or more per toilet or (b) direct installation of a free unit to customers in all sectors to offset the cost of installing high efficiency toilets (1.0 gallon per flush or less). Pressure-assisted varieties will be available for non-residential applications.

SCHEDULE AND PRODUCTION RATES

Program package design could commence after Package A1 has been brought up to speed, perhaps in 2008. Once ramped up, program could serve 1,200 single-family and 1,000 multi-family households a year, as well as 300 industrial, commercial, and institutional customers annually. It may be advantageous to roll out this package in conjunction with Package B2 (High Efficiency Urinals).

CRITICAL TASKS

1 - Develop list of approved models, suppliers; establish rebate amounts and criteria (if Option A chosen).
2 - Select equipment supplier(s), establish eligibility requirements (if Option B chosen).
3 - Design advertising materials and forms.
4 - Roll out and publicize program.
5 - Set up database and process requests.
6 - Evaluate program effectiveness.

RESOURCES NEEDED

a) Conservation staff labor.
b) Support from graphic department (ads).
c) Support from IT department (database).
d) Funds to purchase equipment and/or provide rebates.
e) Funds to disseminate program materials.

COST AND SAVINGS SUMMARY

Year	Annual cost ($)	Annual savings (mgd)
2007	-	-
2008	$703,369	0.084
2009	$664,511	0.084
2010	$664,511	0.084

Package A3	**Pre-rinse spray valves - direct-install**

DESCRIPTION

Hire contractor to direct-install efficient 1.6 gpm pre-rinse spray valves in food service establishment kitchens. At the same time, contractor installs 0.5 gpm aerators on bathroom faucets. Since installers offer service door-to-door, advertising and administration is minimal. Establish co-funding with energy utility.

SCHEDULE AND PRODUCTION RATES

Program began in mid-2006. If program continues at current pace of 500 valves/year, then market should be saturated by early 2008.

CRITICAL TASKS

1 - Continue to administer direct-install contract.

2 - Evaluate program effectiveness.

RESOURCES NEEDED

a) Minimal amount of conservation staff labor

b) Funds to pay contractor.

COST AND SAVINGS SUMMARY

Year	Annual cost ($)	Annual savings (mgd)
2007	$32,466	0.046
2008	$10,714	0.015
2009	-	-
2010	-	-

Package B1	**High efficiency clothes washers - rebates**

DESCRIPTION

Offer rebates for any clothes washer on the Consortium for Energy Efficiency (CEE) Tier 3A/B lists (most efficient on the market) for commercial and residential models. These rebates may be $100 or more for residential models, and $400 or more for commercial models, not including potential additional incentives from energy utilities.

SCHEDULE AND PRODUCTION RATES

Program package design could commence after Package A1 has been brought up to speed, perhaps in 2008. Once ramped up, program could serve about 1,800 single-family and multi-family households a year, as well as about 45 industrial, commercial, and institutional customers annually.

CRITICAL TASKS

1 - Negotiate cost-sharing with other utilities.
2 - Establish rebate amounts and criteria.
3 - Design advertising materials and forms.
4 - Roll out and publicize program.
5 - Set up database and process requests.
6 - Evaluate program effectiveness.

RESOURCES NEEDED

a) Conservation staff labor.
b) Support from graphic department (ads).
c) Support from IT department (database).
d) Funds to provide rebates.
e) Funds to disseminate program materials.

COST AND SAVINGS SUMMARY

Year	Annual cost ($)	Annual savings (mgd)
2007	$29,144	-
2008	$263,717	0.050
2009	$244,288	0.050
2010	$244,288	0.050

Package B2	**High efficiency urinals - rebates**

DESCRIPTION

Offer rebates of about $125 or more for qualifying urinals not exceeding 0.5 gallons per flush.

SCHEDULE AND PRODUCTION RATES

Program package design could commence after Package A1 has been brought up to speed, perhaps in 2008. Once ramped up, program could replace about 300 urinals a year at industrial, commercial, and institutional facilities. It may be advantageous to roll out this package in conjunction with Package A2 (High Efficiency Toilets).

CRITICAL TASKS

1 - Establish rebate amounts and criteria.
2 - Design advertising materials and forms.
3 - Roll out and publicize program.
4 - Set up database and process requests.
5 - Evaluate program effectiveness.

RESOURCES NEEDED

a) Conservation staff labor.
b) Support from graphic department (ads).
c) Support from IT department (database).
d) Funds to provide rebates.
e) Funds to disseminate program materials.

COST AND SAVINGS SUMMARY

Year	Annual cost ($)	Annual savings (mgd)
2007	-	-
2008	$66,984	0.008
2009	$56,929	0.011
2010	$56,929	0.011

Package B3	High efficiency commercial kitchen equipment - rebates

DESCRIPTION

Offer rebates to industrial, commercial, and institutional food service establishments for installing (1) water-efficient door or conveyor dishwashers, (2) boilerless food steamers, and/or (3) air-cooled ice machines. These rebates might cover anywhere from 10-25% of installation costs, and in the case of the dishwashers and steamers, could be supplemented with energy utility co-funding.

SCHEDULE AND PRODUCTION RATES

This program package, along with Package C1, could be designed and implemented after the other technology packages are up and running, perhaps in 2009. It is difficult to predict in advance customer participation levels for such specialized package elements, but about 40 installations annually could be expected once all elements are included.

CRITICAL TASKS

For each program element, either singly or combined:

1 - Negotiate cost-sharing with other utilities, if applicable.
2 - Establish rebate amounts and criteria.
3 - Design advertising materials and forms.
4 - Roll out and publicize program.
5 - Set up database and process requests. Evaluate program effectiveness.

RESOURCES NEEDED

a) Conservation staff labor.
b) Support from graphic department (ads).
c) Funds to provide rebates.
d) Funds to disseminate program materials.

COST AND SAVINGS SUMMARY

Year	Annual cost ($)	Annual savings (mgd)
2007	-	-
2008	-	-
2009	$59,953	0.006
2010	$51,904	0.011

Package C1	Complex HVAC/mechanical systems - rebates

DESCRIPTION

Offer technical and/or financial assistance for water-savings projects involving complex HVAC or mechanical systems, such as improvements to cooling towers and boilers, or elimination of single-pass heat rejection. Financial assistance can consist of rebates up to a percentage (say 40-50%) of the total project cost. In situations with concurrent energy savings, energy utilities may be able to augment incentives.

SCHEDULE AND PRODUCTION RATES

This program package, along with Package B3, could be designed and implemented after the other technology packages are up and running, perhaps in 2009. It is difficult to predict in advance customer participation levels for such specialized package elements, but about 10 projects annually could be expected once all elements are included.

CRITICAL TASKS

For each program element, either singly or combined:

1 - Negotiate cost-sharing with other utilities, if applicable.
2 - Establish level of and criteria for financial assistance.
3 - Set up external resources for providing technical assistance (if offered).
4 - Design advertising materials and forms. Roll out and publicize program.
5 - Set up database and process requests. Evaluate program effectiveness.

RESOURCES NEEDED

a) Conservation staff labor.
b) Support from graphic department (ads).
c) Funds to provide rebates and/or technical assistance (if provided)
d) Funds to disseminate program materials.

COST AND SAVINGS SUMMARY

Year	Annual cost ($)	Annual savings (mgd)
2007	-	-
2008	-	-
2009	$67,756	0.014
2010	$67,509	0.029

Package D1	**Public education**

DESCRIPTION

Update and integrate public information website, materials, and outreach to be consistent with new conservation programs. Support key ongoing educational programs, particularly youth education and Northwest Natural Yard Care Days, and summer watering message, especially with high use customers.

SCHEDULE AND PRODUCTION RATES

Plan in late 2006 to early 2007; implement in 2007. Evaluate individual efforts in 2007. Evaluate awareness and activities in 2008.

CRITICAL TASKS

1 - Review and assess current materials/programs.
2 - Determine critical components, obligations, resources, and partners.
3 - Develop and test appropriate materials for website and distribution.
4 - Coordinate with local and regional entities in outreach, as appropriate.
5 - Implement outreach, education, events, and evaluate.

RESOURCES NEEDED

a) Conservation staff labor.

b) Support from graphic department or advertising agency to develop, print, disperse materials.

COST AND SAVINGS SUMMARY

Year	Annual cost ($)	Annual savings (mgd)
2007	$134,645	-
2008	$121,676	-
2009	$121,676	-
2010	$121,676	-

Package D2	**Product & service promotion**

DESCRIPTION

Work with market participants in key sectors (such as landscapers, plumbers, hardware stores) to promote water efficiency. For example, in the landscaping market, irrigation specialists and landscape firms could promote services and products that ensure water efficiency, incuding education and incenting of landscapers and their crews to ensure efficiency with landscape practices such as automatic irrigation systems, use of drought tolerant plants, mulching, soil amendments, and other techniques.

SCHEDULE AND PRODUCTION RATES

Plan in winter, perhaps in 2009. Implement before the watering season of the following year. Evaluate on ongoing basis. Update activities as needed and repeat.

CRITICAL TASKS

1 - Research other program designs with merit (e.g., Seattle and California).

2 - Choose program design (e.g., training and certification of landscapers and crews; certification of irrigation specialists).

3 - Develop plan/timeline and organize resources (e.g., experts, professional organizations).

4 - Recruit participants.

5 - Conduct/evaluate activities.

RESOURCES NEEDED

a) Conservation staff labor.

b) Support from graphic department or advertising agency to develop outreach and materials.

c) Outside experts to train.

d) Support of professional organizations.

COST AND SAVINGS SUMMARY

Year	Annual cost ($)	Annual savings (mgd)
2007	-	-
2008	-	-
2009	$48,670	-
2010	$81,117	-

Package D3	**Social marketing**

DESCRIPTION

Conduct an integrated series of three in-depth workshops using social marketing techniques to form the basis of this neighborhood based program. Key components include door-to-door recruiting, signing of a "commitment' to take action, and use of local garden expertise, valuable hand-outs, hands-on training, and incentives. Workshop topics include water efficiency, natural lawn care, use of native plants, reducing lawn size, building healthy soils, and managing yard and garden pests without the use of pesticides.

SCHEDULE AND PRODUCTION RATES

Plan in fall-winter, perhaps of 2010; implement the following April and evaluate in November. Evaluate first year's effort and revise as needed. If possible, increase to two neighborhoods in subsequent years.

CRITICAL TASKS

1 - Gather/review input/materials/evaluations from Seattle and others.

2 - Develop plan/timeline; identify neighborhood and resources.

3 - Organize resources (experts, sponsors, materials, venue, incentives).

4 - Recruit participants using direct mail, door-to-door, reminders.

5 - Conduct/evaluate three workshops.

RESOURCES NEEDED

a) Mostly conservation staff labor.

b) Door-to-door recruiters could be volunteers or interns (other utilities have contracted for this work).

c) Incentives may include soaker hoses, rain barrels (a local Tacoma company makes these), mulching mowers, conservation kits.

COST AND SAVINGS SUMMARY

Year	Annual cost ($)	Annual savings (mgd)
2007	-	-
2008	-	-
2009	-	-
2010	$81,117	-

Package D4	Intergovernmental & regional cooperation

DESCRIPTION

Contninue to work with key regional actors, including the Saving Water Partnership, Cascade Water Alliance, and the Water Conservation Coalition of Puget Sound.

SCHEDULE AND PRODUCTION RATES

Plan and implement as needed.

CRITICAL TASKS

1 - Review past intergovernmental obligations and results.
2 - Determine opportunities for cooperation, leveraging.
3 - Attend meetings/participate in activities.

RESOURCES NEEDED

a) Conservation staff.

COST AND SAVINGS SUMMARY

Year	Annual cost ($)	Annual savings (mgd)
2007	-	-
2008	$25,987	-
2009	$16,223	-
2010	$16,223	-

APPENDIX A – TACOMA WATER PAST CONSERVATION ACCOMPLISHMENTS

1987	• Drought leads to mandatory outdoor watering restrictions. • Began working with Simpson Tacoma Kraft, resulting in usage reduced by nearly a third (30 MGD to 21 MGD from 1990-1999, or 9 MGD savings).
1989	• Helped Metro Parks Tacoma install latest central irrigation system technology at 20 parks. Resulted in savings of 30 percent at one park, and reduced maintenance costs. Expanded project in 1999 with similar changes at eight Public Utilities and Metro Parks Tacoma sites.
1991	• Developed water conservation plan. • Supported 1991 Washington State plumbing code changes, which conformed to 1992 Federal EPA act changes (1.6 gallon per flush toilets, 2.5 gallon per minute showerheads). Code changes alone estimated to have saved more than 1.1 million gallons per day (MGD). • Commission water reuse and reclamation studies for industrial customer(s). No measures cost-effective yet.
1992	• Revised residential and wholesale rate structure to include 25 percent higher summer rate. Eliminated declining block rate for commercial, industrial, parks, and irrigation customers. • Amended contract with Simpson Tacoma Kraft to encourage water use reduction without financial penalties. • Drought leads to water use restrictions and rate surcharge. Hired water conservation specialist.
1993	• Watt & Water program – showerhead and faucet aerator installations, plus toilet retrofit kits. 90 percent retention after six months, with estimated savings of 0.24 MGD.
1994	• Commission more water reuse and reclamation studies for industrial customers(s). None cost-effective yet. • Three industrial customers (Atlas Foundry, Pabco Roofing, PW Pipe) begin recirculating cooling water, resulting in 75 percent-97 percent savings. • Outdoor water use reduction campaign through mass media (bill enclosures, advertising, etc.) and personal contact (water conservation seminars for homeowners and landscape professionals).
1995	• Provided City of Tacoma and Pierce County with information about landscape policies for water conservation.
1996	• Continued normal program offerings

1997	• Conservation program assessment performed by CH2M Hill. Recommends program budget of $1.04 million. Recommended program elements include: o Indoor Water Audit Program would target ten of top 25 industrial water users, and 125 public buildings using over 1000 CCF/year. o Commercial/Institutional Low-flow Showerhead Program would distribute 10,000 showerheads to hotels, assisted living residences, schools, health clubs, and hospitals through direct contact and trade allies. Also provide showerheads to Indoor Water Audit and Toilet Rebate program participants. o Toilet Rebate Program would provide up to 1,000 rebates ($80, $200) to C/I customers with indoor usage greater than 1,000 CCF/year. o Landscape Rebate Program for outdoor water use in nearly all customer classes. Rebates from $50/sq. ft. for homes to $330/acre for commercial/public facilities for irrigation controls, audits, landscaping materials. Up to 50 visits to key sites. • More water reuse and reclamation studies for industrial customers(s). None cost-effective yet. • WashWise provides rebates for 400 efficient washing machines. Collaboration with other utilities through the Northwest Energy Efficiency Alliance.
1998	• Implemented 1997 CPA Landscape recommendation - Began customer survey of average and high user groups to determine differences in how groups care for lawns. Survey information used to develop appropriate information for varied residential groups. High water-use residential customers were notified of consumption patterns.
1999	• Implemented 1997 CPA ICI recommendation – Large industrial audit program for six biggest users (Pioneer Chlor-Alkali, US Oil, G-P Gypsum, Continental Lime, Nalleys and Tacoma Public Works incinerator). Audits provide information for tailoring attractive water savings options for businesses. Estimated savings potential is 1.14 MGD pending customer implementation. Several of these businesses subsequently ceased operations. • Sponsored Tacoma Public Library's Summer Reading Program.

2000	• 30-second video public service announcement citing "*Water is Too Precious to Waste*." The PSA was aired free 450 times on Click! stations. Another 6 minute video section was aired on *CityScape* via Tacoma's TV 12 in September, highlighting *"...Fall Yard Work Tips that Save $$ & Water"*. • Two *CityLine* appearances. Topics covered general water conservation, and the Fall Native plant sale at the Nature Center. • Placed a full-page advertisement in the Tacoma News Tribune featuring a nurse with a by-line that read, *"Your Prescription for a Long Hot Summer."* The ad ran eight times during the peak water use season (June, July and August.)
2001	• Inter-industrial recycle/reuse evaluation from 2000 Industrial Audit. Looked at combining waste water between Tide Flats industries to reuse. Preliminary estimates of $8.44 million with $73,500 O&M costs to save 1.1 MGD. (Several businesses which were the source of the reuse water have subsequently ceased operations.) • Implementation of 1997 CPA landscape recommendations – residential high-use customers were notified of conservation patterns and offered soil probes and rain gauges.
2002	• Coordinated with Tacoma Power to host pilot clothes washer rebate program. Provided 145 of the 319 TPU rebates. • Implemented 1997 CPA recommendation - Audits for second-tier large water users, including Tacoma/Pierce County Jail (pre-construction), Pt. Defiance Park, Tacoma General Hospital, St. Joseph's Hospital, two elementary schools, and the Tacoma Lutheran Home. Estimated water savings potential is 0.14 MGD pending customer implementation.
2003	• Continued with Tacoma Power to provide a clothes washer rebate program. Provided 217 of the 682 TPU rebates. • Sent conservation reminder letter to 2,125 residential high-use customers.
2004	• Continued with Tacoma Power to provide a clothes washer rebate program. Provided share of 349 TPU rebates. Over the three years Tacoma Public Utilities issued 1350 rebates. • Distributed 5,000 native plant posters and 1,500 books, which were very popular with customers. • Reprinted conservation literature, updated website, distribute and mail info. Conservation support for wholesalers. Various youth education events and public information campaigns. • Participated in regional public awareness radio campaign (Water Use It Wisely).

2005	• Provided consultation and $55,000 in funding for four new Tacoma Police substations that were designed with “Resource-Efficient Demonstration Gardens”. • Produced and distributed a second round of 5,000 native plants posters along with over 1,000 books on native plants to customers and Master Gardeners.
Ongoing annually	• Conservation messages conveyed to customers via utility bill enclosures, advertising campaigns, newspaper articles, community TV, brochures, booths at fairs and community events, speaking to community groups and water efficiency seminars. • Conservation support for wholesalers. • Classroom programs and teacher training on water conservation, various youth education events and public information campaigns. Supply rain gauges, soil probes, and literature at these events. • Supply faucet aerators and showerheads to customers.

APPENDIX B – 2006 CONSERVATION PROGRAM ASSESSMENT TACOMA WATER SUMMARY REPORT

The 2006 Conservation Program Assessment Tacoma Water Summary Report is on file with Tacoma Water

APPENDIX O

TACOMA WATER SERVICE AREA MAPS

add
Pocket
Here

APPENDIX P

WATER RIGHTS SELF ASSESSMENT

Water Right Self-Assessment *for Existing Water Right Status*											
						Existing Water Rights		**Existing Consumption**		**Current Water Right Status (Excess/Deficiency)**	
	Permit Certificate or Claim #	**Name of Rightholder or Claimant**	**Priority Date**	**Source Name/Number**	**Primary or Supplemental**	**Maximum Instantaneous Flow Rate (Qi) gpm**	**Maximum Annual Volume (Qa) A/F**	**Maximum Instantaneous Flow Rate (Qi) gpm**	**Maximum Annual Volume (Qa) A/F**	**Maximum Instantaneous Flow Rate (Qi) gpm**	**Maximum Annual Volume (Qa) A/F**
1	WRC2298	City of Tacoma	2/8/1906	Green River	P	50,725	81,800	50,725	63,460	0	18,340
2	S1-00726P	City of Tacoma	2/7/1933	Green River	P	44,890	72,397	45,139	New source	0	New source
3	C10616	City of Tacoma	11/21/1968	Prairie Ridge Springs	P	565	450	400	30	50	420
4	C216D	City of Tacoma	12/1/1930	Well 1B	P	3075	603	2800	603	275	0
5	C783A	City of Tacoma	3/1/1948	Well 1B	P	incl above	1028	incl above	864	incl above	164
6	C217D	City of Tacoma	5/1/1930	Well 2A	P	2025	393	0	0	2025	393
7	C784A	City of Tacoma	3/1/1948	Well 2A	P	incl above	681	0	0	incl above	681
8	C1207A	City of Tacoma	12/8/1948	Well 2B	P	3600	2122	1950	12	1650	2110
9	C218D	City of Tacoma	2/1/1931	Well 3A	P	3820	749	3020	749	800	0
10	C783A	City of Tacoma	3/1/1948	Well 3A	P	incl above	1277	incl above	1130	incl above	147
11	C219D	City of Tacoma	12/1/1930	Well 4A	P	1572	322	915	75	657	247
12	C784A	City of Tacoma	3/1/1948	Well 4A	P	incl above	512	0	0	incl above	512
13	C220D	City of Tacoma	12/1/1930	Well 5A	P	5900	1154	4550	1154	1350	0
14	C783A	City of Tacoma	3/1/1948	Well 5A	P	incl above	1975	incl above	1538	incl above	437
15	C221D	City of Tacoma	7/1/1940	Well 6B	P	3210	629	2910	629	300	0
16	C784A	City of Tacoma	3/1/1948	Well 6B	P	incl above	1073	incl above	88	incl above	985
17	C222DC	City of Tacoma	9/1/1939	Well 7B	P	1126	221	975	221	151	0
18	C783A	City of Tacoma	3/1/1948	Well 7B	P	incl above	375	incl above	54	incl above	321
19	C223D	City of Tacoma	7/1/1940	Well 8B	P	4337	853	3280	853	1057	0
20	C783A	City of Tacoma	3/1/1948	Well 8B	P	incl above	1447	incl above	395	incl above	1052
21	C1566A	City of Tacoma	3/1/1949	Well 9A	P	5500	3730	0	0	5500	3730
22	C2665AC	City of Tacoma	9/16/1947	Well 10C	P	600	968	560	164	40	804
23	C2665BC	City of Tacoma	9/16/1947	Well 10B	P	600	952	0	0	600	952
24	C513A	City of Tacoma	9/16/1947	Well 11A	P	9500	5100	7750	1467	1750	3633
25	C2873A	City of Tacoma	8/22/1955	Well 12A	P	6000	4242	3480	1140	2520	3102
26	G2-27860C	City of Tacoma	8/14/1990	Well 13A	P	750	890	750	386	0	504
27	G2-27861P	City of Tacoma	8/14/1990	Well 14A	S	2700	3000	0	0	2700	3000
28	C131A	City of Tacoma	9/12/1946	Well SE-2	P	350	526	350	82	0	444
29	C1036A	City of Tacoma	2/5/1951	Well SE-2	P	250	146	100	0	150	146
30	C5686A	City of Tacoma	1/24/1966	Well SE-6	S	750	1210	430	79	320	1131
31	C5687A	City of Tacoma	9/28/1966	Well SE-6	S	50	80	0	0	50	80
32	C6490A	City of Tacoma	5/8/1968	Well SE-7	S	800	466	0	0	800	466
33	C3374A	City of Tacoma	3/11/1959	Well SE-7	S	230	370	0	0	230	370
34	C7085A	City of Tacoma	10/24/1969	Well SE-8	S	500	400	400	60	100	340
35	G2-20021C	City of Tacoma	3/7/1972	Well SE-10	S	1000	800	0	0	1000	800
36	G2-26094C	City of Tacoma	2/25/1982	Well SE-11	S	1000	800	790	132	210	668
37	C130A	City of Tacoma	9/15/1945	Well SE-11A	P	500	811	425	75	75	736
38	C2872A	City of Tacoma	4/9/1957	Well SE-11A	P	260	416	0	0	260	416
39	G1-00469C	City of Tacoma	8/24/1970	North Fork Well Field	S	58,300	30,244	36,800	16,870	21500	13374
40	G2-27023C	City of Tacoma	12/9/1986	Tide Flats #1 Well	P	1,050	740	0	0	1050	740

Water Right Self-Assessment *for Existing Water Right Status*											
						Existing Water Rights		**Existing Consumption**		**Current Water Right Status (Excess/Deficiency)**	
	Permit Certificate or Claim #	**Name of Rightholder or Claimant**	**Priority Date**	**Source Name/Number**	**Primary or Supplemental**	**Maximum Instantaneous Flow Rate (Qi) gpm**	**Maximum Annual Volume (Qa) A/F**	**Maximum Instantaneous Flow Rate (Qi) gpm**	**Maximum Annual Volume (Qa) A/F**	**Maximum Instantaneous Flow Rate (Qi) gpm**	**Maximum Annual Volume (Qa) A/F**
41	G2-27023C	City of Tacoma	12/9/1986	Tide Flats #1 Well	S	incl above	100	0	0	incl above	100
42	C215D	City of Tacoma	1/1/1928	Tide Flats #1 Well	P	1,050	100	0	0	1050	100
43	G2-28279P	City of Tacoma	9/23/1991	Tide Flats #2 Well	S	1,300	1400	0	0	1300	1400
44	C7318A	City of Tacoma	12/19/1962	Gravity Wells #1 and #2	S	6,400	5,120	5550	473	850	4647
45	G2-28977P	City of Tacoma	12/16/1993	Fred 1 Well	S	1,000	1,075	0	0	1000	1075
46	G2-23895C	City of Tacoma	7/14/1975	Portland Avenue Well	P	1,200	1,130	1040	101	160	1029
47	C715B	City of Tacoma	5/1/1948	Well UP-1	P	300	480	300	369	0	111
48	C1053A	City of Tacoma	11/29/1950	Well UP-1	S	1,000	700	740	0	260	700
49	C5858A	U.P. Water Co.	8/15/1966	Well UP-10	S	1,500	2,400	0	0	1500	2400
50	590D	U.P. Water Co.	5/1/1945	UP Well 4	P	500	356	0	0	500	356
51	591D	U.P. Water Co.	5/1/1945	UP Well 3	P	300	214	0	0	300	214
52	2904A	U.P. Water Co.	10/7/1952	UP Well 8	P	750	528	0	0	750	528
53	2904A	U.P. Water Co.	10/7/1952	UP Well 8	S	incl above	672	0	0	incl above	672
54	4261A	U.P. Water Co.	5/9/1961	UP Well 9	P	1,200	1,920	0	0	1200	1920
55	G2-00097C	U.P. Water Co.	6/11/1970	UP Well 11	S	1,000	800	0	0	1000	800
56	G2-00033C	U.P. Water Co.	11/18/1971	UP Well 12	P	1,400	143	0	0	1400	143
57	G2-00033C	U.P. Water Co.	11/19/1971	UP Well 12	S	incl above	1457	0	0	incl above	1457
58	C49D	City of Tacoma		Flowing #1	P	25	33	0	0	25	33
59	C50D	City of Tacoma		Flowing #3	P	5	7	0	0	5	7
60	C51D	City of Tacoma		Flowing #5	P	100	115	0	0	100	115
61	C52D	City of Tacoma		Flowing #6	P	100	115	0	0	100	115
62	C159A	City of Tacoma	4/23/1948	DP#2	P	400	200	0	0	400	200
63	C5632A	City of Tacoma	9/26/1966	DP#1	S	250	314	0	0	250	314
64	C5656A	City of Tacoma	9/26/1966	DP#3	S	250	314	0	0	250	314
	Totals	*	*	*	*	**235,565**	**245,644**	**176,129**	**93,253**	**59,570**	**79,994**

Water Right Self-Assessment for Projected Water Right(s) Status

	Permit Certificate or Claim #	Name of Rightholder or Claimant	Priority Date	Source Name/Number	Primary or Supplemental	Existing Water Rights		Forecasted Water Use From Sources (20 Year Demand)		Forecasted Water Right Status (Excess/Deficiency)	
						Maximum Instantaneous Flow Rate (Qi) gpm	Maximum Annual Volume (Qa) A/F	Maximum Instantaneous Flow Rate (Qi) gpm	Maximum Annual Volume (Qa) A/F	Maximum Instantaneous Flow Rate (Qi) gpm	Maximum Annual Volume (Qa) A/F
1	WRC2298	City of Tacoma	2/8/1906	Green River	P	50,725	81,800	50,725	81,800	0	0
2	S1-00726P	City of Tacoma	2/7/1933	Green River	P	44,880	72,397	44,880	13,400	0	4,500
3	C10616	City of Tacoma	11/21/1968	Prairie Ridge Springs	P	565	450	400	30	165	420
4	C216D	City of Tacoma	12/1/1930	Well 1B	P	3075	603	2800	603	275	0
5	C783A	City of Tacoma	3/1/1948	Well 1B	P	incl above	1028	incl above	864		164
6	C217D	City of Tacoma	5/1/1930	Well 2A	P	2025	393	2025	393	0	0
7	C784A	City of Tacoma	3/1/1948	Well 2A	P	incl above	681	incl above	681		0
8	C1207A	City of Tacoma	12/8/1948	Well 2B	P	3600	2122	2950	1000	650	1,122
9	C218D	City of Tacoma	2/1/1931	Well 3A	P	3820	749	3020	749	800	0
10	C783A	City of Tacoma	3/1/1948	Well 3A	P	incl above	1277	incl above	1130		147
11	C219D	City of Tacoma	12/1/1930	Well 4A	P	1572	322	915	322	657	0
12	C784A	City of Tacoma	3/1/1948	Well 4A	P	incl above	512	incl above	200		312
13	C220D	City of Tacoma	12/1/1930	Well 5A	P	5900	1154	4550	1154	1,350	0
14	C783A	City of Tacoma	3/1/1948	Well 5A	P	incl above	1975	incl above	1538		437
15	C221D	City of Tacoma	7/1/1940	Well 6B	P	3210	629	3210	629	0	0
16	C784A	City of Tacoma	3/1/1948	Well 6B	P	incl above	1073	incl above	1000		73
17	C222DC	City of Tacoma	9/1/1939	Well 7B	P	1126	221	975	221	151	0
18	C783A	City of Tacoma	3/1/1948	Well 7B	P	incl above	375	incl above	200		175
19	C223D	City of Tacoma	7/1/1940	Well 8B	P	4337	853	3280	853	1,057	0
20	C783A	City of Tacoma	3/1/1948	Well 8B	P	incl above	1447	incl above	1000		447
21	C1566A	City of Tacoma	3/1/1949	Well 9A	P	5500	3730	3500	2000	2,000	1,730
22	C2665AC	City of Tacoma	9/16/1947	Well 10C	P	600	968	560	164	40	804
23	C2665BC	City of Tacoma	9/16/1947	Well 10B	P	600	952	0	0	600	952
24	C513A	City of Tacoma	9/16/1947	Well 11A	P	9500	5100	7750	1467	1,750	3,633
25	C2873A	City of Tacoma	8/22/1955	Well 12A	P	6000	4242	3480	1140	2,520	3,102
26	G2-27860C	City of Tacoma	8/14/1990	Well 13A	P	750	890	750	386	0	504
27	G2-27861P	City of Tacoma	8/14/1990	Well 14A	S	2700	3000	2700	1000	0	2,000
28	C131A	City of Tacoma	9/12/1946	Well SE-2	P	350	526	350	82	0	444
29	C1036A	City of Tacoma	2/5/1951	Well SE-2	P	250	146	100	0	150	146
30	C5686A	City of Tacoma	1/24/1966	Well SE-6	S	750	1210	430	79	320	1,131
31	C5687A	City of Tacoma	9/28/1966	Well SE-6	S	50	80	0	0	50	80
32	C6490A	City of Tacoma	5/8/1968	Well SE-7	S	800	466	0	0	800	466
33	C3374A	City of Tacoma	3/11/1959	Well SE-7	S	230	370	0	0	230	370
34	C7085A	City of Tacoma	10/24/1969	Well SE-8	S	500	400	400	60	100	340
35	G2-20021C	City of Tacoma	3/7/1972	Well SE-10	S	1000	800	0	0	1,000	800
36	G2-26094C	City of Tacoma	2/25/1982	Well SE-11	S	1000	800	790	132	210	668
37	C130A	City of Tacoma	9/15/1945	Well SE-11A	P	500	811	425	75	75	736
38	C2872A	City of Tacoma	4/9/1957	Well SE-11A	P	260	416	0	0	260	416
39	G1-00469C	City of Tacoma	8/24/1970	North Fork Well Field	S	58,300	30,244	36,800	20,000	21,500	10,244
40	G2-27023C	City of Tacoma	12/9/1986	Tide Flats #1 Well	P	1,050	740	0	0	1,050	740

Water Right Self-Assessment for Projected Water Right(s) Status												
						Existing Water Rights		Forecasted Water Use From Sources (20 Year Demand)		Forecasted Water Right Status (Excess/Deficiency)	
	Permit Certificate or Claim #	Name of Rightholder or Claimant	Priority Date	Source Name/Number	Primary or Supplemental	Maximum Instantaneous Flow Rate (Qi) gpm	Maximum Annual Volume (Qa) A/F	Maximum Instantaneous Flow Rate (Qi) gpm	Maximum Annual Volume (Qa) A/F	Maximum Instantaneous Flow Rate (Qi) gpm	Maximum Annual Volume (Qa) A/F
41	G2-27023C	City of Tacoma	12/9/1986	Tide Flats #1 Well	S	incl above	100	0	0		100
42	C215D	City of Tacoma	1/1/1928	Tide Flats #1 Well	P	1,050	100	0	0	1,050	100
43	G2-28279P	City of Tacoma	9/23/1991	Tide Flats #2 Well	S	1,300	1400	0	0	1,300	1,400
44	C7318A	City of Tacoma	12/19/1962	Gravity Wells #1 and #2	S	6,400	5,120	5550	473	850	4,647
45	G2-28977P	City of Tacoma	12/16/1993	Fred 1 Well	S	1,000	1,075	0	0	1,000	1,075
46	G2-23895C	City of Tacoma	7/14/1975	Portland Avenue Well	P	1,200	1,130	1040	101	160	1,029
47	C715B	City of Tacoma	5/1/1948	Well UP-1	P	300	480	300	369	0	111
48	C1053A	City of Tacoma	11/29/1950	Well UP-1	S	1,000	700	740	0	260	700
49	C5858A	U.P. Water Co.	8/15/1966	Well UP-10	S	1,500	2,400	0	0	1,500	2,400
50	590D	U.P. Water Co.	5/1/1945	UP Well 4	P	500	356	0	0	500	356
51	591D	U.P. Water Co.	5/1/1945	UP Well 3	P	300	214	0	0	300	214
52	2904A	U.P. Water Co.	10/7/1952	UP Well 8	P	750	528	0	0	750	528
53	2904A	U.P. Water Co.	10/7/1952	UP Well 8	S	incl above	672	0	0		672
54	4261A	U.P. Water Co.	5/9/1961	UP Well 9	P	1,200	1,920	0	0	1,200	1,920
55	G2-00097C	U.P. Water Co.	6/11/1970	UP Well 11	S	1,000	800	0	0	1,000	800
56	G2-00033C	U.P. Water Co.	11/18/1971	UP Well 12	P	1,400	143	0	0	1,400	143
57	G2-00033C	U.P. Water Co.	11/19/1971	UP Well 12	S	incl above	1457	0	0		1,457
58	C49D	City of Tacoma		Flowing #1	P	25	33	0	0	25	33
59	C50D	City of Tacoma		Flowing #3	P	5	7	0	0	5	7
60	C51D	City of Tacoma		Flowing #5	P	100	115	0	0	100	115
61	C52D	City of Tacoma		Flowing #6	P	100	115	0	0	100	115
62	C159A	City of Tacoma	4/23/1948	DP#2	P	400	200	0	0	400	200
63	C5632A	City of Tacoma	9/26/1966	DP#1	S	250	314	0	0	250	314
64	C5656A	City of Tacoma	9/26/1966	DP#3	S	250	314	0	0	250	314
	Totals	*	*	*	*	**235,555**	**245,644**	**185,395**	**135,295**	**50,160**	**55,852**

APPENDIX Q

CROSS CONNECTION CONTROL PROGRAM SUMMARY

Cross Connection Control
Program Summary

Tacoma Water administers an effective cross connection control program in accordance with Washington Administrative Code (WAC) 246-290-490. It currently meets or exceeds each of the 10 minimum elements of a cross connection control program as outlined in WAC246-290-490(3). The following paragraphs summarize how Tacoma Water is meeting the requirements of each of the 10 elements.

Element 1

Tacoma Water has established its legal authority to administer and enforce the cross connection control program through the adoption of City Ordinance and Customer Service Policies. Currently Tacoma Municipal Code (TMC) 12.10.220 provides that control and/or elimination of cross connections shall be in accordance with the applicable sections of the WAC, TMC, and policies/provisions and/or procedures established by Tacoma Water.

The Tacoma Water Customer Service Policies Section 16 and various sections of the TMC provide the technical provisions and operating policies of the cross connection control program. Corrective actions to be used for the enforcement of the cross connection program are detailed in the TMC. Failure to comply with the Tacoma Water cross connection control program requirements may result in the following corrective actions: Assessment of a penalty fee of $100.00 per occurrence, installation of an approved backflow prevention assembly at the water meter at the expense of the customer, and/or termination of water service. Tacoma Water defines an occurrence as failure to install, test, repair and/or replace a required backflow prevention assembly upon written notification.

Element 2

Tacoma Water has developed and implemented procedures for evaluating all new and existing water services and ensuring that all cross connections are either eliminated or controlled by the installation of approved backflow prevention.

All new water services are evaluated for cross connection control requirements at the time application is made for water service. For those services requiring backflow prevention water service is not provided until approved backflow prevention is installed and inspected by a Tacoma Water Cross Connection Control Specialist. Tacoma Water installs those services requiring backflow prevention in the off position and places an administrative hold on the service so that billing may not be started until the inspection has been completed.

Tacoma Water is currently evaluating all existing water services for compliance with the cross connection control requirements. Inspections are prioritized by the hazard level of the facility the water is serving. Services to those facilities defined in Table 9 of WAC 246-290-490 are currently being evaluated. In addition Tacoma Water performs water use surveys of non-Table 9 facilities during inspections performed as part of the building occupancy process. Any deficiency found during a water use survey or other routine inspection is required to be corrected within 30 – 90 days depending on the hazard level.

Element 3

In addition to the activities described above Tacoma Water inspects all new backflow prevention installations for compliance with Tacoma Water installation standards. Those installations found not to be in compliance with Tacoma Water standards are required to be corrected within 30 days or the customer may be subjected to the corrective action described above in Element 1. Tacoma Water installation standards are in addition to the minimum standards as defined in Section 6 of WAC 246-290-490.

Element 4

Tacoma Water currently has 4 personnel certified as a Cross Connection Control Specialist (CCS). One person is designated as the Cross Connection Control Program Manager and is responsible for the overall program implementation.

Element 5

Tacoma Water ensures that all backflow preventers installed for the purpose of protecting the public water system are inspected and tested annually as a minimum. Tacoma Water may increase the testing frequency for any assembly it believes to be operationally questionable.

Tacoma Water notifies the customer in writing of the test due date and does provide the customer a listing of available testers. The customer is responsible to hire a certified Backflow Assembly Tester (BAT) to perform the annual testing. The customer has 30 days to complete the testing and provide Tacoma Water with a copy of the backflow assembly test report. If Tacoma Water does not receive a satisfactory test report a reminder notice is sent to the customer. If after the second reminder notice Tacoma Water does not receive a satisfactory test report the customer is notified by certified mail that enforcement action as described in Element 1 will be taken.

Element 6

Tacoma Water requires all persons submitting test reports to provide a copy of their BAT card and test equipment calibration certificate. Test reports are not accepted until we have received satisfactory documentation of tester and test kit certification. All test reports must be submitted within 30 days of testing and must be completed in ink. The tester must sign and date the test report form. Tacoma Water has published requirements for submitting test reports and requires all testers to sign a statement of acknowledgement prior to being placed on the Tacoma Water Backflow Assembly Tester List.

Element 7

Tacoma Water has an established incident response procedure that is used to help all personnel identify and properly respond to any cross connection incident. The Water Quality Section has a person on call 24 hrs a day to respond to water quality concerns. All of the on-call personnel are certified as a CCS. We maintain sample containers and water quality analysis equipment to help expedite the evaluation of any potential problems.

Element 8

Tacoma Water provides for public information on the cross connection program in a variety of ways. Some of them include; information in the Consumer Confidence Report, distribution of pamphlets and brochures, and utility bill inserts. Tacoma Water also sponsors a booth at the Puyallup Fair where 50% of the booth is dedicated to cross connection control.

Element 9

Tacoma Water maintains the records associated with the cross connection control program using the program XC2. XC2 provides a comprehensive database that allows Tacoma Water to track all backflow prevention assembly installations, inspections, and testing. It also allows us to maintain Backflow Assembly Tester records and to track surveys of new and existing facilities.

Tacoma Water maintains an electronic record of all assemblies for the life of the assembly and paper records of each assembly for a minimum of 1 year.

Element 10

All facilities that produce and/or receive reclaimed water within the Tacoma Water service area are required to install a reduced principle backflow assembly (RPBA) at the water meter as a condition of water service.