Regional Wastewater Services Plan

2005 Annual Report

September 2006

King County
Department of Natural Resources and Parks
Wastewater Treatment Division

Regional Wastewater Services Plan (RWSP)

RWSP 2005 Annual Report

September 2006

King County
Department of Natural Resources and Parks
Wastewater Treatment Division
King Street Center, KSC-NR-0512
201 South Jackson Street
Seattle, WA 98104
http://dnr.metrokc.gov/wtd/

For comments or questions, contact:
Debra Ross
King County Wastewater Treatment Division
201 South Jackson Street
KSC-NR-0512
Seattle, WA 98104-3856
206-684-1531
debra.ross@metrokc.gov

This information is available in alternative formats on request at 206-684-1280 (voice) or 711 (TTY).

Table of Contents

List of Tables

List of Figures

Appendices

Executive Summary

The Regional Wastewater Services Plan (RWSP) outlines a number of important projects, programs, and policies for King County to implement through 2030 to continue to protect public health and water quality and ensure sufficient wastewater capacity to meet future growth needs. In adopting the RWSP in 1999, the Metropolitan King County Council recognized the importance of reviewing the implementation of the RWSP on a regular basis. As a result, the council adopted specific RWSP reporting policies in March 2006 that call for regular reviews and updates associated with implementing the RWSP.[1]

The Wastewater Treatment Division (WTD) of the King County Department of Natural Resources and Parks (DNRP) has prepared the *RWSP 2005 Annual Report* in accordance with the RWSP reporting policies. The report presents the activities and accomplishments of implementing the RWSP in 2005. Highlights of the report are provided in this executive summary.

Brightwater Treatment System

The RWSP calls for building a third regional wastewater treatment plant by 2010, now known as 'Brightwater', to accommodate growth in the northern portion of King County's wastewater service area. The new facilities will include a 36 million gallons per day (mgd) treatment plant, conveyance (pipes and pumps that take the wastewater to and from the plant), and a marine outfall that will discharge effluent (treated wastewater) from the Brightwater Treatment Plant into Puget Sound. The Brightwater conveyance system consists of approximately 14 miles of pipeline built in underground tunnels.

The Brightwater project remains on schedule for completion in 2010. Significant efforts in 2005 included:

- Prepared a supplemental environmental impact statement to evaluate potential environmental impacts that could result if an earthquake were to damage Brightwater facilities at the treatment plant site.
- Initiated final design on the treatment plant and conveyance system, including additional value engineering review.
- Secured agreements with property owners to purchase all 25 treatment plant parcels and acquire 92 percent of conveyance parcels and easements.
- Acquired nearly all major permits needed for construction.
- Continued to involve the public and stakeholders in the design and permitting processes.

[1] The Metropolitan King County Council adopted specific RWSP reporting policies in May 2006 via Ordinance 15384. The RWSP annual report reporting policies are provided in Chapter 1 of this report.

- Developed and signed Project Labor Agreements with building and construction trades councils.
- Met the King County Council's provisos in the 2005 budget (monthly cost reports, baseline budget, hiring of oversight consultant).
- Incorporated a reclaimed water "backbone" into the design of the conveyance system.
- Negotiated mitigation agreements with Snohomish County and other affected jurisdictions.
- Developed a cost trend based on preliminary cost estimates for the treatment plant from the General Contractor/Construction Manager (GC/CM).[2]

More details on the Brightwater Treatment System and accomplishments in 2005 are provided in Chapter 2 of this report.

Conveyance System Improvements

King County's regional wastewater conveyance system consists of more than 335 miles of pipes and 42 pump stations that move wastewater from local communities to the county's two regional wastewater treatment plants. Improvements to the county's conveyance system are being made in accordance with RWSP policies to meet the 20-year design storm and accommodate increased flows where needed.

Work began in 2005 to update the conveyance system improvement (CSI) plan. The update is scheduled to be transmitted to the King County Council in early 2007. Efforts associated with the plan update include identifying capacity constraints, age and condition of facilities, and conveyance needs in the combined system that are not addressed in the combined sewer overflow control plan.

The RWSP conveyance projects in design during 2005 include the Bellevue Pump Station Upgrade, Kent/Auburn Conveyance System Improvements, Hidden Lake Pump Station Replacement and Sewer Improvement, and Soos Creek Improvements. The CSI projects in construction during 2005 include the Fairwood Interceptor Sewer, Juanita Bay Pump Station Replacement, and Pacific Pump Station Replacement.

More details on the RWSP CSI projects and accomplishments in 2005 are provided in Chapter 3 of this report.

[2] GC/CM is an alternative project delivery method in which the contractor provides input into the design. During design, the owner and GC/CM negotiate a guaranteed maximum price for project construction. The GC/CM then manages construction and acts as general contractor.

Infiltration and Inflow Program

The RWSP calls for improvements to reduce existing and future levels of infiltration and inflow (I/I) into local collection systems. I/I is clean stormwater and groundwater that enter the sewer system through cracked pipes, leaky manholes, or improperly connected storm drains, down spouts, and sump pumps. Most inflow comes from stormwater and most infiltration comes from groundwater. I/I affects the size of King County conveyance and treatment systems and, ultimately, the monthly rates that businesses and residents pay to operate and maintain them.

A significant effort of WTD's I/I program in 2005 was the completion of a joint county/local agency comprehensive six-year study of I/I in the portions of the regional wastewater service area served by separated sewers. Based on the results of the study, the King County Council approved the *Executive's Recommended Regional Infiltration and Inflow Control Program* in May 2006. The recommendations represent the consensus reached by the county and the local agencies that send wastewater flows to the county's regional system for treatment and disposal.

The I/I program recommendations reflect the need to cost-effectively remove enough I/I from the collection system to delay, reduce, or eliminate some otherwise needed conveyance system improvement projects. The recommendations also reflect the need to maintain I/I reductions long-term to prevent future increases in I/I throughout the regional system. Long-term I/I control includes policy, administrative, financial, and technical measures that promote an ongoing program of review, maintenance, and repair of the collection and conveyance system.

More information on the I/I program and accomplishments in 2005 are provided in Chapter 4 of this report.

Combined Sewer Overflow Control

The RWSP calls for the control of all county combined sewer overflows (CSOs) by 2030.[3] The RWSP CSO control policies also call for development of a long-range sediment management strategy to prioritize cleanup of contaminated sediments at specific CSO locations.

More information on the 2005 accomplishments associated with the CSO control program, sediment management program, and efforts to improve water and sediment quality in the Lower Duwamish Waterway is provided in Chapter 5.

CSO Control Program

CSOs are events where untreated wastewater and stormwater from combined sewers discharge directly from outfall pipes into water bodies during heavy rainstorms when sewers are full.

[3] The Washington State Department of Ecology (Ecology) regulates the level of CSO control based on the number of untreated CSO events that occur in a year. Ecology defines "the greatest reasonable reduction" in CSOs (RCW 90.48) as being "control of each CSO in such a way that an average of one untreated discharge may occur per year" (WAC 173-245-020).

Combined sewers, which carry both wastewater and clean stormwater, exist in many parts of older cities across the nation, including Seattle. To protect treatment plants and avoid sewer backups into homes, businesses, and streets, combined sewers in Seattle sometimes overflow at specific locations (CSOs) into Puget Sound, the Duwamish Waterway, Elliott Bay, Lake Union, the Lake Washington Ship Canal, and Lake Washington. Although the wastewater in CSOs is greatly diluted by stormwater, CSOs may be harmful to public health and aquatic life because they can carry chemicals and disease-causing pathogens.

Many of these CSOs have been controlled through construction of CSO control facilities, which began in the late 1970s. Since 1988, when monitoring and measuring of CSO flows began, these control efforts have reduced CSO volumes by nearly 60 percent, from an estimated 2.4 billion gallons per year to approximately 900 million gallons per year.

Key achievements of the CSO control program in 2005 include completion and startup of the Mercer/Elliott West and Henderson/Norfolk CSO control systems and completion of substantial portions of the CSO program review, which was transmitted to the King County Council in spring 2006. The review confirmed the control strategies and schedules put forth in the RWSP. Further work will be done to assess CSO treatment technologies and to update the hydraulic model used to predict the effectiveness of CSO control. Results of these and other efforts, recommendations stemming from the results, and updated cost estimates for the program will be presented in the next program review, scheduled for 2010.

Lower Duwamish Waterway Superfund Site

King County continues to work to improve water quality in the Lower Duwamish Waterway through actions such as reducing CSOs, restoring habitats, capping and cleaning up sediments, and controlling toxicants from industries and stormwater runoff. WTD is partnering in an arrangement known as the Lower Duwamish Waterway Group (LDWG) with the City of Seattle, the Port of Seattle, and the Boeing Company under a consent agreement to prepare a remedial investigation and feasibility study for cleaning up sediments in the Lower Duwamish Waterway Superfund Site. This effort is in coordination with the U.S. Environmental Protection Agency (EPA) and the Washington State Department of Ecology (Ecology). The field studies needed to complete the remedial investigation have been finished. Work is under way on the feasibility study that will outline alternatives for the final cleanup of the site. The work on the feasibility study is expected to be complete by the end of 2007.

The LDWG is committed to undertaking four early action sites, which will clean up portions of the waterway years earlier than required. The county is participating in two of the early action sites at Diagonal/Duwamish CSO/Storm Drain and Slip 4.

Sediment Management Program

WTD is carrying out a sediment management plan developed in the late 1990s to remediate sediment contamination near some county CSO outfalls. The sediment in these areas is contaminated with a variety of heavy metals (lead, copper, zinc), phthalates, polychlorinated

biphenyls (PCBs), and hydrocarbons. Most of the contamination occurred in the first half of the 20th century, before industrial pretreatment standards were enforced.

WTD continues to move forward with the sediment management plan and continues its collaboration with public and private agencies and organizations to address environmental concerns in the Duwamish Waterway. The *Duwamish/Diagonal CSO/SD Sediment Remediation Project Closure Repo*rt was issued in July 2005; this report describes the dredging, transport, disposal, and capping methods that were used at the Duwamish/Diagonal location between November 2003 and March 2004.

Local Treatment Systems

At the request of the Vashon Sewer District and the City of Carnation, and in accordance with RWSP policies, King County extended its wastewater service area to meet specific public health needs and to help manage the environmental impacts of growth in these communities. The county is currently upgrading the Vashon Treatment Plant and constructing a new treatment plant in Carnation.

More information on the efforts associated with the Vashon and Carnation treatment plants in 2005 is provided in Chapter 6 of this report.

Vashon Treatment Plant

In 1999, King County started to manage and operate the Vashon Sewer District's wastewater treatment plant. The Vashon Sewer District owns and maintains the collection system that delivers wastewater from about 425 residential and commercial customers in and around the island's main business area.

In 2004, the county began upgrading the Vashon Treatment Plant. The upgraded facility will have increased capacity and enhanced backup systems. Improvements include new headworks, an oxidation ditch, two secondary clarifiers, a stormwater detention tank, an administration building, and an electrical building.

Construction in 2005 got off to a slow start because of the discovery of contaminated surface soils on site. The contaminants were likely deposited by fallout from the smokestacks of the Asarco Copper Smelter in Ruston, which operated from 1890 to 1996. After a soil management plan was developed and implemented, construction resumed in April 2005. Construction is expected to be complete in late 2006.

Carnation Treatment Plant

In 2002, the City of Carnation contracted with King County to design, build, operate, and maintain a new treatment plant and associated discharge facilities to replace onsite septic systems. The city will design, build, and operate the local wastewater collection system.

Several milestones were achieved in 2005, including selection of the treatment plant design and issuance of a facilities plan. In addition, EPA prepared an Environmental Assessment and issued a Finding of No Significant Impact under the National Environmental Policy Act. Construction of the treatment plant will begin in fall 2006.

Odor Control Program

The RWSP includes policy guidance to achieve King County's odor control goal and to carry out an odor prevention program that goes beyond traditional odor control. The county's goal is to prevent and control nuisance odor occurrences at all treatment plants and associated conveyance facilities.

Phased improvements are under way at the West Point and South Treatment plants to control the most significant potential odor sources first. Design on improvements to the West Point Plant's existing odor scrubber system and changes to the division channel ventilation system were completed in 2005. Design was completed on covers for each first pass of the four aeration basins and for the return activated sludge channel at South Plant. Several projects are also in progress to improve odor problems in the conveyance system.

More information on the achievements of the Odor Control Program in 2005 is provided in Chapter 7 of this report.

Biosolids Program

The RWSP policies guide the county to continue to produce and market Class B biosolids and to evaluate alternative technologies to produce the highest quality marketable biosolids, including Class A biosolids.[4,5] Biosolids are the nutrient-rich organic material produced by treating wastewater solids. After processing and treatment, they can be beneficially recycled as a fertilizer and soil amendment.

WTD continued to produce Class B biosolids at the county's regional treatment plants. Approximately 115,000 wet tons of biosolids were produced in 2005, all of which was recycled as a soil amendment in forestry and agricultural applications and to make compost.

More information on the Biosolids Program's accomplishments in 2005 is provided in Chapter 8 of this report.

[4] Class B biosolids refer to biosolids that have been treated to significantly reduce pathogens to levels that are safe for beneficial use in land application.

[5] Class A biosolids refer to biosolids that have been treated to reduce pathogens to below detectable levels. Biosolids that meet this designation can be used without site access or crop harvest restrictions, and are exempt from site specific permits. Federal regulations require Class A quality for biosolids that are sold or given away in a bag or other container, or applied to lawns or home gardens.

Reclaimed Water[6] and Water Conservation

RWSP water reuse policies call for the county to pursue the use of reclaimed water and to develop a water reuse program. Water reuse is also a component of the RWSP treatment plant policies.

WTD's regional treatment plants produced and used about 266 million gallons of reclaimed water in 2005 for landscape irrigation, internal plant reuse, and other non-drinking purposes. WTD moved ahead on predesign of a project to supply reclaimed water to the Sammamish Valley using conveyance lines from the Brightwater Treatment Plant. This project is known as the Brightwater reclaimed water backbone. More information on this effort is included in Chapter 2 of this report.

The RWSP policies also recognize the importance of supporting water conservation efforts. DNRP extended its water conservation program for an additional year to complete several projects that were started in 2005. In addition, DNRP continued its efforts to install water conserving fixtures for specific projects.

More information on the efforts in 2005 associated with the reclaimed water and water conservation programs is provided in Chapter 9 of this report.

RWSP Cost Estimates

RWSP reporting policies call for including in the RWSP annual reports an update of anticipated RWSP costs through the year 2030. Estimates of RWSP costs were first prepared in 1998 and then updated in 2003. The 2003 RWSP estimates were included in the *2004 RWSP Update*.[7] In addition to updating the cost of projects included in the 1998 estimate, the 2003 cost estimates included anticipated costs for projects and programs that resulted from implementing RWSP policies but that were not identified or included in the 1998 RWSP cost estimates. Such projects included the construction of the Carnation Treatment Plant, upgrades to the Vashon Treatment Plant, odor control improvements at West Point plant and South plant, and acquisition of and improvements to Snohomish County interceptors.

Cost estimates were updated in 2005. The 2005 cost estimate for implementing the projects and programs associated with the RWSP through 2030 is approximately $2.97 billion, an increase of $212 million from the 2003 RWSP cost estimate of approximately $2.76 billion in 2005$ dollars. The 2005 Brightwater cost trend estimates described in Chapter 2 of this report account for 89 percent ($189 million) of this increase.

The RWSP 2005 cost estimates include preliminary estimates for projects that are planned for the future, costs for projects that are in predesign, costs for projects that are in final design and construction, and costs for completed RWSP projects. Scopes and estimated costs for projects that are planned further out could change as more detailed information becomes available over

[6] King County's Reclaimed Water Program was formerly called the Water Reuse Program.
[7] The *2004 RWSP Update* is available on the Web at http://dnr.metrokc.gov/wtd/rwsp/library.htm#3yrupdate

time. Generally, cost estimates become less variable as projects near final design and construction.

The 2005 RWSP cost estimates, shown in Table 10-1 in Chapter 10 of this report, are based on the capital projects that were included in the 2003 cost estimate and RWSP projects that were identified after 2003. The 2005 RWSP cost estimates include adjustments for inflation, including cost increases that have occurred as the result of unforeseen circumstances such as the recent increases in global commodities. The 2005 estimates also reflect modifications to projects resulting from information gathered through flow monitoring, modeling, and cost analysis after 2003.

More details on the 2005 RWSP cost estimates are provided in Chapter 10 of this report.

Water Quality Management and Compliance

The RWSP water quality protection policies guide King County in identifying and resolving regional water quality issues, protecting public and environmental health, and protecting the public's investment in wastewater facilities and water resource management. The policies recognize that research and analysis are required and will be used to evaluate water quality of water bodies in WTD's wastewater service area.

To meet the water quality protection policies and protect public health, King County regularly monitors its major lakes, beaches, streams, marine waters, and wastewater effluent. In 2005, King County's wastewater treatment plants continued to be in compliance with the terms and conditions of their NPDES (National Pollutant Discharge Elimination System) permits.[8]

The Industrial Waste and Local Hazardous Waste Management Programs continue to work to control pollutants at their source, thereby keeping them out of the wastewater system and, in turn, out of surface waters and the environment. In 2005, the Industrial Waste Program (IWP) issued 129 permits and 288 industrial waste discharge authorizations and conducted 435 inspections. IWP continued to work on the Lower Duwamish Waterway (LDW) Source Control Project in support of the WTD's Sediment Management Program. In addition, IWP evaluated the area's biotechnology industry to assess the need to develop a streamlined permitting process to assist biotechnology facilities in meeting local, state, and federal discharge regulations.

The Local Hazardous Waste Management Program (LHWMP) is a consortium of the King County DNRP (the Water and Land Resources Division and the Solid Waste Division), the City of Seattle (Seattle Public Utilities), Public Health–Seattle & King County, and the Suburban Cities Association. The program provides technical assistance, reimbursement, and recognition to businesses that generate small quantities of hazardous waste. It also provides collection services for household hazardous wastes as well as public education aimed at proper handling and reduction in use of hazardous household products.

[8] NPDES permits are issued by Ecology and set limits on the quality and quantity of effluent (treated wastewater) discharged from point sources such as treatment plants, CSOs, and industrial facilities.

One service of the LHWMP is the EnviroStars Program, which provides businesses incentives and recognition for reducing hazardous waste, while giving consumers an objective way to identify environmentally sound practices. In 2005, the program added 39 King County businesses to its roster, bringing the total in the county to 354 businesses.

In 2005, more than 80,000 customers used the program's facilities or services to dispose of more than 1,800 tons of household hazardous waste. If these services were not available, much of this waste could have ended up in regional landfills, sewers, storm drains, and the environment.

More information on King County's water quality management and compliance activities and accomplishments in 2005 is provided in Chapter 11 of this report.

In addition to providing information on water quality management and compliance, the RWSP reporting policies call for a summary of the previous year's water quality monitoring results. The water quality monitoring results for 2005 are provided as Appendix D. In general, monitoring activities in 2005 found that the quality of marine and fresh waters in King County is good.

Chapter 1

Introduction

The purpose of the Regional Wastewater Services Plan (RWSP) 2005 Annual Report is to describe King County's progress in implementing the major elements of the RWSP for the year 2005. This report is presented in response to the RWSP reporting policies outlined in Ordinance 15384 and King County Code 28.86.165.[1]

Each chapter in this report describes accomplishments achieved in 2005 for major RWSP programs or projects. Chapters 2 through 9 also mention anticipated achievements for 2006. The subject matter of each chapter is as follows:

- Chapter 2 describes the progress made on the Brightwater Treatment System.
- Chapter 3 discusses the activities associated with the conveyance system improvement program and summarizes the progress made on RWSP conveyance projects that are in design and construction.
- Chapter 4 provides an update on the infiltration and inflow (I/I) program and summarizes the Executive's Recommended Regional I/I Program that was adopted by the Metropolitan King County Council in May 2006.
- Chapter 5 summarizes the key achievements of the Combined Sewer Overflow Control Program. It also describes efforts to improve water quality in the Lower Duwamish Waterway and the activities associated with the county's Sediment Management Program.
- Chapter 6 provides details on the progress made on the Vashon Treatment Plant upgrades and the design and environmental review processes for the Carnation Treatment Plant.
- Chapter 7 discusses the efforts carried out in 2005 to meet the RWSP policies to prevent and control nuisance odors at the county's treatment plants and conveyance facilities.
- Chapter 8 describes the activities and achievements of the biosolids program.
- Chapter 9 provides information on reclaimed water and water conservation activities in 2005.
- Chapter 10 provides an update of the RWSP cost estimates through 2030.
- Chapter 11 reports on the Wastewater Treatment Division's water quality management activities in 2005.

[1] Previous RWSP annual reports are available on the Web at http://dnr.metrokc.gov/wtd/rwsp/library.htm

The remainder of this chapter provides background information on King County's wastewater treatment system and the RWSP. The last section of the chapter lists the awards and recognitions received in 2005 associated with implementing the RWSP.

1.1 King County's Wastewater Treatment System

King County protects water quality and public health in the central Puget Sound region by providing high quality and effective treatment to wastewater collected from 17 cities and 17 local sewer utilities. The county's Wastewater Treatment Division (WTD) serves about 1.4 million people, including most urban areas of King County and parts of south Snohomish County and northeast Pierce County.

King County's wastewater system (Figure 1-1) includes two large regional treatment plants (the West Point Plant in the City of Seattle and the South Plant in the City of Renton), one small treatment plant on Vashon Island, one community septic system (Beulah Park and Cove on Vashon Island), four combined sewer overflow (CSO) treatment facilities (Alki, Carkeek, Mercer/Elliott West, and Henderson/Norfolk—all in the City of Seattle), over 335 miles of pipes, 19 regulator stations, 42 pump stations, and 38 CSO outfalls. Construction on two new treatment plants will begin in 2006: the Brightwater Treatment Plant, the system's third regional plant, scheduled for completion in 2010, and a smaller local treatment plant in the City of Carnation, scheduled for completion in 2007.

Visit WTD's Web site for more information on projects and programs:
http://dnr.metrokc.gov/wtd/

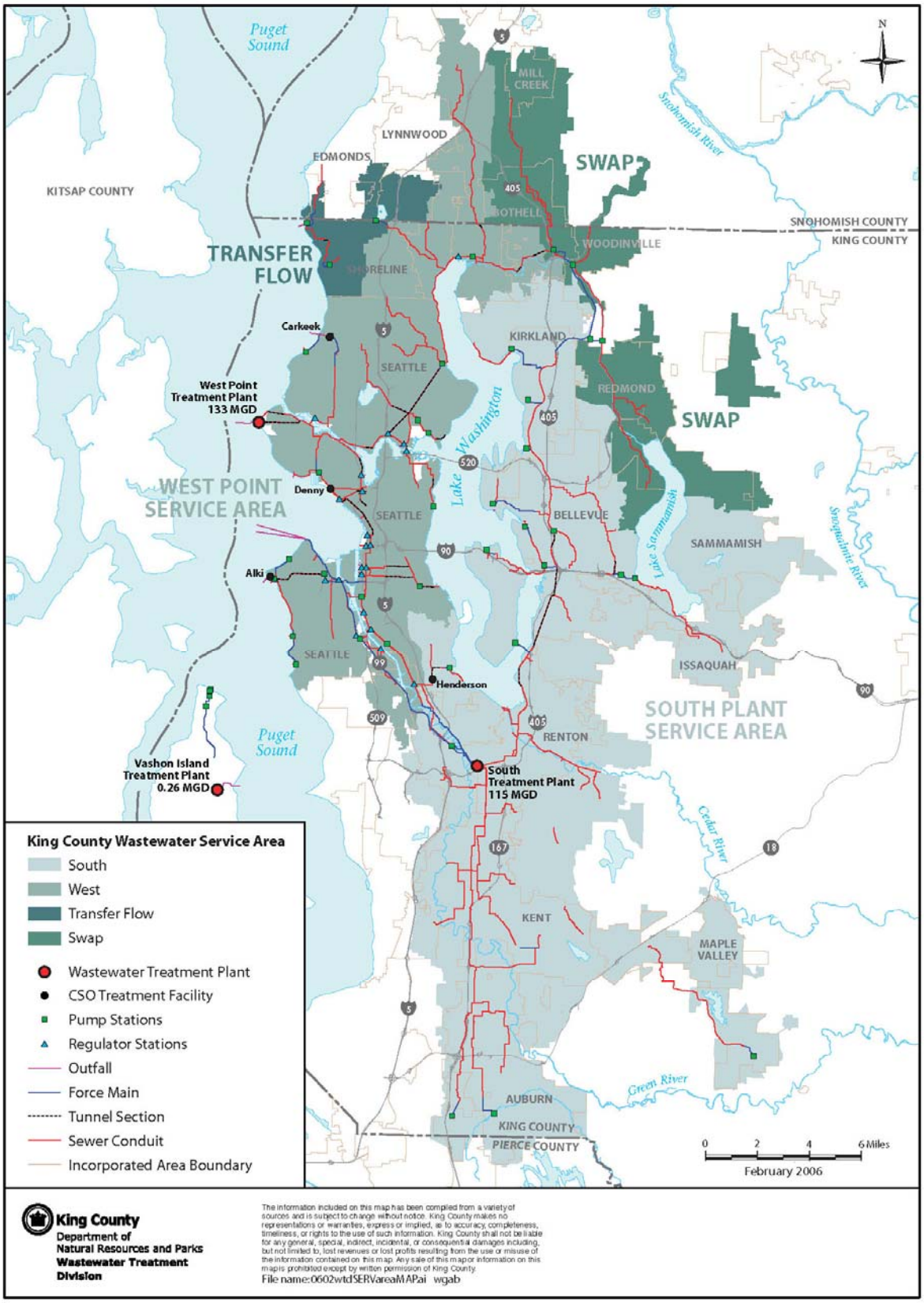


Figure 1-1. King County Wastewater Service Area and Facilities

1.2 Regional Wastewater Services Plan

In the 1990s, flow estimates based on projected population growth estimates in King County's wastewater service area indicated that King County's regional wastewater treatment system would run out of capacity by 2010. To ensure the continuation of high quality and effective wastewater treatment services in the future, the county carried out an intensive planning effort, involving numerous elected officials, representatives from local sewer agencies, organizations, and individuals from around the region. The RWSP resulted from this effort and was adopted by the Metropolitan King County Council in November 1999, via Ordinance 13680.

The RWSP outlines a number of important projects, programs, and policies for King County to implement through 2030. The RWSP calls for building a new treatment plant, now known as "Brightwater," to accommodate growth in the northern portion of the wastewater service area. The plan also calls for improvements to our conveyance system to meet the 20-year design storm standard and accommodate increased flows; improvements to reduce existing and future levels of infiltration and inflow (clean groundwater and stormwater) into local collection systems; and improvements to control CSOs so that an average of no more than one untreated discharge occurs per year at each CSO site by 2030.[2]

The RWSP also identifies the need to expand the South Plant in Renton by 2029 to handle projected increased wastewater flows in the southern and eastern portions of the county's wastewater service area.

Ordinance 13680 was codified in the

RWSP Annual Report Reporting Policies

The policies below were established via adoption of Ordinance 15384. They guide the preparation of the RWSP annual reports.

"A. Regional wastewater services plan annual report. The executive shall submit a written report to the council and RWQC in September each year until the facilities in the RWSP are operational. This report, covering the previous year's implementation, will provide the following:

1. *A summary of activities for each major component of the RWSP, including treatment, conveyance, infiltration and inflow, combined sewer overflows, water reuse, biosolids and highlights of research and development projects underway and proposed for the coming year;*
2. *Details on each active RWSP project in the capital budget, including a project summary, project highlights, project issues, upcoming activities, schedules, and expenditures summary including labor staff and miscellaneous services, a description of adjustments to costs and schedule and a status of the projects contract;*
3. *A status of the odor prevention program, including a listing and summary of odor complaints received and progress on implementing odor prevention policies and projects;*
4. *A summary of the previous year's results for the comprehensive water quality monitoring program;*
5. *A review of the plan elements, including water pollution abatement, water quality, water reclamation, Endangered Species Act compliance, biosolids management and variability of quality over time, wastewater public health problems, compliance with other agency regulations and agreements, to ensure it reflects current conditions; and*
6. *An update of anticipated RWSP costs through the year 2030."*

[2] The Washington State Department of Ecology (Ecology) regulates the level of CSO control based on the number of untreated CSO events that occur in a year. Ecology defines "the greatest reasonable reduction" in CSOs (RCW 90.48) as being "control of each CSO in such a way that an average of one untreated discharge may occur per year" (WAC 173-245-020).

King County Code as Chapter 28.86. Amendments to Ordinance 13680 and the King County Code Chapter 28.86 have been made since the RWSP's adoption. Amendments have included updates to the financial policies, new odor control policies for the county's existing regional treatment plants and facilities, and a new section on reporting policies.

Visit the RWSP Web site for more information on this regional plan:
http://dnr.metrokc.gov/wtd/rwsp/rwsp.htm

The entire contents of the RWSP 2005 Annual Report is available on the Web at:
http://dnr.metrokc.gov/wtd/rwsp/library.htm

1.3 2005 Awards and Recognition

WTD, a division within King County's Department of Natural Resources and Parks, received several awards and recognitions in 2005 associated with implementing the RWSP. The awards and recognitions are as follows.

- The American Society of Landscape Architects awarded the *National Honor Award in Analysis and Planning* to the Brightwater Project for the development and implementation of the site selection process.
- The Puget Sound Region International Right of Way Association awarded the *Project of the Year Award* to WTD's Right of Way and Permitting team for excellence, innovation, and timeliness in the acquisition of 114 acres of industrial land for the Brightwater Treatment Plant site, successful relocation of seventeen commercial and residential tenants, regulatory compliance, and coordination with other state and local agencies. (awarded in 2005 for the year 2004).
- enterpriseSeattle presented the *2005 Public Sector Economic Development Champion Award* to King County Executive Ron Sims in recognition of his leadership role in moving the Brightwater project forward.
- The National Association of Clean Water Agencies (NACWA) awarded both the West Point and South plants the *Gold Award* for peak performance for their NPDES (National Pollutant Discharge Elimination System) compliance and for incurring no permit violations over the preceding year.
- NACWA awarded the *Excellence in Leadership Award* to WTD's management team for incorporating modern and up-to-date utility management leadership practices in their work.
- NACWA recognized WTD's Fuel Cell Demonstration Project with its *Research and Technology Award* for development of technological innovations that have a practical application in wastewater treatment.

Chapter 2

Brightwater Treatment System

The RWSP calls for the construction of a new regional treatment plant and conveyance system in the northern portion of King County's wastewater service area by the year 2010. These facilities are collectively termed the Brightwater System. Locations for these facilities were identified during a siting process that took place during 2000–2003.[1] The focus in 2004 was completing predesign, applying for permits, hiring new employees to carry out the design and construction phases of the project, and continuing to involve stakeholders and members of the public in the Brightwater design and permitting process. In 2005, the project team continued its permitting, design, and stakeholder involvement activities in addition to other activities such as purchasing properties and negotiating mitigation agreements with local jurisdictions.

This chapter briefly describes the Brightwater System, gives an overview and more detailed discussion of project accomplishments in 2005, and presents a schedule for 2006. For more information, visit the Brightwater project Web site at http://dnr.metrokc.gov/wtd/brightwater/

2.1 Description of the Brightwater System

The locations of the Brightwater facilities are shown in Figure 2-1.The treatment plant will be built in Snohomish County on a site just north of the City of Woodinville. It will have an initial capacity to treat 36 million gallons per day (mgd) with room for future expansion to 54 mgd. In addition to the treatment plant, the Brightwater System includes approximately 14 miles of pipelines to be constructed in underground tunnels in north King County. The pipelines will convey untreated wastewater (influent) to the plant and treated wastewater (effluent) from the plant for discharge through an outfall in Puget Sound. The tunnel will be constructed in three segments (east, central, and west) at the five portal sites shown in Figure 2-1.

[1] A summary of the Brightwater siting process was provided in the December 2003 *RWSP Annual Report*. This report can be accessed at http://dnr.metrokc.gov/wtd/rwsp/library.htm.

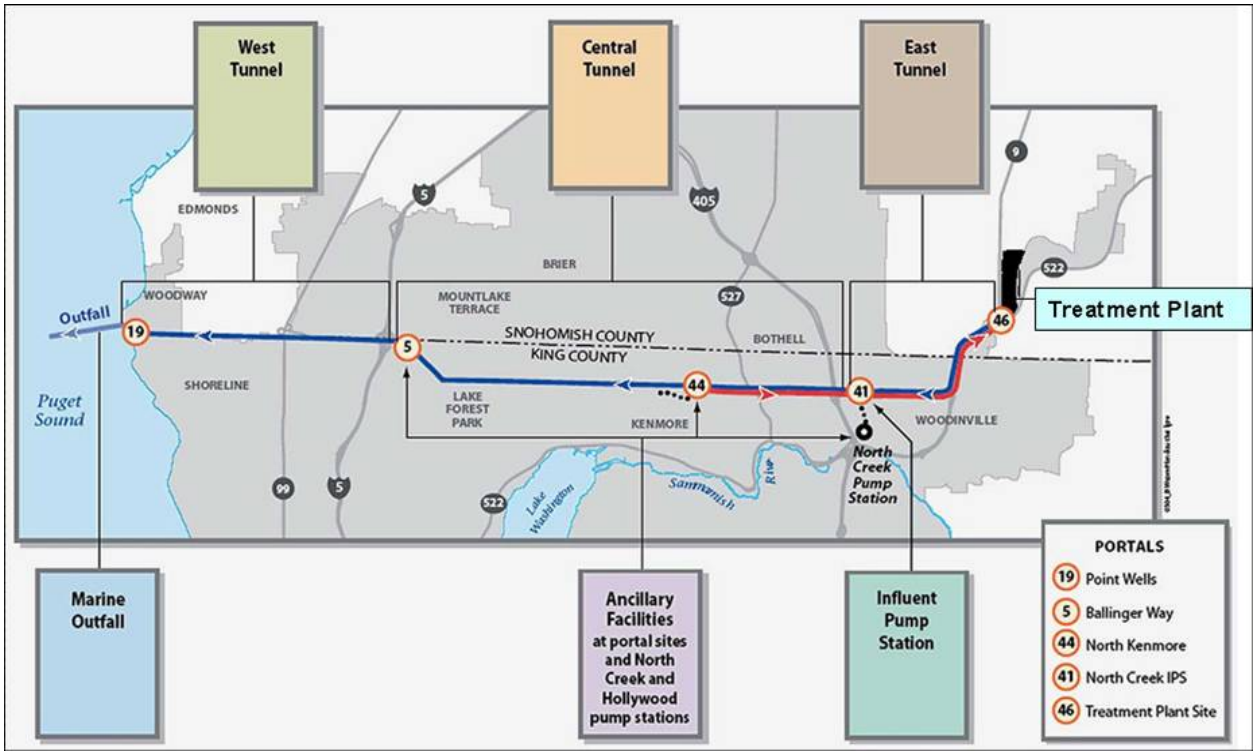


Figure 2-1. Components of the Brightwater System

2.2 Overview of 2005 Accomplishments

King County made substantial progress on the Brightwater project in 2005. The project is on schedule for completion in 2010. Milestones achieved in 2005 include the following:

- Prepared a supplemental environmental impact statement to evaluate potential environmental impacts that could result if an earthquake were to damage Brightwater facilities at the treatment plant site.
- Initiated final design on the treatment plant and conveyance system, including additional value engineering review.
- Secured agreements with property owners to purchase all 25 treatment plant parcels and acquire 92 percent of conveyance parcels and easements.
- Acquired nearly all major permits needed for construction.
- Continued to involve the public and stakeholders in the design and permitting processes.
- Developed and signed Project Labor Agreements with building and construction trades councils.
- Met the Metropolitan King County Council's provisos in the 2005 budget (monthly cost reports, baseline budget, hiring of oversight consultant).
- Incorporated a reclaimed water "backbone" into the design of the conveyance system.

- Negotiated mitigation agreements with Snohomish County and other affected jurisdictions.
- Developed a cost trend based on preliminary cost estimates for the treatment plant from the General Contractor/Construction Manager (GC/CM).[2]

2.3 Supplemental EIS

As required by the State Environmental Policy Act (SEPA), King County issued a Final Environmental Impact Statement (Final EIS) for the Brightwater project on November 19, 2003. In January 2004, an appeal was filed with the King County Hearing Examiner challenging the adequacy of the Final EIS. The Hearing Examiner ruled in August 2004 that the EIS was adequate to support the King County Executive's decision in December 2003 to build the Brightwater Treatment Plant on the Route 9 site north of Woodinville, a conveyance tunnel across north King County, and an outfall off Point Wells. This ruling was upheld in June 2005 by the King County Superior Court.

In the August 2004 ruling, the Hearing Examiner directed King County to excavate a trench on the northern portion of the Route 9 site to evaluate whether a suspected fault identified by the U.S. Geological Survey (Lineament 4) was active. If the fault was determined to be active, King County was further directed to prepare a supplemental environmental impact statement (Supplemental EIS) for the treatment plant site. The U.S. Geological Survey also postulated that a second fault trace, Lineament X, may exist in the southern portion of the Route 9 site, south of the proposed treatment plant facilities.

Examination of a trench dug in September 2004 indicated that Lineament 4 could be an active fault, even though it does not meet the International Building Code's (IBC) definition of an active fault.[3] King County prepared a Draft Supplemental EIS in accordance with the Hearing Examiner's direction. The Draft Supplemental EIS, issued in April 2005, analyzed the types and degrees of impacts that could result from a range of hypothetical worst-case scenarios involving a potential earthquake on Lineament 4 or Lineament X. King County also analyzed the highly unlikely possibility of a hypothetical fault between Lineaments 4 and X, even though no active faults are known to exist beneath the treatment plant structures. King County used the findings to redesign features of the plant and conveyance system. For example, the caustic and acidic chemical storage areas will be in different locations at the plant, flexible piping systems will be used, and safeguards will be incorporated to capture a spill in the stormwater system.

[2] GC/CM is an alternative project delivery method in which the contractor provides input into the design. During design, the owner and GC/CM negotiate a guaranteed maximum price for project construction. The GC/CM then manages construction and acts as general contractor.

[3] The IBC defines an active fault as one that has two qualities: a) an average historic slip rate of 1 mm/yr or more ***and*** b) geologic evidence of seismic activity within Holocene times. Earthquakes producing slip on the SWIF (including Lineament 4) have not occurred during historical time; therefore, the average historical slip rate is less than 1 mm/yr.

Conveyance pipelines will now have thicker walls and stronger joints, and the spaces around pipelines in the tunnel will be filled with grout to reduce potential leakage.[4]

King County received over 600 comments on the Draft Supplemental EIS from 26 agencies, organizations, and community members. The comments, while substantive, did not prompt any major changes to the analysis presented in the Draft Supplemental EIS. In July 2005, a Final Supplemental EIS was released that responded to comments and clarified certain points made in the draft analysis. The adequacy of the Final Supplemental EIS was subsequently appealed and the issue was unresolved as of December 2005.

The Brightwater Supplemental EIS is available on the Web at http://dnr.metrokc.gov/wtd/brightwater/env/seis.htm

2.4 Final Design

Following completion of predesign in October 2004, King County initiated the final design process on the various components of the Brightwater System. Final design involves the process of successively breaking down, analyzing, and designing the facility and its elements so that it complies with recognized standards of safety and performance. The design is then rendered in a set of explicit drawings and specifications that tell the contractors how to build the facility. The major activities associated with the final design process in 2005 are as follows:

- **Treatment Plant:** Completed 60 percent design, updated cost estimates, and value engineering workshops.
- **East Conveyance Tunnel:** Completed final design and contractor selection.
- **Central Tunnel:** Completed 90 percent design.
- **Influent Pump Station:** Completed 60 percent design.
- **West Tunnel:** Submitted 60 percent design for review.
- **Ancillary Facilities:** Submitted 60 percent design for review on North Creek facilities.
- **Marine Outfall:** Received approval for use of design-build contracting method; initiated bid process for design-build contractor.

In April 2005, the 60 percent design drawings for the treatment plant were used to develop an updated construction cost estimate. In an effort to ensure the reasonableness of this estimate, King County requested that URS, an engineering and design firm, and the treatment plant GC/CM prepare independent cost estimates. Each of these estimates indicated a significant upward trend from the construction cost anticipated during predesign. As a result, King County

[4] A subsequent technical memorandum released on October 27, 2005, evaluated the impacts of ground shaking and faulting on the East Tunnel, Portal 46, and the effluent drop structure associated with an earthquake along Lineament X (*Brightwater Conveyance Final Design Technical Memorandum; Scope Item 730.5 – Summary of Seismic Design for East Contract Conveyance*). In general, the memo concluded that while the conveyance system would sustain damage during an earthquake at Lineament X, it would maintain its serviceability and not undergo a catastrophic failure that would result in large negative impacts to the environment.

decided to suspend the design and conduct a series of value engineering workshops in summer 2005. During value engineering, participants review and challenge a project's design elements, including underlying assumptions and methodologies, to identify ways to improve performance, reliability, quality, and safety, and to reduce life-cycle costs. The workshops resulted in a set of recommendations that have the potential to reduce estimated plant costs by approximately $50 million. These recommendations are being incorporated into the final design of the Brightwater Treatment Plant.

2.5 Land and Right-of-Way Acquisition

Another significant effort in 2005 was the work involved with acquiring nearly all the parcels and easements needed to move forward with constructing the Brightwater System. As of December 2005, a team of King County staff had secured agreements with property owners to purchase all 25 of the treatment plant parcels, purchased two of the portal properties, and secured rights for possession and use of the remaining two portal properties. (One portal is on the treatment plant property.) In addition, the county acquired 92 percent of parcels/easements for the conveyance system (Table 2-1).

King County has pursued all property acquisitions with voluntary negotiations as the highest priority. Condemnation filing became necessary only once. Furthermore, the county has been able to stay under the overall budget for land acquisition.

Table 2-1. Conveyance Easements

Tunnel Section	Easements	Easements Signed	Percent Signed
East	22	19	86
Central	95	90	95
West	30	26	87
Total	**147**	**135**	**92**

2.6 Permitting

One of the primary activities undertaken by Brightwater project staff in 2005 has been working with federal, state, and local agencies to secure the permits necessary to develop and construct the Brightwater facilities. As a result of these activities, King County's Wastewater Treatment Division (WTD) received approval for all the required systemwide permits at the federal and state level in early 2005, including permits under Sections 404, 402, and 401 of the Clean Water Act and Section 7 of the Endangered Species Act. These permits regulate construction-related discharges to wetlands and surface water and impacts to endangered species and their habitat. In addition, WTD coordinated with all local agencies and jurisdictions to obtain the necessary demolition, grading, and building permits.

2.7 Public Involvement Activities

WTD continues to place a high priority on involving stakeholders and members of the public in the Brightwater design and permitting process. Over 30 meetings and briefings with residents, community leaders, and groups were held in 2005, including informational meetings for community members who live or work near the portal areas and treatment plant. Brightwater informational booths were available at several community fairs, festivals, and public events. A model of the preliminary design for the treatment plant was also available at some of these events.

Other public involvement activities in 2005 were as follows:

- **Public hearings.** WTD hosted a public hearing in May on the Brightwater Draft Supplemental EIS. A public hearing was also held in October on a proposed transfer of property and easements to the Washington State Department of Transportation and Snohomish County Public Utility District.
- **Education/Community Center Advisory Group.** Increased interest and support for an education/community center at the treatment plant site led to the formation of the Education/Community Center Advisory Group (ECCAG) in May. The ECCAG includes representatives from local jurisdictions, tribes, environmental groups, and educational groups. The group's purpose is to provide input on the design of the center.
- **Odor control system peer review.** In June 2005, WTD convened a peer panel of national odor control experts to review Brightwater's proposed odor control system and to comment on odor control alternatives that had been generated during value engineering workshops. The panel also provided advice on longer term odor control monitoring, formation of an odor control advisory board, and use of an odor control reserve fund. Panelists concurred that the odor control system will meet the goal of no detectable odors at the property line and offered recommendations to reduce costs of the system without compromising this goal. Representatives from nearby jurisdictions and sewer districts attended the panel sessions as observers.
- **Bulletins, newsletters, news releases, and responses to questions.** The Brightwater project team continues to respond to questions and comments received on the project from property owners, jurisdictions, neighbors of future facilities, and the general public. In addition, the team produced project newsletters, bulletins, and news releases to keep people informed about project activities.

2.8 Project Labor Agreements

In June and July 2005, the Metropolitan King County Council approved the use of project labor agreements (PLAs) to construct the Brightwater System. Both Washington State criteria and King County policies support the use of PLAs for projects that will extend for a long period of time; involve a substantial number of contractors, subcontractors, and trades and craft workers; have a large dollar value; and provide public benefit.

The Brightwater PLAs were negotiated between and agreed to by the King County Department of Natural Resources and Parks, the Northwest Washington Building and Construction Trades Council, the Seattle/King County Building and Construction Trades Council, and the Washington State Building and Construction Trades Council. The agreements establish labor terms and general work rules for the entire Brightwater construction period and will help to avoid potential disruptions from strikes, lockouts, or slowdowns. The Brightwater PLAs will also do the following:

- Ensure that small non-union contractors can effectively compete for work on the Brightwater project
- Set goals for achieving broad representation of women, minority, and disadvantaged business enterprises and workers in the Brightwater workforce
- Help provide and maintain a highly trained construction work force in the Puget Sound region
- Include provisions for safe working conditions and employee compliance with all safety rules
- Ensure that all workers are paid a livable wage and receive health, welfare, and retirement benefits

2.9 2005 Budget Provisos

The King County Council's adopted 2005 budget included two provisos related to the Brightwater project. The first required WTD to hire a consultant to provide independent oversight and monitoring of the design of the Brightwater System. The second proviso required WTD to develop a reporting format and a baseline budget for the project. King County's actions in 2005 related to each proviso are summarized in the following sections.

2.9.1 Oversight Monitoring Consultant

On March 10, 2005, WTD retained R.W. Beck as the oversight and monitoring consultant (OMC) for the Brightwater project. The budget proviso requires the OMC to provide to the executive, council, and Brightwater project representatives the results of an initial comparison of the scope, schedule, budget, and distribution of budget categories of the project with other projects of similar scope and scale or industry standards. The proviso further requires the OMC to review the scope, schedule, and budget for 30, 60, 90, and 100 percent design submittals.

The findings of the initial comparison were documented in June 2005 in the *Brightwater Project Overview Report* (POR). The OMC presented these findings to the Regional Water Quality Committee (RWQC) in July and the council's Budget and Fiscal Management (BFM) Committee in August. Brightwater staff incorporated a number of suggestions from the POR into the Brightwater design process. The OMC completed a number of design reviews in 2005—the East Tunnel (60 and 90 percent), the Central Tunnel (60 percent), and the treatment plant (60 percent)—and reported the findings to the RWQC and BFM. The OMC also provided insight to

project staff on the GC/CM contracting method and on overall design and construction considerations. To continue this beneficial relationship, King County will extend the scope of the OMC to oversee construction activities in 2006.

In addition to the OMC, the council and executive audit services provided direction on the management of design and construction contracts. This effort will continue in 2006.

2.9.2 Brightwater Reporting Format and Baseline Budget

Another 2005 budget proviso required WTD to develop a monthly management and budget reporting format for the Brightwater project that was modeled after formats in use for other large capital improvement projects in the region. The proviso also required WTD to submit a proposed baseline budget for the Brightwater program based on the proposed budget reporting format and the October 2004 predesign estimate. The baseline budget—once approved by council—would then serve as a performance measurement planning tool for the Brightwater program.

In February 2005, WTD transmitted monthly reporting and budget formats and a baseline budget to the council. The baseline budget, derived from the October 2004 predesign estimates, showed the expected cost of the Brightwater project, by year, for the life of the project. Future costs were presented in 2004 dollars and with inflationary adjustments of three and five percent. The council approved the monthly report format and baseline budget via Motion 12189 in August 2005.

2.10 Reclaimed Water Backbone

During 2005, King County developed the concept of a reclaimed water "backbone"—a dedicated reclaimed water pipeline located within the Brightwater conveyance tunnel. Starting in 2011, the backbone will convey Class A reclaimed water produced at the Brightwater Treatment Plant to the Sammamish Valley and to potential customers along the conveyance tunnel.[5] This concept solidified as a result of negotiations with the Washington State Department of Ecology (Ecology) on the *Brightwater Facilities Plan* (finalized in May 2005 and approved by Ecology in June 2005). The backbone will provide widely available high quality reclaimed water for meeting the competing—and increasing—demands on the region's future water supply. The County Council approved the project cost of $26 million in November 2005 as part of the WTD's 2006 budget.

[5] "Class A Reclaimed Water" is reclaimed water that, at a minimum, is at all times an oxidized, coagulated, filtered, and disinfected wastewater. Allowed end uses of Class A reclaimed water are irrigation of food and non-food crops and irrigation of open access areas, such as parks. The water could also be used for industrial cooling and process water and other non-drinking-water (non-potable) uses.

2.11 Mitigation

The county's goal is to construct regional wastewater facilities that enhance the quality of life in the region and in the local community. As part of the adopted RWSP, the County Council established mitigation policies to address systemwide impacts of construction and operation of WTD facilities and to create attractive facilities that complement surrounding neighborhoods. The policies stipulated that funds set aside for mitigation of impacts will be at least 10 percent of the costs associated with new facilities.

For Brightwater, the county worked with each jurisdiction, agency, and tribal government that would be affected by project construction and operation to negotiate formal mitigation agreements. By the end of 2005, nearly all the mitigation agreements were negotiated and signed.

2.11.1 Snohomish County Agreement

In late 2005, King County reached an agreement with Snohomish County to mitigate short- and long-term impacts of the Brightwater facilities in Snohomish County. The $70 million agreement included $30 million for parks improvements, $26 million for pedestrian and bicycle paths, and $11 million for habitat mitigation and conservation in the Little Bear Creek watershed. King County will also provide free use of an educational and community center at the treatment plant for Snohomish County government and nonprofit agencies if they provide services at the center that benefit the public ($3 million). The mitigation agreement also identifies procedures and timelines for the review and issuance of Brightwater permits in order to reduce the uncertainty associated with the permitting process. In addition to the agreement, King County has been working with communities in Snohomish County on developing design guidelines, constructing the education center, landscaping, and open space at the treatment plant site.

2.11.2 Other Mitigation Agreements

King County has reached mitigation agreements to address systemwide impacts of construction and operation of Brightwater facilities. In 2005, agreements were reached with the City of Shoreline, City of Kenmore, City of Bothell, City of Woodinville, Lake Forest Park Water District, Cross Valley Water District, Bothell Business Park, Suquamish Tribe, and the Muckleshoot Indian Tribe.

More information on the Brightwater mitigation package and the specific agreements are available on the Web at http://dnr.metrokc.gov/wtd/brightwater/mitigation/

2.12 Cost Trend Report

In December 2005, King County developed a Brightwater cost trend as part of an ongoing effort to keep decision-makers and stakeholders informed about the Brightwater project. A report on the cost trend was released in March 2006. The report identifies current trends, market

conditions, and design refinements as of December 2005 that could potentially affect the final cost of the Brightwater project.

The 2005 trend estimated the potential cost of the Brightwater project to be about $1.621 billion, as shown in Table 2-2. This amount is approximately $138 million over the October 2004 predesign cost estimate of $1.483 billion. One significant factor contributing to the increase was inflation, including contractor markups, which contributes about $61 million to the overall increase. Another factor was mitigation costs, which increased by about $50.5 million to accommodate additional mitigation to Snohomish County. The remainder of the increase was largely due to scope and pricing refinements on the treatment plant, along with corresponding increases in sales taxes and allied costs. The increases were partially offset by decreases in conveyance and land costs, which fell by about $37 million and $1.4 million, respectively, compared to predesign.

Table 2-2. Summary of Current Brightwater Cost Trend Estimates[a]

Brightwater Component	Oct. 2004 Predesign Estimate (2004$ x 1M))	Dec. 2005 Trend Estimate (2004$ x 1M))	Difference over/(under) (2004$ x 1M)	Dec. 2005 Trend Estimate (2005$ x 1M)	2005 Trend minus 2004 Predesign[b] (2005$ x 1M)
Treatment Plant	$426.4	$515.9	$89.4	$529.4	$102.9
Conveyance	$869.7	$832.7	($34.1)	$852.9	($16.9)
Land/ROW	$98.9	$97.5	($1.4)	$97.8	($1.1)
Mitigation	$88.0	$138.5	$50.5	$140.9	$52.9
Total	**$1,483.1**	**$1,584.6**	**$101.5**	**$ 1,620.9**	**$137.9**

[a] Costs are in millions of dollars; totals may not add due to rounding.
[b] Includes inflation since October 2004.

2.13 Schedule for 2006

Table 2-3 shows the major accomplishments expected in 2006 for each of the main components of the Brightwater project.

Table 2-3. Anticipated Accomplishments of the Brightwater Project in 2006

2006 Accomplishment	Anticipated Completion
Treatment Plant	
Advertise bids for North Mitigation Area (NMA)	March
Advertise bids for site preparation construction	April
Receive plant site preparation grading permit	April
Issue Notice to Proceed (NTP) for NMA and plant site preparation construction	May
Complete demolition on treatment plant site	May
Begin site preparation	May
90 percent design submittal	May
Submit building permit package	June
100 percent design submittal	October

2006 Accomplishment	Anticipated Completion
Receive treatment plant grading permit	November
East Tunnel	
Receive grading/noise permits for Portal 46	January
Issue NTP for East Tunnel construction	February
Central Tunnel	
Complete 100 percent design	January
Advertise bid for Central Tunnel construction	January
Issue NTP for Central Tunnel construction	July
West Tunnel	
Receive building/grading/right-of-way permits for Portal 19	May
Complete 100 percent design	July
Advertise bid for West Tunnel construction	July
Influent Pump Station	
Complete 90 percent design peer and constructability review	January
Complete 100 percent design	September
Advertise bid for construction	September
Marine Outfall	
Issue NTP for consultant construction management contract	May
Advertise for design-build contractor	July
Receive contractor statement of qualifications; review of statements of qualifications, and develop shortlist of contractors	October
Ancillary Facilities	
90 percent design for North Creek facilities	June
Complete 100 percent design of North Creek facilities	August

Chapter 3

Conveyance System Improvements

The RWSP calls for improvements to King County's conveyance system to meet the 20-year design storm standard and accommodate projected increases in flows.

In 1999, the conveyance system improvement (CSI) program began by developing a system to identify and prioritize ten planning areas, or basins in the wastewater service area. Regional conveyance system improvement planning was completed in 2003 for each of the basins. This initial work culminated in the 2003 regional conveyance system plan. The plan identified improvements that would help the system meet projected capacity demands based on wastewater flow, infiltration and inflow (I/I), and urban growth projections made at the time. Since 2003, new flow monitoring and modeling information was developed with the assistance of the local agencies that contribute wastewater flows to King County's regional system.[1] This information provides a more accurate basis for projecting future flow and capacity demands. In 2005, planning, design, and construction work continued on a number of conveyance projects.

This chapter provides an overview of CSI accomplishments in 2005 and describes projects that were in design and construction in 2005. The last section of the chapter presents CSI schedule information for 2006.

3.1 Overview of 2005 Accomplishments

In 2005, the Wastewater Treatment Division (WTD) began to update its regional CSI plan. The process and timeline for completing the update are shown in Figure 3-1. The update will identify improvements to address capacity-constraint and condition-based needs in conveyance system components and will provide updated cost estimates for identified improvements through 2030.

In December 2005, a technical memorandum identified the projected capacity needs through 2050.[2] This information provides the basis for working with the local agencies to complete the planning tasks outlined in Figure 3-1 by the end of 2006. The technical memorandum is available on the CSI Web site at http://dnr.metrokc.gov/wtd/csi/csi-docs/RegionalConveySysNeeds/

The inclusion of condition-based needs is a new component of CSI planning. It was added to provide a more complete picture of the long-term capital needs for the conveyance system. The CSI program is coordinating with WTD's Asset Management program on this component.

[1] The new flow monitoring and modeling information was developed as part of the I/I control program (discussed in Chapter 4 of this report).

[2] 2050 is the projected date when the regional wastewater service area will be fully built out and all portions of the service area will be connected into the wastewater treatment system.

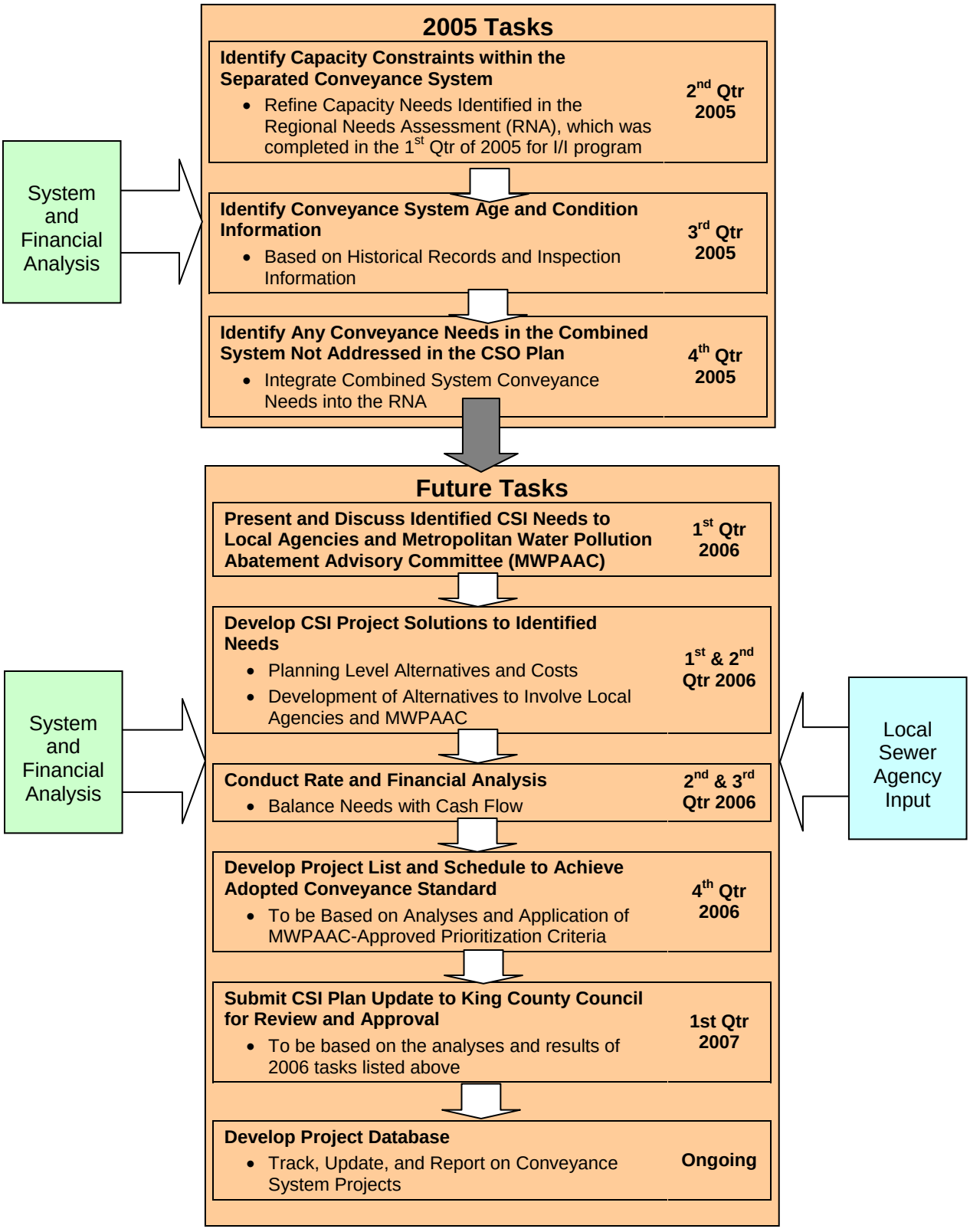


Figure 3-1. Process and Timeline to Update the Regional Conveyance System Improvement Plan

3.2 Projects in Design and Construction

The RWSP CSI projects in design during 2005 include the Bellevue Pump Station Upgrade, Kent/Auburn Conveyance System Improvements, Hidden Lake Pump Station Replacement and Sewer Improvement, and Soos Creek Improvements. The CSI projects in construction during 2005 include the Fairwood Interceptor Sewer, Juanita Bay Pump Station Replacement, and Pacific Pump Station Replacement. The locations of these projects are shown in Figure 3-2.

3.2.1 Bellevue Pump Station Upgrade

The Bellevue Pump Station pumps about 8 million gallons per day (mgd) of wastewater from west Bellevue to the Sweyolocken Pump Station near the Mercer Slough. From there, the wastewater flows to the county's South Treatment Plant in Renton. This project will increase the Bellevue Pump Station's capacity to 11 mgd to meet projected flows in the future and will improve the station's electrical and control systems.

The pump station improvements include new pumps; new electrical, mechanical, and odor control equipment; a new standby generator; new aboveground facilities to house the new equipment; and better access for maintenance vehicles and workers. In addition to these improvements, a new 5,500-foot-long, 24-inch-diameter force main will be constructed to convey the added flows directly from the upgraded Bellevue Pump Station to the East Side Interceptor. Because of space constraints, the Sweyolocken Pump Station cannot be upgraded to handle these additional flows.

The environmental review and predesign for the project are complete. Final design began in September 2005; the project's facility plan was approved in December 2005.

Visit the project Web site for more information: http://dnr.metrokc.gov/wtd/projects/bellevue/

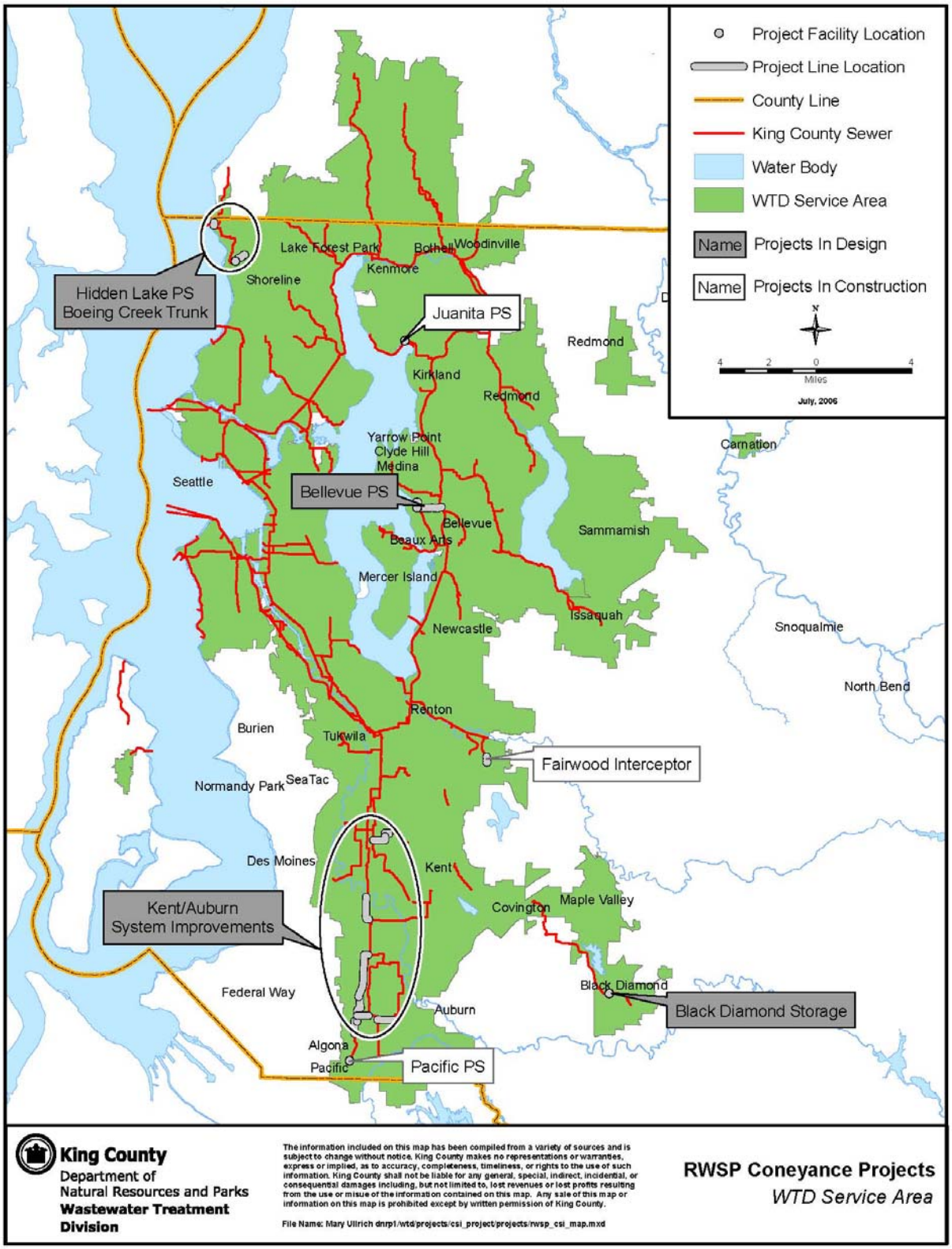


Figure 3-2. RWSP Conveyance Projects in Design and Construction in 2005

3.2.2 Kent/Auburn Conveyance System Improvements (Southwest Interceptor)

The Kent/Auburn Conveyance System Improvements project will provide additional capacity needed in Kent, Auburn, and Algona. To meet these needs, the county is looking at constructing approximately 6 miles of new pipe, ranging from 30- to 54-inch-diameter, or constructing a combination of new pipes and storage facilities.

This project was formerly known as the Southwest Interceptor project, which proposed to meet the capacity needs in the Kent and Auburn planning areas by rerouting flows to a new large-diameter sewer located primarily in the West Valley Highway right-of-way. As a result of information gathered during the I/I control study, the planning analyses were revisited. It was determined that the capacity needs could be met more cost effectively by constructing some capital projects in 2010 and others in 2020. The Kent/Auburn Conveyance System Improvement project will meet the 2010 capital project needs.

In addition to evaluation of storage options, the project will evaluate design of two sewer lines in the Auburn area:

- **Auburn West Valley Parallel Interceptor.** Located in Algona and Auburn, this new pipeline would run north and add capacity to relieve the Algona Pacific Trunk, Auburn West Valley Interceptor, and Auburn West Interceptors.
- **Construction of the Stuck River Trunk.** Located in Auburn, this pipeline would convey flow away from the M-Street Trunk to the new Auburn West Valley parallel interceptor.

The project will focus on design of one new sewer line in Kent:

- **Mill Creek Relief Sewer.** This sewer line will be designed to divert some flow out of the Mill Creek Interceptor and convey it west to the Auburn Interceptor.

Predesign is expected to be complete in 2007. During predesign, it is possible that modifications will be made to these project elements.

3.2.3 Hidden Lake Pump Station Replacement and Sewer Improvement

The 40-year-old Hidden Lake Pump Station does not have capacity to handle existing or future peak storm flows, nor does it meet current design standards for odor control, instrumentation, space, and equipment handling. Further, the pump station discharges to the Boeing Creek Trunk, which has a history of capacity, odor, and corrosion problems. This project will address these problems through phased improvements to control overflows and increase the capacity of the Boeing Creek Trunk to handle the 20-year storm.

The capacity improvements include construction of a new Hidden Lake Pump Station on the site of the existing pump station. The new station will have a capacity of 5.5 mgd and a future peak capacity of 6.8 mgd. Other capacity improvements include a 0.5 million gallon storage facility

constructed upstream of the pump station and replacement of approximately 12,000 linear feet of pipeline. Future I/I reduction has the potential to reduce the size or need for additional facilities.

Project staff worked closely with the surrounding community in 2005 to keep community members informed about the project and respond to their questions and concerns. In October, King County and the City of Shoreline hosted an on-site tour for community members to learn more about the project. The county obtained the necessary construction permits from the City of Shoreline in December 2005 and completed the project design. The county advertised the project for construction in January 2006.

Visit the project Web site for more information:
http://dnr.metrokc.gov/wtd/projects/hiddenlake.htm

3.2.4 Soos Creek Sewer Improvements

In 2002, King County signed an agreement with the Soos Creek Water and Sewer District, committing to build and operate three pump stations and 10 miles of sewer to meet the long-term needs of this rapidly growing area. A preferred location for Pump Station D (now called the Covington Pump Station) was identified and the predesign report for the pump station and pipeline was completed in June 2005.

When the estimated cost of the Covington Pump Station and pipeline turned out to be significantly higher than anticipated, WTD explored alternative options for phasing system improvements. This analysis determined that the most critical short-term capacity need is in Black Diamond. The revised plan will address that need by constructing a wastewater storage facility in Black Diamond by 2010 and delay the start of design for the Covington Pump Station and pipeline until 2015. The anticipated completion date for the pump station is 2020. Planning for the Black Diamond storage facility will start in 2006.

WTD plans to build additional pump stations and pipelines between Black Diamond and Kent by the year 2020. To ensure that these facilities will be in place when needed, WTD will continue to work with the Soos Creek Water and Sewer District and monitor system flows.

Visit the project Web site for more information: http://dnr.metrokc.gov/wtd/projects/sooscreek/

3.2.5 Fairwood Interceptor Sewer

Wastewater flows from the Fairwood community through a pipeline in the Madsen Creek ravine. The pipeline is unstable and located in a sensitive area prone to landslides and erosion. The project will redirect flow to the new Fairwood Interceptor and upsize existing Cedar River Water and Sewer District pipelines. In accordance with community preference, the new deep gravity interceptor avoids the need to build a pump station in Fairwood.

To complete the final phase of work, King County will build new pipes to connect portions of pipe laid earlier in the project. Construction on the final phase began in June 2005 and is scheduled to be complete in October 2006.

Throughout 2005, project staff have been working closely with the project's affected neighbors and surrounding community to keep them informed about construction impacts and respond to their questions and concerns.

Visit the project Web site for more information: http://dnr.metrokc.gov/wtd/projects/fairwood/

3.2.6 Juanita Bay Pump Station Replacement

The existing 14.2-mgd Juanita Bay Pump Station is an aging facility that is experiencing significant operational difficulties in conveying existing flows and that has insufficient capacity to convey future flows. To meet flow demands projected through 2050, a 30.6-mgd pump station is being built across the street to replace the existing station. In addition to increased capacity, the new pump station will include features to improve safety and reliability, such as a standby generator, odor and corrosion prevention systems, improved access for maintenance vehicles and workers, and equipment lifting devices.

In early 2005, final design was completed, construction permits and property rights-of-entry were obtained, and the pump station construction contract was awarded. A construction notice to proceed was issued in August, and a neighborhood meeting and site tour were held at the new pump station site before construction broke ground. In late 2005, a temporary site dewatering system and underground utilities were installed and structural concrete secant pile construction began. Project staff worked closely with the affected neighbors and surrounding community to keep them informed about construction impacts and to respond to their questions and concerns.

Plans for 2006 include continued construction of the belowground portion of the pump station and microtunneling of a 60-inch-diameter influent sewer under NE Juanita Drive. Project construction is expected to be complete in 2008.

Visit the project Web site for more information: http://dnr.metrokc.gov/wtd/projects/juanita/

3.2.7 Pacific Pump Station Replacement

The existing 1.6-mgd Pacific Pump Station has insufficient capacity to convey existing and projected future peak flows. To meet flow demands through 2030, a new 3.3-mgd pump station will be constructed in an industrial zone site two blocks west of the existing station. The new pump station will have features such as standby power, odor control, reliable and safe access for operational and maintenance staff, and equipment lifting devices. Project construction is scheduled to be complete by the end of 2006.

Visit the project Web site for more information: http://dnr.metrokc.gov/wtd/projects/pacific/

3.3 Schedule for 2006

CSI activities scheduled for 2006 are as follows:

- The CSI project team will continue to work on the regional CSI plan update; the update is expected to be transmitted to the Metropolitan King County Council in early 2007.
- Construction on the Bellevue Pump Station is anticipated to begin in late 2006.
- Predesign activities will take place on the Kent/Auburn Conveyance System Improvements project in 2006; predesign is expected to be complete in May 2007.
- Construction on the Hidden Lake Pump Station Replacement and Sewer Improvement project is expected to begin in summer 2006 and be complete in spring 2009.
- Construction on the Fairwood Interceptor Sewer project is scheduled to be complete in October 2006.
- Construction on the belowground portion of the Juanita Bay Pump Station will continue in 2006; the project is expected to be complete in 2008.
- Construction on the Pacific Pump Station is expected to be complete in summer 2006.

Chapter 4

Infiltration and Inflow

The RWSP calls for improvements to reduce existing and future levels of infiltration and inflow (I/I) into local collection systems. I/I is clean storm and groundwater that enter the sewer system through cracked pipes, leaky manholes, or improperly connected storm drains, down spouts, and sump pumps. Most inflow comes from stormwater and most infiltration comes from groundwater. I/I affects the size of King County conveyance and treatment systems and, ultimately, the rate that businesses and residents pay to operate and maintain them.

The RWSP I/I policies direct the county to carry out pilot rehabilitation projects to demonstrate the effectiveness of I/I control in the local sewer systems tributary to the regional system. In response to these policies, the county and local agencies that contribute wastewater to the King County system completed a comprehensive six-year study in 2005 of I/I in the portions of the regional wastewater service area served by separated sewers. The study consisted of four key elements:

- Region-wide flow monitoring during the winter months of 2000–2001 and 2001–2002
- Ten pilot I/I reduction projects completed in 2004
- A Regional Needs Assessment conducted in 2005 to identify needed conveyance system improvement (CSI) projects, the year they would be needed, and their cost
- A benefit-cost analysis completed in 2005 to compare the costs of I/I reduction in areas where needed CSI projects were identified to the cost of the identified CSI projects

The results of the study were used to prepare the *Executive's Recommended Regional Infiltration and Inflow Control Program* for review and approval by the Regional Water Quality Committee (RWQC) and the Metropolitan King County Council. The council approved the recommended I/I program in May 2006 via adoption of Motion 12292.

This chapter presents the recommended I/I control program and describes the two elements of the I/I control study completed in 2005—the Regional Needs Assessment and the benefit-cost analysis.[1] The last section of the chapter presents schedule information for 2006.

[1] Information related to flow monitoring and the completion of the 10 pilot projects was reported in previous RWSP annual reports.

4.1 Executive's Recommended I/I Control Program

The *Executive's Recommended Regional I/I Control Program* includes recommendations for I/I reduction, long-term I/I control, and program administration and policy. The recommendations represent the consensus reached by the county and local agencies throughout the six-year program development process.

Recommendation Highlights

King County and the local agencies would select, implement, and evaluate two or three "initial" I/I reduction projects to test the effectiveness of I/I reduction on a larger scale than the pilot projects.

After completion of the initial projects, recommendations would be made to the King County Council regarding long-term I/I reduction and control, including applicable changes to policy or code.

The recommendations reflect the need to reduce I/I by cost-effectively removing enough I/I from the collection system to delay, reduce, or eliminate some otherwise needed CSI projects. The recommendations also reflect the need to maintain I/I reductions long-term to prevent future increases in I/I throughout the regional system. Long-term I/I control includes policy, administrative, financial, and technical measures that promote an ongoing program of review, maintenance, and repair of the collection and conveyance system.

The following sections list the I/I control program recommendations for I/I reduction, long-term I/I control, and I/I control program administration and policy.

4.1.1 Recommendations for I/I Reduction

- Identify cost-effective I/I reduction projects on a project-specific basis, rather than on a regional basis or by the need to meet specific I/I reduction targets.
- Select two or three initial I/I reduction projects for implementation from the list of nine cost-effective projects identified in the benefit-cost analysis. King County and the Metropolitan Water Pollution Abatement Advisory Committee (MWPAAC), through its Engineering & Planning (E&P) Subcommittee would work cooperatively to select these projects.
- In the next 3 to 5 years, construct the selected initial projects to test planning assumptions and gain more information about costs.
- Proceed with work on private property when a project calls for it. Experiences on initial projects would be documented in terms of public involvement activities, private property participation rates, costs, neighborhood impacts, groundwater effects, and special construction issues that arise.
- Fund initial projects through King County wastewater revenue that is dedicated to funding CSI projects in the regional conveyance system. For future I/I reduction projects, options to supplement King County funding may be considered. For example, local agencies could contribute funds to expand the project scope in order to take advantage of

construction efficiencies, as was done in some pilot projects, or to move a project into the cost-effective category.

- Conduct pre- and post-project flow monitoring to test the ability of I/I reduction projects to reduce enough flow to delay, downsize, or eliminate the need for CSI projects.
- Reconvene the E&P Subcommittee when initial projects and post-project flow monitoring are completed to evaluate results of projects, adjust planning assumptions if appropriate, and further refine private property protocols or best practices to ensure that successful approaches are carried forward to future work.
- If the initial projects are deemed successful and future I/I reduction is approved, proceed programmatically to apply I/I reduction planning to all CSI project planning. Wherever an I/I reduction project is a cost-effective alternative to the planned CSI project, the county and local agencies would implement the I/I reduction project provided that it is environmentally and logistically feasible.

4.1.2 Recommendations for Long-Term I/I Control

- Make use of existing local agency regulations to ensure that new development and redevelopment within the regional wastewater service area meet up-to-date construction standards for sewer conveyance lines and connections.
- Apply the standards, guidelines, procedures, and policies in final draft form to the initial I/I reduction projects (included as Appendix A in the Executive's Recommended I/I Control Program). Once they have been tested on large-scale projects, the standards, guidelines, procedures, and policies would be reviewed and finalized by the local agencies and translated into King County policy in the form of an ordinance.
- Conduct a system flow audit of the regional and local systems every 10 years to track I/I levels. The county and local agencies would conduct the audits and use the information to cooperatively make decisions about how to adjust I/I control measures as may be necessary.
- Do not implement a surcharge on local agencies for flows that exceed targeted I/I reduction levels already established in the King County Code. The county and local agencies found that implementing a surcharge, as contemplated in the King County Code, would be costly to administer and would pose difficulties in verifying violations.

4.1.3 Recommendations for Program Administration and Policy

- Authorize King County to centrally manage the I/I control program, to develop public information materials for the overall program, and to serve as a central clearinghouse for program inquiries and training.
- Conduct flow monitoring to assess effectiveness of I/I reduction over time.

- After completion of the initial I/I reduction projects, develop recommendations regarding changes to local agency agreements and/or the King County Code.

The Executive's Recommended Regional Infiltration and Inflow Control Program report is available on the Web at http://dnr.metrokc.gov/wtd/i-i/library/ExecRec/report.htm.

4.2 Regional Needs Assessment

The Regional Needs Assessment was completed in March 2005. The assessment used projections of regional population growth and I/I generation to identify portions of the regional conveyance system that will require expansion over time.

Sixty-three CSI projects were identified to meet the region's projected peak flow capacity needs through 2050. These projects and their estimated costs provided the basis for conducting benefit-cost analyses of potential I/I reduction projects. The list of identified CSI projects is provided as Appendix A; locations of CSI projects are shown in Figure 4-1.

The Regional Needs Assessment is available on the Web at http://dnr.metrokc.gov/wtd/i-i/library/NeedsAssess/report.htm.

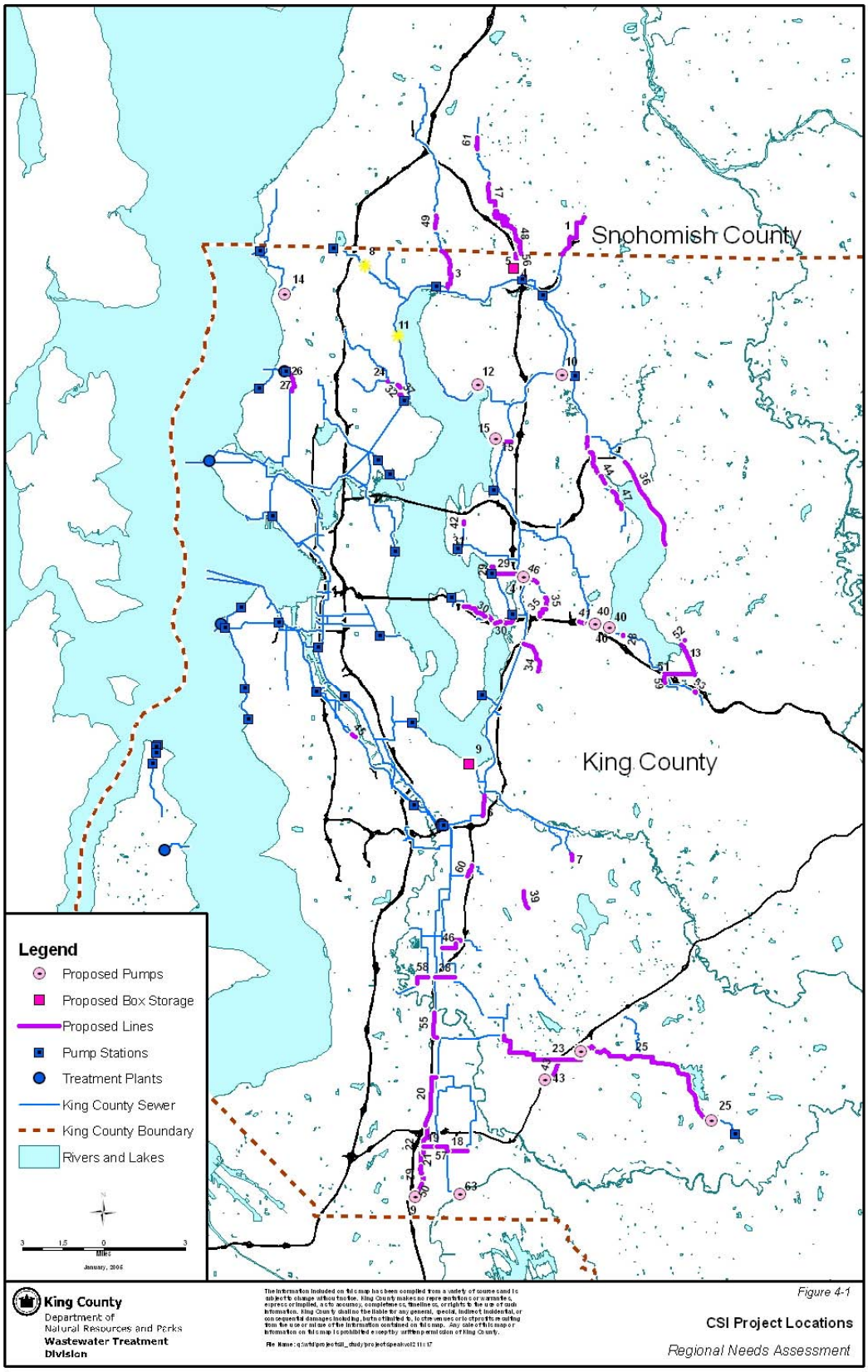


Figure 4-1. Conveyance System Improvement Project Locations

4.3 Benefit-Cost Analysis

To make the most effective use of county resources, the Wastewater Treatment Division (WTD) evaluated whether it would be cost effective to eliminate or delay CSI projects identified in the Regional Needs Assessment by reducing the amount of I/I in the conveyance system. The benefit-cost analysis compared the estimated costs of constructing CSI projects with the estimated costs of I/I reduction projects.

To evaluate cost-effectiveness of I/I reduction projects, the following benefit-cost ratio was calculated for each candidate CSI project:

$$\frac{\textbf{(CSI Project Savings After I/I Reduction)}}{\textbf{(Cost of Proposed I/I Reduction Project)}}$$

When an I/I reduction project delays, downsizes, or eliminates the need for a conveyance facility improvement, the savings achieved (benefit) must be higher than the cost of the I/I reduction project (cost) to arrive at a positive benefit-cost ratio.

Table 4-1 summarizes the nine resulting cost-effective I/I reduction projects. The two or three initial I/I reduction projects will be selected from this list. (See the I/I control program recommendations listed earlier in this chapter for more detail about the initial projects.)

Table 4-1. Cost-Effective I/I Reduction Projects

CSI Project No.	Project	I/I Available (mgd)	I/I Reduction (mgd)	Benefit: Capital CSI Cost Reduction	Cost: I/I Reduction Project	Benefit -Cost Ratio	No. of Private Properties
60	South Renton Interceptor (RE*SRENTON.R18-16(9))	7.0	0.81	$7,270,000	$2,217,645	3.3	119
58	ULID 1 Contract 4 (RE*ULID 1-4.S-31(8))	5.5	1.08	$2,410,000	$999,123	2.4	101
55	Auburn 3 New Storage (Auburn3 Twin Tube Storage)	52.8	6.87	$22,990,000	$11,362,511	2.0	1,176
59	Issaquah 2 Trunk (RE*ISSAQ2.R17-40(3))[a]	5.4	1.05	$5,770,000	$3,964,850	1.5	395
33	Bryn Mawr Storage (Bryn Mawr Tube Storage)	16.2	2.04	$8,510,000	$6,018,534	1.4	557
47	Lk Hills Trunk 3rd Barrel Upgrade (WE*LKHILLST.ENTR(3))	10.8	2.20	$14,438,000	$11,307,052	1.3	1,086
41	Eastgate Storage and Trunk[b] (Eastgate Tube Storage)[a]	8.7	3.55	$16,629,000	$14,459,862	1.2	1,163
35	Wilburton PS / Factoria Trunk (RE*FACTOR.RO6-05(7))	10.4	2.39	$12,058,000	$10,550,378	1.1	976
46	Garrison Creek Trunk (RE*ULID 1-5.57I(10))	5.7	2.12	$13,660,000	$12,013,489	1.1	1,275
	TOTAL	**122.5**	**22.11**	**$103,735,000**	**$72,893,444**		**6,848**

Note: Identified projects are based on E&P Subcommittee–approved assumptions.

[a] The Eastgate Tube Storage and RE*ISSAQ2.R17-40(3) projects are related and are considered as one construction project.

[b] Modeling for the Eastgate trunk facilities was updated since the *Regional Needs Assessment Report* was published in March 2005. The updated project now includes the new Eastgate storage facility.

The benefit-cost analysis report is available on the Web at
http://dnr.metrokc.gov/wtd/i-i/library/BenefitCost/report.htm

4.4 Schedule for 2006

A major milestone for the I/I control program in 2006 is to begin implementing the council-approved regional I/I control program. The first step is to work with the local agencies to select two or three cost-effective I/I reduction projects for implementation in 2007. For each project, sewer system evaluation surveys will be conducted at the project sites to identify specific points in local agency sewers and in privately owned side sewers where I/I is entering the sewer system. The information from these surveys will help determine the level of effort necessary to reduce I/I to a point where a larger conveyance facility will no longer be needed and will help identify the appropriate repair technologies for each rehabilitation project.

Visit the project Web site for more information: http://dnr.metrokc.gov/wtd/i-i/

Chapter 5

Combined Sewer Overflow Control

The RWSP calls for continued improvements to control combined sewer overflows (CSOs). The RWSP identifies 21 projects to control King County's CSOs by 2030 to meet the Washington State Department of Ecology (Ecology) standard of no more than an average of one untreated discharge per year at each CSO location.

CSOs are events where untreated wastewater and stormwater from combined sewers discharge directly from outfall pipes into water bodies during heavy rainstorms when sewers are full. Combined sewers, which carry both wastewater and clean stormwater, exist in many parts of older cities across the nation, including Seattle. To protect treatment plants and avoid sewer backups into homes, businesses, and streets, combined sewers in Seattle sometimes overflow at specific locations (CSOs) into Puget Sound, the Duwamish Waterway, Elliott Bay, Lake Union, the Lake Washington Ship Canal, and Lake Washington. Although the wastewater in CSOs is greatly diluted by stormwater, CSOs may be harmful to public health and aquatic life because they can carry chemicals and disease-causing pathogens.

By May 2005, about 17 of King County's 38 CSOs were controlled to Ecology's standard. The remaining 21 uncontrolled CSOs will meet state standards as capital improvement projects are completed between 2012 and 2030. An update and calibration of the hydraulic model, expected to be ready in 2007, will help verify the control status of King County CSOs. More information on the update of the hydraulic model is provided later on in this chapter. [1]

Strategies for reducing CSOs include pollution prevention through source control, operational controls, upgrades of existing facilities, and construction of additional facilities to provide storage and treatment of excess flows prior to discharge. The RWSP directs the county to give the highest priority to CSO discharges that have the greatest potential to impact human health, bathing beaches, and/or species listed under the federal Endangered Species Act (ESA). Based on this direction, projects to control CSO discharges along Puget Sound beaches are scheduled to be completed first. The RWSP also directs the county to continue implementation of CSO control projects that were under way prior to adoption of the RWSP.

5.1 Accomplishments in 2005

The key achievements of the CSO control program in 2005 are as follows:

- Completion and startup of Mercer/Elliott West CSO control system (formerly called the Denny Way/Lake Union CSO control project)

[1] The hydraulic model outputs flow depths and velocities in specific pipe segments and allows for the evaluation of system performance under existing and future demands.

- Completion and startup of the Henderson/Norfolk CSO control system (formerly called the Henderson/MLK/Norfolk CSO control project)
- Substantial progress on the CSO control program review
- Continued coordination on CSO and stormwater management for the Alaskan Way Viaduct and Seawall Replacement project
- Continued response to the Environmental Protection Agency's Superfund listing of the Lower Duwamish Waterway
- Moving forward with the sediment management plan (progress on sediment cleanup at the Denny Way outfall structure sites and at the Lander and Hanford CSOs)

5.2 Mercer/Elliott West CSO Control System

The Mercer/Elliott West CSO control project was under way prior to the adoption of the RWSP. This project was a joint effort of King County and the City of Seattle to control CSOs into Lake Union and Elliott Bay. The project was completed in May 2005. The completed system controls several of Seattle's CSOs in addition to the largest CSO in the county's system.

Startup of Mercer/Elliot West system has been complicated because of dry weather flows entering the Mercer Tunnel from Seattle's Lake Union system. These flows have caused operations and maintenance challenges. Investigations indicate that the downstream pipe is two-thirds full of sediments, causing flows from the pipe to back up in the tunnel. Cleaning of the pipes began in May 2006. New flow monitors will be installed to monitor the effects of the pipe cleaning. The project is expected to be fully operational in late 2006.

5.3 Henderson/Norfolk CSO Control System

The Henderson/Norfolk CSO control project was under way prior to the adoption of the RWSP. The project was completed in May 2005. This completed system controls two CSOs in Lake Washington and one CSO on the Duwamish River at Norfolk. With completion of this project, all of the county's CSOs along Lake Washington are controlled.

5.4 CSO Control Program Review

In accordance with the RWSP CSO control policies, the Wastewater Treatment Division (WTD) carried out a CSO control program review to evaluate the benefits of continuing the CSO control program as identified in the RWSP. The CSO control program review was completed and transmitted to the Metropolitan King County Council in spring 2006.

The review assessed whether adjustments in the CSO control program were needed to respond to changing conditions, ongoing regulatory requirements, and county business needs. Results of the review indicate that current scientific information supports the approach and direction of the

RWSP CSO control program. The review confirmed that the current WTD priority of using conveyance improvements or storage facilities to capture and then transfer CSOs to the secondary plants provides the best CSO control management and that satellite CSO treatment should be used where transfer is not feasible. The review also confirmed that the schedule for completing the CSO control projects meets the RWSP's direction to prioritize projects according to their potential to protect human health, the environment, and endangered species. The project priorities, as shown in Figure 5-1, are as follows:

- **Priority 1, CSOs near Puget Sound Beaches.** The current schedule calls for completion of the Barton, Murray, North Beach, and South Magnolia projects in 2012.
- **Priority 2, University/Montlake CSO.** This CSO is located at the east end of the Ship Canal. The control project was given a high priority because of the high level of boating in that area, which could result in secondary contact with the water. The current schedule calls for completion of this project in 2015.
- **Priority 3, CSOs Along the Duwamish River and in Elliott Bay.** The RWSP designated that nine projects at CSOs along the Duwamish River and in Elliott Bay be completed between 2017 and 2027. These projects were given third priority because King County's 1998 *Combined Sewer Overflow Water Quality Assessment for the Duwamish River and Elliott Bay* indicated that the level of bacterial pollution originating upstream of CSOs was high enough to dwarf improvements by CSO control projects.
- **Priority 4, CSOs at the West End of the Ship Canal.** Three projects to control CSOs at the west end of the Ship Canal (Ballard, 3rd Avenue West, and 11th Avenue West) are scheduled to be completed by 2030. These are the last projects to be completed because significant CSO control had already been accomplished in this area prior to the adoption of the RWSP.

* The SW Alaska Storage project is no longer needed; updated monitoring and modeling data indicate that this CSO is already controlled.

Figure 5-1. Prioritized CSO RWSP projects

The four CSO control projects along Puget Sound beaches—Murray and Barton in Alki, Magnolia along north Elliott Bay, and North Beach near Carkeek Park—will enter predesign in mid-2006. Low-interest state loans have been awarded to develop facility plans for three of these projects.

WTD will continue to monitor the information that is being generated through the Lower Duwamish Waterway Superfund project for factors that could lead to recommending future schedule changes to CSO control projects. For example, if an ongoing human health risk in the Duwamish River is identified as resulting from CSOs, recommendations for changes in the schedule may be considered to accelerate the CSO control projects in these locations.

The review also identified advances in CSO treatment technologies that could lead to more cost-effective facilities. Pilot testing of these technologies will be conducted in late 2006 through 2009. In addition, the review determined the need to update and recalibrate the hydraulic model used to predict the effectiveness and design of CSO control projects. The updated model is expected to be complete in 2007 and will be used to re-evaluate project needs and sizing. The next CSO program review, scheduled for 2010, will include information on the results of the updated model and the testing of technologies, as well as updated cost estimates for the CSO control program projects.

The CSO control program review is available on the Web at http://dnr.metrokc.gov/wtd/cso/library.htm#plans

5.5 Coordination on the Alaskan Way Viaduct and Seawall Replacement Project

Discussions continued with the City of Seattle and Washington State Department of Transportation (WSDOT) on CSO and stormwater management for the Alaskan Way Viaduct and Seawall Replacement project. The county provided significant technical input and review to the city's drainage and wastewater feasibility study (August 2005). The feasibility study found that the city's CSOs along the Elliott Bay waterfront were not controlled as had been assumed during development of the RWSP. The county, city, and WSDOT continue to work on solutions for future stormwater and CSO management in this area.

5.6 Lower Duwamish Waterway Superfund Site

King County continues to work to improve water quality in the Lower Duwamish Waterway through actions such as reducing CSOs, restoring habitats, capping and cleaning up sediments, and controlling toxicants from industries and stormwater runoff. WTD is partnering in an agreement known as the Lower Duwamish Waterway Group (LDWG) with the City of Seattle, the Port of Seattle, and the Boeing Company under a consent agreement with the U.S. Environmental Protection Agency (EPA) and Ecology to prepare a remedial investigation and feasibility study for the Lower Duwamish Waterway Superfund Site. The agreement gives WTD the opportunity to shape the process and to implement any cleanups earlier than would have occurred under a traditional Superfund approach.

The field studies needed to complete the remedial investigation have been completed. Work is starting on the feasibility study, which will outline alternatives for the final cleanup of the site. Extensive public outreach activities are being carried out to ensure that local communities and other stakeholders are informed of the progress on the site and to provide them with opportunities for involvement in the development of the program.

The LDWG is committed to undertaking four of the early action sites, which will clean up portions of the waterway years earlier than required. The county is participating in two of the early action sites at Diagonal/Duwamish CSO/Storm Drain and Slip 4.[2] The cleanup of 60,000 cubic yards of contaminated sediment over a 7-acre area of river bottom at Diagonal/Duwamish was successfully completed in February 2004. The dredged area was capped with 3 to 6 feet of clean sediment and gravel to provide new fish habitat, helping to restore a vital area of the river environment. Follow-up work was completed at the site in February 2005, and monitoring of these actions will provide critical information on cleanup alternatives for the Superfund site. The Diagonal/Duwamish remediation closure report issued in July 2005 summarizes the purpose for and details of the follow-up work. The closure report is available on the Web at http://dnr.metrokc.gov/wtd/duwamish/diagonal.htm. Monitoring on the new cap in 2005 showed accumulations of phthalates and other chemicals in front of the Diagonal/Duwamish outfall. This discovery has led to discussions with EPA, Ecology, and the Cities of Seattle and Tacoma about how to address ubiquitous runoff contaminants, including the formation of a special phthalate workgroup.

In spring 2006, EPA selected a cleanup plan for Slip 4 sediments. Sediments with the highest contamination will be removed, and the remaining sediments will be capped. The cleanup is scheduled to begin in October 2007.

WTD worked with the City of Seattle and Port of Seattle to secure a state grant for the portion of this work done in the 2003–2005 biennium and has been awarded a new grant for the 2005–2007 biennium. To date, 50 percent of the county's cost on the remedial investigation/feasibility study and the Slip 4 cleanup has been covered by these grants. WTD also applied for and was notified that it is eligible for a retroactive grant for the cleanup of contaminated sediments at Diagonal/Duwamish and two other sites conducted as part of the Elliott Bay/Duwamish Restoration Program.[3] Grant award will be made in the next biennium (2007–2009) based on availability of dedicated funds.

Visit the Duwamish Waterway Programs Web site for more information: http://dnr.metrokc.gov/wtd/duwamish/#sediment

5.7 Sediment Management Program

The RWSP policies call for the development of a long-range sediment management strategy to prioritize cleanup of contaminated sediments at specific CSO locations. WTD is carrying out a sediment management plan developed in the late 1990s to remediate sediment near some county CSO outfalls that are contaminated with a variety of heavy metals (lead, copper, zinc),

[2] Slip 4 is located approximately 3 miles upstream from Harbor Island, just north of Boeing Plant 2. The slip encompasses 6.4 acres and is approximately 1,400 feet long with an average width of 200 feet. The northwest side of the slip is mostly covered with docks and a berthing area.

[3] The Elliott Bay/Duwamish Restoration Program (EBDRP) was established to implement the requirements of the 1991 Consent Decree defining the terms of a natural resources damage agreement. The goals of the EBDRP include remediation of contaminated sediments associated with King County and Seattle CSOs and storm drains, restoration of habitat in Elliott Bay and the Duwamish River, and control of potential sources of contaminants from the outfalls.

phthalates, polychlorinated biphenyls (PCBs), and hydrocarbons. Most of the contamination is from the first half of the 20th century.

King County is responsible for cleaning up sediment contamination related to CSOs under the federal Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) and the state Model Toxics Control Act (MTCA).[4] The county is working to meet the following objectives:

- Remediate sediments in a timely, efficient, and economical manner
- Prevent harm to public health
- Limit future liability

King County has begun work on the first of the cleanup sites—in front of the old Denny Way outfall structure. This three-year project will clean up the remaining contaminated sediment in the nearshore area adjacent to the outfall. Cleanup is also under way at the Lander and Hanford CSOs. Dredging at Hanford is complete, but EPA has determined that a remedial investigation/feasibility study (RI/FS) is warranted to determine additional cleanup needs in the East Waterway. The work associated with the RI/FS is a continuation of the Harbor Island Superfund cleanup begun in the 1990s. WTD has negotiated an agreement with the Port of Seattle and the City of Seattle to conduct these studies and pursue other parties that might have contributed to the contamination.

5.8 Schedule for 2006

5.8.1 CSO Control Program

The CSO control program review was transmitted to the King County Council and the Regional Water Quality Committee in spring 2006. Predesign will begin in 2006 on the four Puget Sound beach CSO control projects. Update of the hydraulic model will continue in 2006 and will be completed in 2007; the testing of new technologies will take place in 2007 to 2009. Coordination with the City of Seattle will continue on CSO control planning projects, including discussions about sewer system needs associated with the Alaskan Way Viaduct and Seawall Replacement project.

Visit the CSO control program Web site for more information: http://dnr.metrokc.gov/wtd/cso/

5.8.2 Lower Duwamish Waterway Superfund Site

In 2006, work will continue on the remedial investigation for the Lower Duwamish Waterway Superfund site. The draft remedial investigation is scheduled for public review in early 2007. The detailed work plan for the feasibility study for the project is expected to be ready for public review in late 2006. Work will continue on the feasibility study through 2007. Cleanups at two of

[4] CERCLA is commonly known as Superfund.

the early action sites are currently scheduled to begin in late 2007. Post-remediation monitoring will continue at Diagonal/Duwamish cleanup site. Ecology, WTD, and the Cities of Seattle and Tacoma are forming a workgroup to determine appropriate actions and strategies to address runoff problems for ubiquitous contaminants like phthalates. Visit the Duwamish Waterway Programs Web site for more information: http://dnr.metrokc.gov/WTD/duwamish/

5.8.3 Sediment Management Program

Dredging at the old Denny Way outfall site is scheduled to begin in late 2007. The schedule and process for the remedial investigation/feasibility study on the East Waterway of the Duwamish River will be determined in 2006. Allocations for formal cost shares for the cleanups at Slip 4 and Hanford will be set during 2006. WTD is also starting negotiations to conduct a cooperative cleanup at King Street CSO as part of WSDOT's Colman Dock upgrade project.

Visit the Sediment Management Program Web site for more information:
http://dnr.metrokc.gov/wtd/sediment/

Chapter 6

Local Treatment Plants

At the request of Vashon Sewer District and the City of Carnation, and in accordance with RWSP policies, King County extended its service area to meet specific public health needs and to help manage the environmental impacts of growth in these communities. Since 1999, King County has managed and operated the Vashon Treatment Plant for the Vashon Sewer District. Upgrades to the plant will be complete in 2006. In 2002, the City of Carnation contracted with King County to design, build, and operate a new wastewater treatment plant. Construction of the Carnation Treatment Plant will be complete in late 2007.

This chapter summarizes the progress made in 2005 on the Vashon Treatment Plant and Carnation Treatment Plant projects. Information on activities planned for 2006 is also provided.

6.1 Vashon Treatment Plant

Since 1999, the county has carried out several steps to improve the Vashon Treatment Plant. It has extended the marine outfall farther into Puget Sound and completed interim upgrades to improve the plant's performance and compliance with NPDES (National Pollution Discharge Elimination System) permit requirements.[1]

Further upgrades are in progress to increase plant capacity and enhance its backup systems. Improvements include new headworks, an oxidation ditch, two secondary clarifiers, a stormwater detention tank, an administration building, and an electrical building. The upgrade is funded in part by loans from the Public Works Trust Fund, the Washington State Department of Ecology (Ecology), and the U.S. Environmental Protection Agency (EPA). Completion of this project will allow the plant to reliably meet regulatory requirements and to protect human health and the environment. See Figure 6-1 for a treatment plant vicinity map.

6.1.1 Project Status

Construction in 2005 got off to a slow start because of the discovery of contaminated surface soils on site. The contaminants were likely deposited by fallout from the smokestacks of the Asarco Copper Smelter in Ruston, which operated from 1890 to 1996. After a soil management plan was developed and implemented, construction resumed in April 2005.

[1] NPDES permits are issued by the Washington State Department of Ecology and set limits on the quality and quantity of effluent (treated wastewater) discharged from point sources such as treatment plants, CSOs, and industrial facilities.

Project accomplishments in 2005 include the following:

- A pipe bridge across the ravine between the old and new plant site was constructed. The sensitive ravine area will be restored with native plants.
- Major site and structural work, including a substantial amount of the concrete placed for the stormwater detention tank and clarifiers, was completed.
- The new siphon was completed.

6.1.2 Schedule for 2006

The Vashon Treatment Plant upgrade is expected to be complete by fall 2006. The application to renew the current NPDES permit based on the upgraded facility was submitted to Ecology in early 2006. The Wastewater Treatment Division (WTD) is under a compliance order with Ecology to have the plant in operation in the first quarter of 2007 and is on schedule to meet this deadline.

Visit the project Web site for more information: http://dnr.metrokc.gov/wtd/vashon/

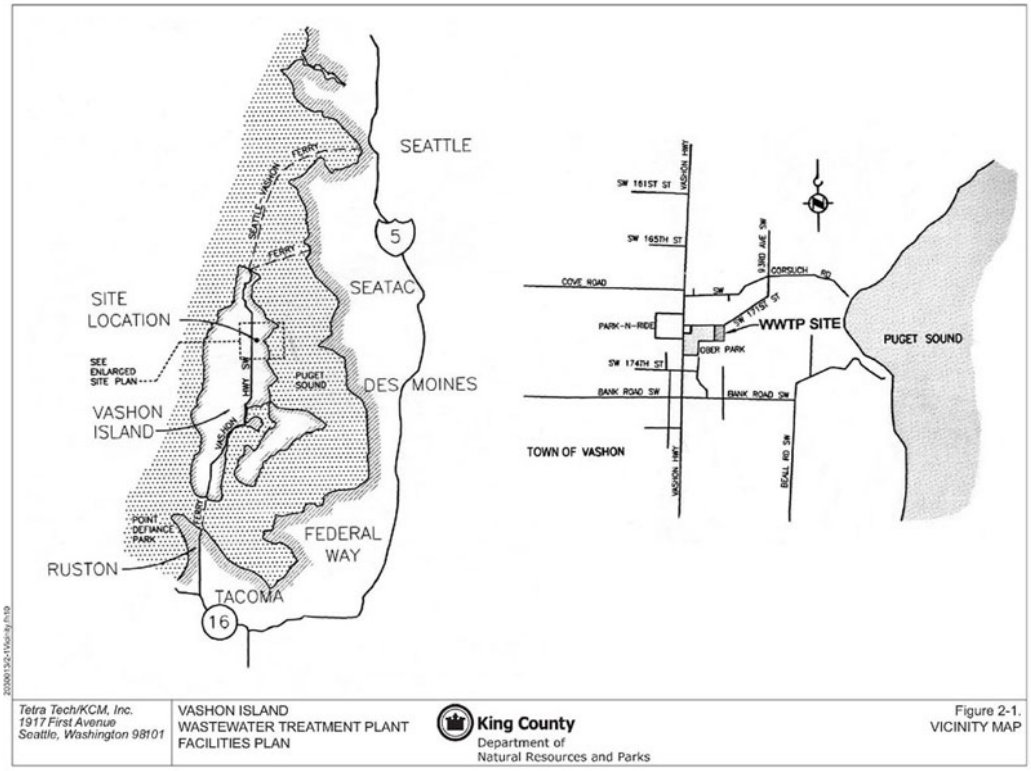


Figure 6-1. Vashon Wastewater Treatment Plant Vicinity Map

6.2 Carnation Treatment Plant

The City of Carnation decided to replace on-site septic systems with a new wastewater treatment facility and collection system to better protect public health and the environment, achieve the city's comprehensive plan goals, and maintain and enhance community livability. The city will design and build the local wastewater collection system. It has contracted with King County to design, build, operate, and maintain a new treatment plant and associated discharge facilities. King County is purchasing the approximately 2-acre plant site from the city. A 12-inch-diameter effluent pipeline approximately 1.6 miles long will be built from the treatment plant to a discharge outfall into the Snoqualmie River at the Carnation Farm Road Bridge. Figure 6-2 shows the location of the Carnation treatment facilities.

Construction will begin in mid-2006, and the treatment plant is expected to begin operating in January 2008. The plant will use membrane bioreactor technology (MBR), which produces a higher quality effluent than effluent produced by typical secondary treatment processes. At startup, the plant will have the capacity to treat a maximum daily flow of about 430,000 gallons of wastewater per day. The average daily flow capacity of the plant at startup will be 210,000 gallons of wastewater per day.

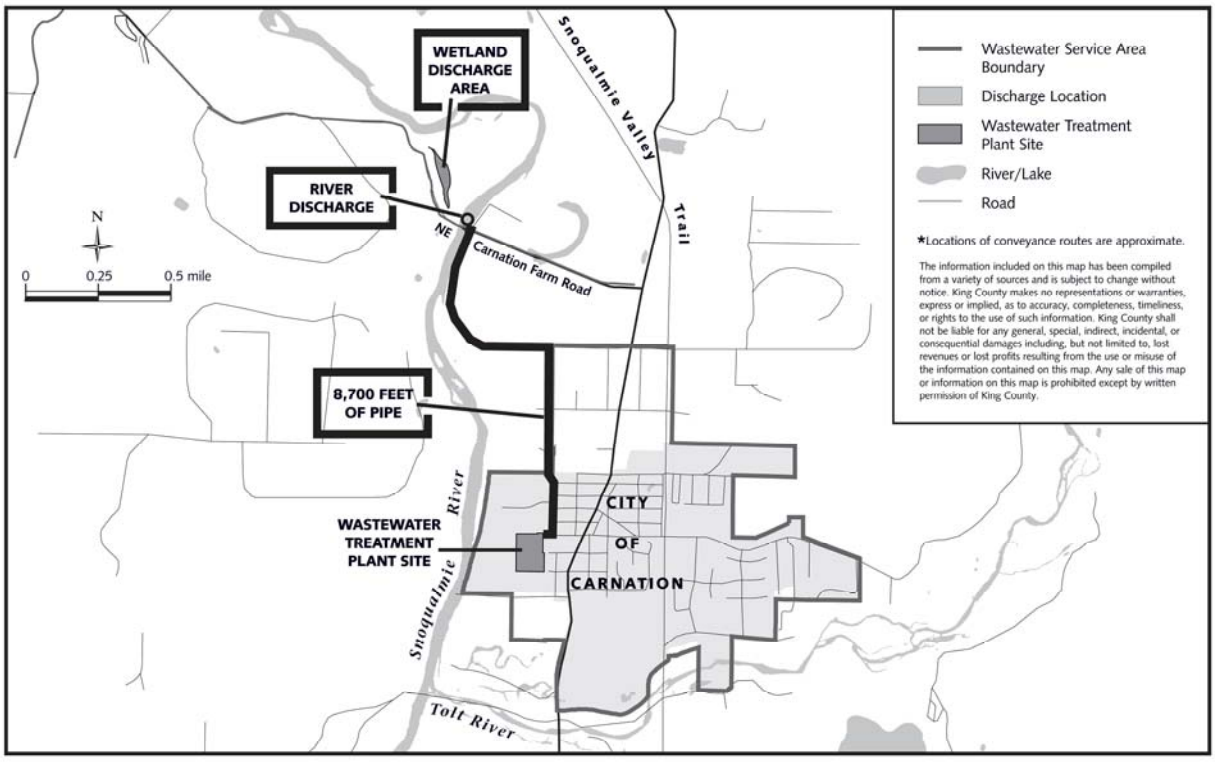


Figure 6-2. Location of Carnation Treatment Facilities

6.2.1 Project Status

Several milestones were achieved in 2005:

- **Selection of the treatment plant design.** Public meetings were held to discuss treatment plant design options. Before making a design recommendation, the City of Carnation considered comments received, aesthetics, and costs. In June 2005, the city recommended that the county move forward with a barn-like building design.
- **Moving forward on discharge options.** The county is obtaining permits for a Snoqualmie River outfall at Carnation Farm Road Bridge and continues to pursue a wetland enhancement discharge at the Chinook Bend Natural Area. Late in 2005, King County sought the support of the Snoqualmie Tribe, which was granted after the county agreed to a wetland discharge. To resolve an appeal of the shoreline permit, the county further committed to accelerate the timing of the wetland discharge. The wetland discharge is expected to come online as soon as the treatment plant successfully goes through its startup procedures and is operating effectively. The county will also continue to consider other water reuse opportunities that may develop in the Carnation area.
- **Issuance of facilities plan.** A facilities plan was prepared in accordance with Washington Administrative Code 173-240 for submittal to Ecology. Ecology approved the plan on October 31, 2005. The approved plan demonstrates how the siting and design of the Carnation Treatment Plant will meet the applicable guidelines, regulations, and approval requirements for the issuance of a discharge permit. In addition, the facilities plan serves as a comprehensive guide to the project. This plan is available on the Web at http://dnr.metrokc.gov/wtd/carnation/library/FacilityPlan/02PurposeScope.pdf
- **Completion of the National Environmental Policy Act (NEPA) Process.** Because federal funds will be used to pay for a part of the Carnation wastewater treatment facilities, the facility is subject to NEPA review. EPA prepared an Environmental Assessment (EA) and issued a Finding of No Significant Impact (FONSI) for the proposed project in fall 2005. The EA and FONSI can be found at http://dnr.metrokc.gov/wtd/carnation/library.htm#environmental
- **Permitting**. Significant progress was made in 2005 toward obtaining construction permits for the treatment plant.
- **Design.** The 30 percent and 60 percent design submittals were completed for the treatment plant.

6.2.2 Schedule for 2006

Final design and permitting activities for the Carnation Treatment Plant are expected to be complete by spring 2006. The county plans to complete the purchase of the plant site in early 2006 and acquire the necessary easements for the discharge pipeline. Construction of the treatment plant will begin in fall 2006 and continue through 2007. The facility is expected to begin startup in late 2007 and to start operating in 2008.

Visit the project Web site for more information: http://dnr.metrokc.gov/wtd/carnation/

Chapter 7

Odor Control Program

The RWSP includes policies to guide King County in achieving its goal of preventing and controlling nuisance odor occurrences at all wastewater treatment plants and associated conveyance facilities. The policies also call for implementation of an odor prevention program that goes beyond traditional odor control.

The RWSP reporting requirements call for an annual report on the status of the odor prevention policies and projects, including a summary of odor complaints. This chapter meets those reporting requirements. The summary of odor complaints is provided as Appendix B.

This chapter presents activities completed in 2005 to implement odor control improvements at the West Point and South Treatment plants. It then describes the odor control improvements planned for conveyance system facilities and the odor control design planned for the Brightwater System. The last section of the chapter describes the odor control activities planned for 2006.

7.1 Phased Retrofit of the West Point and South Plants

The RWSP odor control policies, as established via Ordinance 14712, require implementation of phased improvements at the West Point and South Treatment plants to control the most significant potential odor sources first. To that end, the Wastewater Treatment Division (WTD) has undertaken projects at each plant to identify and implement changes to existing odor control systems and to install new systems.

At the West Point Plant, design on improvements to the existing odor scrubber system is complete and modifications are expected to be substantially complete by the end of 2006. Changes to the division channel ventilation system were also designed and completed in 2005.

At the South Plant, WTD has completed final design of covers for each first pass of the four aeration basins and of covers for the return activated sludge channel. Installation of the covers will begin in 2006 and is expected to be complete in mid-2007. Because the aeration basins need to be taken out of service while the covers are installed, delays in the project schedule are possible. The amount of time that the aeration basins can be offline depends on wet-weather flow volumes.

7.2 Conveyance System Upgrades

RWSP policies call for conveyance facilities that pose nuisance odor problems to be retrofitted with odor prevention systems as soon as such odors occur, subject to technical and financial feasibility. As shown in Table 7-1, several projects are under way to improve odor problems in the conveyance system. The type of control technology and the anticipated completion dates are also provided.

Table 7-1. Conveyance System Upgrades with Odor Control Components

Facility	Odor Control Technology	Anticipated Completion Date
Hidden Lake Pump Station	Carbon bed odor scrubber & chemical injection	4th quarter 2008
Kenmore Lakeline	Carbon bed odor scrubber & chemical injection	4th quarter 2008
Lake City Regulator Station	Replacement of phoenix/carbon scrubber with bioscrubber	4th quarter 2009
University Regulator Station	Carbon bed odor scrubber	3rd quarter 2007
Interbay Pump Station	Carbon bed odor scrubber	4th quarter 2010
King Street Regulator Station Odor Control	Carbon bed odor scrubber	4th quarter 2008
53rd Avenue Pump Station	Carbon bed odor scrubber	3rd quarter 2008
Juanita Bay Pump Station	Carbon bed odor scrubber & chemical injection	2nd quarter 2008
Kirkland Pump Station	Carbon bed odor scrubber	4th quarter 2009
Bellevue Pump Station	Carbon bed odor scrubber & chemical injection	4th quarter 2008
Eastside Interceptor	Chemical (nitrate) injection	4th quarter 2007
Soos Creek Pump Station & Pipeline	Carbon bed odor scrubber & chemical injection	4th quarter 2020

7.3 Brightwater Odor Control System Design

The Brightwater System will incorporate odor control systems based on proven technologies that will comply with the High/New Plant odor prevention level referenced in Attachment A of Ordinance 14712. Pilot studies at the South Treatment Plant were conducted to test the feasibility of using biologically based odor scrubbers in lieu of some the chemical scrubbers originally envisioned for the Brightwater odor control systems. Testing showed that the same level of odor control could be attained more economically if biological scrubbers were to replace two of the three chemical scrubber stages originally designed. The final odor control system design includes biological, chemical, and carbon odor scrubber stages that meet the goal of no odors at the property line and the other requirements contained in Ordinance 14712.

7.4 Schedule for 2006

WTD will continue to implement odor control improvements in accordance with RWSP policies. The following activities are planned for 2006:

- Complete the modifications to the odor control scrubber system at West Point Plant.
- Install aeration basin covers at South Plant; this project will be completed in 2007.
- Continue to design and implement odor control improvements to conveyance system facilities that are listed in Table 7-1 of this chapter.
- Complete an Odor and Corrosion Control Plan. This plan will identify where odor or corrosion problems are occurring, describe the sources if known, and propose solutions. In the *2004 RWSP Annual Repor*t, this plan was referred to as the Odor Control Comprehensive Plan.

Visit the Odor Control Program's Web site for more information:
http://dnr.metrokc.gov/wtd/odorcontrol/

Chapter 8

Biosolids Program

Biosolids are the nutrient-rich organic material produced by treating wastewater solids. After they are processed and treated, biosolids can be beneficially reused as a fertilizer and soil amendment. RWSP policies guide King County to continue to produce and market Class B biosolids and to evaluate alternative technologies to produce the highest quality marketable biosolids, including Class A biosolids.[1,2]

This chapter describes the county's Biosolids Program activities and milestones in 2005 and its planned activities for 2006.

8.1 Accomplishments in 2005

8.1.1 Use of Biosolids

The Wastewater Treatment Division (WTD) continued to produce high quality Class B biosolids at the South and West Point plants. Approximately 115,000 wet tons of biosolids were produced in 2005, all of which was recycled as a soil amendment for forestry and agricultural applications and to make compost. Monitoring continues to show low levels of pollutants and excellent nutrient value of biosolids.

In 2005, King County's biosolids were used as a soil amendment for a variety of applications:

- 4,600 acres of wheat in Douglas County
- 245 acres of wheat, 789 acres of hops, and 19 acres of grapes in the Yakima Valley
- 213 acres of state forestlands and 1,236 acres of Douglas-fir plantations in Hancock's Snoqualmie Forest as part of the Mountains to Sound Greenway Biosolids Forestry Program

[1] Class B biosolids refer to biosolids that have been treated to significantly reduce pathogens to levels that are safe for beneficial use in land application.

[2] Class A biosolids refer to biosolids that have been treated to reduce pathogens to below detectable levels. Biosolids that meet this designation can be used without site access or crop harvest restrictions and are exempt from site-specific permits. Federal regulations require Class A level of quality for biosolids that are sold or given away in a bag or other container or that are applied to lawns or home gardens.

8.1.2 Investigation and Implementation of Biosolids Technologies

New "high-solids" centrifuges were installed and began operating at the South Treatment Plant in February 2005.[3] These centrifuges remove more water from the biosolids. As a result, the number of biosolids truck trips was reduced by 17 percent despite a 5 percent increase in solids produced in 2005.

In 2005, WTD conducted further investigations into the most appropriate technologies and resultant costs for producing Class A biosolids at its regional treatment plants. These technologies would open up opportunities to market the product in King County and western Washington, thereby reducing haul costs. The investigation concluded that temperature-phased anaerobic digestion would be the most viable alternative for converting each plant to Class A biosolids production. Further assessment of costs and benefits will continue in 2006.

8.1.3 Permits and Certification

King County submitted an application to the Washington State Department of Ecology in September 2005 to renew coverage under the statewide general permit for biosolids. No significant changes to the county's biosolids program are anticipated during the five-year permit cycle.

WTD continued operating as a certified program in the National Biosolids Partnership's Environmental Management System (EMS) for biosolids. An audit conducted by the NSF-International Strategic Registrations in 2004 verified King County's conformance to EMS requirements, making the biosolids program eligible for five-year certification. Participation in the National Biosolids Partnership represents a commitment to improvements in biosolids management practices to address issues of public concern, such as quality and odor. More information on the EMS is on the Web at http://dnr.metrokc.gov/wtd/biosolids/EMS.htm

8.1.4 Cost Savings

The biosolids program realized significant savings for the county through sales tax exemptions for machinery, equipment, and ingredients used to make the biosolids product ready for sale. The county receives revenue from landowners for the nutrient and soil amendment value of biosolids, thereby meeting the requirement that a product is sold.[4] More than $1 million in tax refunds and credits were received from the Washington State Department of Revenue for purchases of centrifuges and polymer made from 1999 to 2004.[5]

[3] Centrifuges are equipment that removes water from biosolids.
[4] In 2005, the Biosolids Program generated $100,000 in fertilizer revenue from its customers.
[5] Polymer refers to products added to digested solids prior to dewatering. Polymer helps to more effectively separate the solids from the water. Removing water from the solids reduces the volume of biosolids produced, which in turn reduces the number of haul vehicles leaving the plants.

8.2 Schedule for 2006

In 2006, design will begin on the three-year West Point Digestion System Improvements project. The improvements are intended to increase the stability of the digestion system and decrease the potential for digester upsets.

WTD will continue to conduct research and demonstration projects to evaluate the safety and benefits of the county's biosolids projects, including evaluating new uses with additional environmental benefits, and to respond to public concerns.

A recent case study evaluated the potential to use biosolids as a tool to maximize carbon sequestration and gain carbon credits for greenhouse gas reductions.[6,7] In 2006, the University of Washington will continue to evaluate a range of carbon sequestration options for biosolids. Options include using biosolids to enhance forest growth, to increase soil carbon reserves in agriculture or restoration projects, and to grow energy crops such as oil seed crops for biodiesel. The study will include details on how to account for carbon storage in soils and in different ecosystems.

Visit the Biosolids Program Web site for more information:
http://dnr.metrokc.gov/wtd/biosolids/

[6] Carbon sequestration is the process through which agricultural and forestry practices remove carbon dioxide (CO_2) from the atmosphere. CO_2 is a major contributor to global warming.

[7] In July 2006, the King County Council approved membership in the Chicago Climate Exchange, which works to reduce greenhouse gas emissions through binding goals and the trading of "carbon credits." The trading of carbon credits is similar to pollution credit programs that allow industries and jurisdictions to sell, trade, or purchase emissions that contribute to air pollution, with the goal of reducing the overall amount of emissions.

Chapter 9

Reclaimed Water and Water Conservation

RWSP water reuse policies call for King County to pursue the use of reclaimed water and to develop a water reuse program. Water reuse is also a component of the RWSP treatment plant policies. These policies call for the county to continue water reuse at existing facilities, to explore opportunities for expanded reuse at existing facilities, and to explore reuse opportunities at all new treatment facilities. In addition, RWSP policies recognize the importance of supporting water conservation efforts.

This chapter provides information on the activities of the county's Reclaimed Water and Water Conservation Programs in 2005 and their anticipated activities for 2006.

9.1 Reclaimed Water Program[1]

9.1.1 Accomplishments in 2005

The Wastewater Treatment Division (WTD) has been safely using reclaimed water since 1997 at the South and West Point plants. These plants use about 266 million gallons per year of reclaimed water for landscape irrigation, internal plant reuse, and other non-drinking purposes. The South Plant, which produces approximately 70 million gallons per year of Class A reclaimed water, distributes some of this water offsite to the King Conservation District Wetland Nursery and Fort Dent Park for irrigation during the summer months.[2]

As reported in the *2004 RWSP Annual Report*, development of the Sammamish Valley Reclaimed Water Production Facility was cancelled in favor of developing capabilities of the Brightwater System to produce and distribute reclaimed water, now known as the Brightwater reclaimed water backbone. The Washington State Public Works Board awarded a $1 million low-interest loan in spring 2006 to King County to help with the costs of building the reclaimed water system. The funding will go towards design and preconstruction activities. More information on the Brightwater reclaimed water backbone is provided in Chapter 2 of this report.

[1] The Reclaimed Water Program was formerly called the Water Reuse Program.

[2] "Class A Reclaimed Water" is reclaimed water that, at a minimum, is at all times an oxidized, coagulated, filtered, and disinfected wastewater. Allowed end uses of Class A reclaimed water are irrigation of food and non-food crops and irrigation of open access areas, such as parks. The water could also be used for industrial cooling and process water and other non-drinking-water (non-potable) uses.

Reclaimed water is a component of the Regional Water Supply Planning process, which was initiated in 2005. Multiple agencies and organizations are voluntarily participating in this process for the purpose of identifying, compiling information on, and discussing many of the key issues that relate to or may affect water resources of the region. The goal is to develop the best available data, information, and pragmatic tools that the participants may use, at their discretion, to assist in the management of their respective water systems and resources, and in their water supply planning activities. The work of this planning process is expected to produce information and recommendations in seven topic areas: water demand forecast, water supply assessment, climate change impacts, reclaimed water, tributary stream flows, source exchange strategies, and small water systems. A reclaimed water technical committee associated with this effort has formed to assess the use, cost, and benefit of reclaimed water as a feasible source of supply for non-potable purposes. More information on the Regional Water Supply Planning process is available on the Web: http://www.govlink.org/regional-water-planning/index.htm

9.1.2 Schedule for 2006

Final design of the reclaimed water backbone component in the Brightwater East and West Tunnels was completed in spring 2006. The construction schedule of this portion of the reclaimed water pipeline is included in and coincides with the East and West tunnel construction schedules (see Chapter 2). Work will continue in 2006 to identify potential reclaimed water customers.

WTD's reclaimed water program staff will continue to participate on the Reclaimed Water Technical Committee that is a part of the Regional Water Supply Planning process. WTD will continue to work with individual water districts and potential customers to provide information about the availability of reclaimed water and to respond to their questions or concerns.

In preparation for operations at the Carnation and Brightwater treatment plants, WTD staff will pilot test the Xenon membrane bioreactor technology at South Plant.

Visit the Reclaimed Water Program Web site for more information:
http://dnr.metrokc.gov/wtd/reuse/

9.2 Water Conservation Program

In accordance with RWSP policies, the Metropolitan King County Council decided to implement a water conservation program to provide a holistic approach in water resource management and to reduce impacts to the wastewater system. Specifically, the RWSP policy calls for the county to "support regional water supply agencies and water purveyors in their public education campaign on the need and ways to conserve water through pilot projects that support homeowner water conservation, emphasizing strategies and technologies that reduce wastewater."

Water conservation minimizes the loss of potable water into the wastewater stream, thus decreasing the demand for this valuable resource from fish-bearing streams and decreasing the base flow of wastewater to treatment plants. Water conservation projects are being implemented

as a form of "demand management" under the RWSP. The program committed $300,000 per year for a five-year program through 2005. While no additional funding was allocated in the 2006 budget, the program was extended by one year to complete several projects that got under way in 2005 and are scheduled to be completed in 2006. The main focuses of the program are water conservation retrofits and public education.

9.2.1 Accomplishments in 2005

In 2005, King County installed water conserving fixtures at the following facilities:

- **Harborview Medical Center.** Eleven new water-saving autoclaves were installed. These autoclaves, which are used for sterilizing medical instruments, run 24 hours a day. Replacement is expected to save 5 million gallons of water and more than $60,000 a year in water and sewer bills.

- **Weyerhaeuser King County Aquatic Center.** The final phase of retrofits was completed in 2005 and included installation of 14 low-flow showers. These showers are the last of 83 water-saving fixtures installed since 2003. More than 500,000 people use this facility annually. The retrofits will save 2.25 million gallons of water per year.

- **King County Correctional Facility.** In partnership with Seattle Public Utilities, more than half of the old shower valves were replaced with low-flow valves. This facility houses an average of 2,300 people a day who use about 33 million gallons of water per year in showers alone. The installation of low-flow shower valves will save more than 4.5 million gallons of water per year and over $55,000 a year in water and sewer bills.

In 2005, the water conservation program again contributed to the Water Conservation Coalition of Puget Sound's Regional Public Awareness Campaign. Staff presentations, fact sheets, and Bert the Salmon water conservation baseball cards were distributed at a variety of events and venues.

9.2.2 Schedule for 2006

Water conservation retrofits of the King County Correctional Facility that began in 2005 and retrofits of the White Center and Renton public health facilities will be completed in 2006. Audits and implementation of projects at WTD facilities are also being completed in 2006. The Web page, fact sheet, and other public education tools continue to be available. Although 2006 marks the last year of this program, water conservation remains a vital tool in water resource management.

Visit the Water Conservation Program Web site for more information:
http://dnr.metrokc.gov/WTD/waterconservation/

Chapter 10

RWSP Cost Estimates

RWSP reporting policies call for including in the RWSP annual reports an update of the RWSP cost estimates through the year 2030.

The cost estimates presented in this report include estimates for projects in various stages of development including planning, predesign, final design, and construction. Costs of completed RWSP projects are also included. The accuracy of cost estimates increases as projects become more defined and are specified in greater detail. Often the scopes of work and estimated costs for projects in the planning phase will change as more detailed information becomes available over time.

Planning-level cost estimates are based on generic facility concepts. Specific details of a project such as location, technologies, and environmental impacts and potential mitigation of such impacts are determined later during project predesign. Planning-level cost estimates are expected to be within +/- 30–50 percent of the final cost, with the wider range assigned when there is greater uncertainty about the project or greater risk to construct. By the time a project enters the construction phase, estimates are typically within +/- 10 percent of the final cost. Other factors such as new regulations, changes in demand for construction materials, natural disasters, and international conflicts may cause unanticipated cost increases.

Traditionally, the Department of Natural Resources and Parks (DNRP) has assumed a standard increase of 3 percent per year in estimating costs for its wastewater projects to account for price increases in project components such as materials, labor, equipment, supplies, and contractor markups. However, in recent years, inflation costs have increased more than anticipated, which can cause a significant and unexpected impact on the cost of the construction projects. The recent increase in inflation is largely attributable to the extraordinary increase in the price of construction materials like concrete and steel. In 2005, inflation averaged about 4.1 percent per the Engineering News-Record's Construction Cost Index (CCI).[1] DNRP will continue to track inflation and take steps to mitigate possible impacts to RWSP construction projects as necessary, such as purchasing certain "high risk" materials and equipment before they are needed or using alternative materials that may be less expensive in the market place.

This chapter describes RWSP cost estimates done in 1998 and 2003. It then presents a summary table of the updated 2005 RWSP cost estimates, followed by an explanation of components in the table.

[1] The Engineering News-Record publishes both a Construction Cost Index (CCI) and Building Cost Index (BCI) that are widely used in the construction industry.

Details on RWSP capital projects in design and construction are provided as Appendix C. In accordance with RWSP reporting policies, the appendix presents a project schedule; an expenditures summary (including staff labor and miscellaneous services); a description of any adjustments to costs and schedules; and a status of the project contracts for each project.

10.1 1998 and 2003 RWSP Cost Estimates

The original RWSP cost estimates developed in 1998 reflected planning-level costs for capital projects adopted in Ordinance 13680 and outlined in the 1999 RWSP Operational Master Plan.[2,3] An update to these original estimates, reflecting cost estimates as of December 31, 2003, was included in the *2004 RWSP Update.*[4] In addition to updating the cost of projects included in the 1998 estimate, the 2003 cost estimates included anticipated costs for projects and programs that resulted from implementing RWSP policies but were not identified or included in the 1998 RWSP cost estimates. Such projects include the Carnation Treatment Plant, upgrades to the Vashon Treatment Plant, odor control improvements at the West Point and South plants, and acquisition of and improvements to Snohomish County interceptors.

The 2003 RWSP cost estimates also included costs for modifications made to the original RWSP conveyance improvements after 1998. These modifications resulted from information gathered through the basin planning process.[5] More detail on the non-Brightwater conveyance cost increases from 1998 through 2003 is provided in the June 2004 technical memorandum: *Summary of Non-Brightwater Conveyance Cost Increases from the 1998 Regional Wastewater Services Plan to the 2004 Regional Wastewater Services Plan Update.* A revised 2003 RWSP cost estimates summary table was included in this memorandum. The revised table includes a project that was inadvertently omitted from the table provided in the *2004 RWSP Update.*

10.2 2005 RWSP Cost Estimates

Table 10-1 summarizes the 2005 RWSP cost estimates and compares them to the 2003 estimates. The 2005 cost estimate for implementing the projects and programs associated with the RWSP through 2030 is approximately $2.97 billion, an increase of $212 million from the 2003 RWSP cost estimate of approximately $2.76 billion in 2005$ dollars. The 2005 Brightwater cost trend estimates described in Chapter 2 of this report account for 89 percent ($189 million) of this increase.

The 2005 estimates include adjustments for inflation, including cost increases that have occurred as the result of unforeseen circumstances such as the recent increases in global commodities. The 2005 estimates also reflect modifications to projects resulting from information gathered through flow monitoring, modeling, and cost analysis after 2003.

[2] Ordinance 13680 adopted the Regional Wastewater Services Plan and was approved by the Metropolitan King County Council in November 1999.
[3] The Operational Master Plan explains how King County will implement the RWSP.
[4] The *2004 RWSP Update* is available on the Web at: http://dnr.metrokc.gov/wtd/rwsp/library.htm#3yrupdate
[5] See Chapter 3 of this report for more information on the basin planning process

Total project cost estimates reflect anticipated costs from the initial planning stage through construction and startup. The estimates also include the costs for RWSP projects that have been completed and projects that are in the planning, design or construction phase. Expenditures through 2004 are included at their original value (not adjusted for inflation) to provide as complete an estimate as possible of RWSP costs through 2030.

More details on the 2005 RWSP cost estimates and changes in costs by program are provided in the section following Table 10-1.

Table 10-1. Comparison of 2003 and Updated 2005 RWSP Cost Estimates (1999–2030)

RWSP Element	2003 RWSP Cost Estimates (2003$ x 1M)	2003 RWSP Cost Estimates (2005$ x 1M)	2005 RWSP Updated Cost Estimates (2005$ x 1M)	Cost Change (2005$ x 1M)
Total RWSP	**$2,599**	**$2,756**	**$2,968**	**$212**
Total Brightwater Treatment & Conveyance	**$1,350**	**$1,432**	**$1,621**	**$189**
Brightwater Treatment Plant	$548	$581	$529	
Brightwater Conveyance	$802	$851	$853	
Land and Right-of-Way[a]			$98	
Mitigation[a]			$141	
Total Treatment & Odor Control Improvements[b] (Non-Brightwater)	**$133**	**$141**	**$147**	**$6**
Odor Control at South Plant	$4	$4	$5	$1
West Point Odor Control	---	---	$1	$1
West Point Digestion Improvements	$4	$4	$4	--
King Street Regulator Odor Control Project	---	---	$1	$1
South Plant Expansion	$97	$103	$103	---
Vashon Treatment Plant Upgrade	$16	$17	$19	$2
Carnation Treatment Plant	$12	$13	$14	$1
Total Conveyance (Non-Brightwater)[c]	**$638**	**$677**	**$663**	**$(14)**
Projects included in the 2003 estimate	$638	$677	$640	$(37)
Projects identified after 2003 estimate	---	---	$23	$23
Total Infiltration/Inflow (I/I)	**$43**	**$45**	**$45**	**--**
I/I Planning Study	$43	$45	$45	--
Total Combined Sewer Overflow	**$392**	**$417**	**$428**	**$11**
CSO Control Program	$355	$377	$377[h]	--
CSO Planning & Updates	$5	$6	$6	--
Sediment Management/Lower Duwamish Superfund	$32	$34	$45	$11
Total Reclaimed Water	**$18**	**$19**	**$36**	**$17**
Technology Demonstration[d]	$1	$1	$1	--
Future Water Reuse	$3	$3	$3	--
Demo Projects (Water Reuse Satellite Facility)[e]	$14	$15	$5	$(10)
Reclaimed Water Backbone	--	--	$26	$26
RWSP Water/Wastewater Conservation[f]	--	--	$1	$1
Water Quality Protection	**$15**	**$15**	**$15**	**--**
Habitat Conservation Plan/Programmatic Biological Assessment[g]	**$10**	**$10**	**$10**	**--**
RWSP Planning and Reports	**--**	**--**	**$3**	**$3**

Notes: All costs in 2005 column are as of December 31, 2005; projects shown are not exhaustive, but are listed to Illustrate changes. Totals may not add due to rounding.

[a] In the 2003 RWSP cost estimates summary table, mitigation and land acquisition costs were included in the overall Brightwater Plant and Conveyance cost estimates.

[b] The odor control improvement costs reflect specific odor control projects for existing facilities, resulting from implementing the policies adopted via Ordinance 14712.

[c] Cost estimates for non-Brightwater conveyance will be updated and provided with the conveyance system improvement plan update, anticipated to be transmitted to the King County Council in early 2007.

[d] The reclaimed water demonstration project was complete as of December 31, 2004.

[e] The reuse satellite project was cancelled; the cost in the 2005 column represents the total expenditures through December 31, 2004.

[f] The water/wastewater conservation program was inadvertently omitted from the 2003 RWSP cost estimates summary table; the program will be completed by end of 2006.

[g] The Habitat Conservation Plan completed its first phase and will not continue. The majority of the HCP funds have been expended; remaining funds are being directed to pursuing a Programmatic Biological Assessment.

[h] The 2005 cost estimates for the CSO control program are the 2003 estimates adjusted for inflation. CSO control program cost estimates will be updated after completion of the hydraulic model update and will be provided with the *2010 CSO Program Review.*

10.3 Explanation of RWSP Cost Estimate Summary Table

Table 10-1 presents a summary of the 2003 and 2005 RWSP cost estimates. The table includes four columns:

- **2003 Cost Estimates (2003$ x 1M) column.** This column shows the 2003 RWSP cost estimates in 2003$ dollars. The costs and line items in this column are the same as the costs and line items shown for 2003 cost estimates in revised Table 14-1 in the June 2004 technical memorandum mentioned earlier in this chapter.
- **2003 Cost Estimates (2005$ x 1M) column.** This column shows the 2003 RWSP cost estimates adjusted to 2005$ dollars to show how the updated 2005 cost estimates compare to the 2003 cost estimates adjusted for inflation. Adjustments for inflation are based on the assumption of a standard increase of 3 percent per year.
- **2005 Updated Cost Estimates (2005$ x 1M) column.** This column shows the updated 2005 cost estimates in 2005$ dollars that were developed based on project details as of December 31, 2005.
- **Cost Change (2005$ x 1M) column.** This column shows the changes in cost estimates for each line item and total category cost from the 2003 cost estimates to the 2005 cost estimates in 2005$ dollars.

Table 10-1 presents the total cost estimates for each RWSP category first, followed by the cost estimates for specific projects or programs within the category. The RWSP categories are as follows:

- Brightwater Treatment and Conveyance
- Treatment and Odor Control Improvements (Non-Brightwater)
- Conveyance (Non-Brightwater)
- Infiltration/Inflow
- Combined Sewer Overflow
- Reclaimed Water
- Water Quality Protection
- Habitat Conservation Plan
- RWSP Planning and Reports

The following sections provide more detail on each category.

10.3.1 Brightwater Treatment and Conveyance

The 2005 cost estimates for the Brightwater System is $1.6 billion, an increase of $189 million from the 2003 cost estimates. Rising inflation, higher global commodities prices, and mitigation commitments have contributed to this cost increase. Chapter 2 of this report provides more detail on the Brightwater cost trend.

10.3.2 Treatment and Odor Control Improvements (Non-Brightwater)

Non-Brightwater treatment and odor control improvements costs cover treatment plant improvements and specific odor control improvements that result from implementing RWSP policies. The 2005 cost estimates for these projects is $141 million, an increase of $6 million from the 2003 cost estimates.

The cost estimate for odor control improvements at South plant increased by approximately $1 million. Rising inflation and construction costs contribute to this increase. The odor control improvements at the West Point Plant and at the King Street Regulator Station were identified after publication of the 2003 RWSP cost estimates. Both of these projects meet the requirements of Ordinance 14712 to implement phased odor control improvements at the county's wastewater facilities. The cost estimates as of December 31, 2005, for these projects is $2 million. More information on the odor control program is provided in Chapter 7 of this report.

The cost estimates for the Vashon Treatment Plant upgrades increased by $2 million from the 2003 estimate. The costs of cleaning up the contaminated soils that were discovered on the site contributed to this increase. More information on the Vashon Treatment Plant project is provided in Chapter 6 of this report.

The cost estimates as of December 31, 2005, for the Carnation Treatment Plant increased by $1 million. Rising inflation and construction costs contribute to this increase. More information on the Carnation Treatment Plant project is provided in Chapter 6 of this report.

10.3.3 Conveyance (Non-Brightwater)

The total non-Brightwater conveyance cost estimates include the cost estimates for projects included in the 2003 cost estimate and for projects that have been identified since the 2003 cost estimate was prepared.

The 2005 cost estimate for RWSP conveyance projects through 2030 is $663 million, which is a decrease of $14 million from the 2003 cost estimates. The cost change reflects cost increases to some projects, cost decreases because some projects are no longer needed prior to 2030 or the project need is being assumed through other projects, and costs of new projects since the 2003 cost estimate was prepared:

- **Cost increases of $143 million in projects that were included in the 2003 RWSP cost**

estimates. Projected increases in land acquisition costs or modifications to the project contribute to these cost increases.

- **Cost decreases of $180 million in projects that are no longer needed.** This decrease results from the removal of projects that were included in the 2003 RWSP cost estimate but are no longer needed by 2030 or their need is being assumed through other projects. This amount also includes cost decreases associated with some of the projects that have been completed. For example, the total project cost for the completed North Creek storage is approximately $29 million. The 2003 estimate for this project was $36 million in 2005$ dollars.
- **Cost increases of $23 million in new projects.** This increase results from the addition of the Black Diamond storage and Kenmore Lakeline projects and from staff and labor costs associated with the Conveyance System Improvement Program from 2005 through 2030.

As reported in Chapter 3 of this report, updated cost estimates for RWSP conveyance projects through 2030 will be presented in the conveyance system improvement (CSI) plan update, which will be transmitted to the King County Council in early 2007. The CSI plan update will identify needed improvements to address capacity and condition needs in the regional conveyance system.

10.3.4 Infiltration/Inflow (I/I)

There is no change in the 2005 RWSP I/I cost estimate from the 2003 estimate. The 2005 cost estimate for this program is $45 million, which covers the costs for completing the six year comprehensive I/I study that led to the development of the Executive's Recommended I/I Control Program. The I/I Program Recommendation was subsequently adopted by the King County Council in May 2006. As reported in Chapter 4 of this report, components of the six year study included region-wide flow monitoring and implementation of ten pilot I/I reduction projects.

WTD and the local agencies will begin implementation of the Executive's Recommended I/I Control Program's in 2007. The first step will be development of two to three initial cost-effective I/I reduction projects. Funding of these initial projects will come from King County wastewater revenue that is dedicated to funding CSI projects in the regional conveyance system. The goal of the I/I control program is to cost-effectively remove enough I/I from the collection system to delay, reduce, or eliminate some otherwise needed CSI project. Based on this goal, the costs associated with implementation of the initial I/I reduction projects are already included in the CSI cost estimates, which are discussed earlier in this chapter.

More information on the RWSP I/I control program is provided in Chapter 4 of this report.

10.3.5 Combined Sewer Overflow

The total combined sewer overflow (CSO) cost estimate includes costs associated with the CSO control program, CSO planning and updates, Sediment Management Program, and the Lower Duwamish Waterway Superfund project. The 2005 total CSO cost estimate is $428 million, an increase of $11 million from the 2003 cost estimate.

The cost estimates for the Sediment Management Program have increased by around $5.5 million, mainly because of delays in project start dates to accommodate partnership arrangements with other agencies. Another $5.5 million has been added since the 2003 cost estimate for the county's participation in the Superfund remedial investigations and feasibility studies for sediment cleanup in the Duwamish River.

Cost estimates for the CSO Control Program have not been updated since the 2003 cost estimates. These estimates will be updated and presented in the *2010 CSO Control Program Review.* The cost estimates will be based on the results of updating and recalibrating the hydraulic model that is used to predict the design and effectiveness of CSO control projects.

More information on the CSO Control Program is provided in Chapter 3 of this report.

10.3.6 Reclaimed Water

The total 2005 cost estimates for the Reclaimed Water Program is $36 million, an increase of $17 million from the 2003 cost estimate. The projects and programs that make up the total reclaimed water cost estimate area as follows:

- **Technology Demonstration Project.** This project was complete as of December 31, 2004. The 2005 cost estimate represents the total expenditures for this project and is the same as the 2003 cost estimate.
- **Future Water Reuse.** This project includes activities to implement the RWSP water reuse plan that was submitted to the council in December 2000 and to support water conservation opportunities within WTD programs. There is no change in the 2005 cost estimate from the 2003 estimate.
- **RWSP Water/Wastewater Conservation Program.** This program was inadvertently omitted from the 2003 cost estimate summary table. The addition of the total cost for the program in the 2005 estimate increases the total estimated cost for the reclaimed water program by $1 million. The program will be complete by the end of 2006.
- **Sammamish Valley Reclaimed Water Facility.** This project was cancelled in favor of the reclaimed water capabilities at the Brightwater Treatment Plant. As a result, the 2005 cost estimate for this project represents a $10 million decrease from the 2003 cost estimate.
- **Reclaimed Water Backbone.** This is a new council-approved project since the 2003 cost estimate was prepared. The 2005 cost estimate for this project is $26 million.

More information on the reclaimed water program is provided in Chapter 9 of this report.

10.3.7 Water Quality Protection

The Water Quality and Protection Program—a water resource modeling and monitoring program—provides scientific information on water quality and hydrologic conditions in both the Lake Washington and Green River watersheds.

There is no change in the 2005 cost estimate from the 2003 estimate. The 2005 cost estimate for this program is $15 million. Approximately 75 percent of this cost estimate has been expended.

10.3.8 Habitat Conservation Plan

The cost estimates for the Habitat Conservation Plan (HCP) have not changed since the 2003 estimate. As reported in Chapter 11 of this report, the HCP completed its first phase and the program will not continue. The majority of the funds allocated to the HCP have been expended. The remaining funds are being directed to pursuing a Programmatic Biological Assessment with NOAA Fisheries and U.S. Fish and Wildlife Services.[6]

10.3.9 RWSP Planning and Reports

The RWSP reporting policies call for RWSP annual reports and comprehensive reviews. The costs associated with these reporting requirements were not included in the 2003 cost estimate. The 2005 cost estimates for these activities is $3 million.

[6] NOAA = National Oceanographic and Atmospheric Administration.

Chapter 11

Water Quality Management and Compliance

RWSP reporting policies call for including in RWSP annual reports a summary of the Wastewater Treatment Division's water quality management programs and its compliance with the Endangered Species Act and with other agency regulations and agreements.

The Wastewater Treatment Division (WTD) manages several programs to protect and preserve water quality. On average, its three secondary treatment plants process over 180 million gallons of wastewater each day. The quality of treated effluent from these plants remained high in 2005. Effluent values were typically far below the limits set in the wastewater discharge permits. Close to half of King County's combined sewer overflow (CSO) locations are now "controlled," meaning that they meet the Washington State regulation of no more than one untreated discharge per year. WTD has committed to controlling its remaining CSO locations by 2030.

The best way to protect our waterways is to control pollutants at their sources. Two programs work to prevent pollutants from reaching King County treatment plants—the Industrial Waste Program and the Local Hazardous Waste Management Program. Among other achievements, these programs have helped to reduce the level of mercury in biosolids by 50 percent from levels in 2000. WTD also recovers its treatment plant byproducts for beneficial uses. It recycles 100 percent of its biosolids, produces reclaimed water for reuse in treatment plant operations and for customers in the service area, and recovers methane (digester gas) to generate energy for running plant operations and for sale to local utilities.

This chapter reports on WTD water quality management and compliance activities in 2005. Detailed information on the 2005 results of the county's water quality monitoring program is included as Appendix D.

11.1 Wastewater Treatment Plant Capacity, Flows, and NPDES Compliance

WTD's two regional wastewater treatment plants (the South Plant and West Point Plant) and the Vashon Plant continue to be in compliance with the terms and conditions of their NPDES[1] (National Pollution Discharge Elimination System) permits, and so are in compliance with the

[1] NPDES permits are issued by the Washington State Department of Ecology and set limits on the quality and quantity of effluent (treated wastewater) discharged from point sources such as treatment plants, CSOs, and industrial facilities.

Washington State Water Pollution Control Law, the Federal Water Pollution Control Act, and the Federal Clean Water Act.

11.1.1 South Treatment Plant

The South Treatment Plant is located on Monster Road in Renton. It provides secondary treatment for wastewater flows from customers in the lower Green River basin, suburban cities east of Lake Washington, and Seattle's Rainier Valley, in addition to flows from parts of Snohomish and Pierce Counties. The South Plant also treats about 20 million gallons (MG) per year of septic tank solids from throughout the region as well as sludge from treatment facilities in neighboring areas such as Snoqualmie Valley cities and Vashon Island. The plant currently holds the National Association of Clean Water Agencies (NACWA) Gold Award for excellent operation.

The South Treatment Plant is designed to manage an average monthly wet-weather flow of 115 million gallons per day (mgd). The effluent pumping capacity at the plant was recently upgraded to handle a peak flow of 325 mgd. The outfall in Puget Sound discharges secondary effluent 10,000 feet from shore at a depth of 600 feet into the denser deeper water layer. The increasingly diluted effluent plume moves southward in the Sound, remaining at or below a depth of 390 feet.

Despite the fluctuation of flow volumes and influent composition, the South Plant's secondary treatment process consistently produces high quality secondary effluent. In 2005, the plant managed an average wet-weather flow of 83 mgd and a maximum monthly flow of about 91 mgd.[2,3] Treatment efficiency remained high and consistent. The plant experienced seven exceptions to the Class A reclaimed water permit limits, one in May and six in September.[4] The reclaimed water exceptions resulted from higher-than-permitted fecal coliform counts that resulted in temporary interruption of reclaimed water distribution.

11.1.2 West Point Treatment Plant

The West Point Treatment Plant is located on the shore of Puget Sound in Seattle's Discovery Park. It provides secondary treatment for wastewater from customers located in the greater Seattle area and in southwest Snohomish County. West Point is the largest plant in the King County system. This plant is designed to manage an average non-storm wet-weather flow of

[2] For the South and Vashon plants, the average wet-weather flow (AWWF) is the average flow during the wet season, between November and April, on days when no rainfall has occurred on the previous day. For the West Point plant, the "non-storm" AWWF is calculated without counting the flow on days when it rains or the days immediately following a rain event. For purposes of this report, the months of January through April and November and December were used to calculate AWWF for the calendar year 2005.

[3] Maximum monthly flow is the average of daily flows for the month with the highest total flow.

[4] "Class A Reclaimed Water" is reclaimed water that, at a minimum, is at all times an oxidized, coagulated, filtered, and disinfected wastewater. Allowed end uses of Class A reclaimed water are irrigation of food and non-food crops and irrigation of open access areas, such as parks. The water could also be used for industrial cooling and process water and other non-drinking-water (non-potable) uses.

133 mgd and a peak wet-weather flow of 440 mgd. After treatment, the secondary effluent is discharged through an outfall to Puget Sound. The outfall discharges 3,650 feet from shore at a depth of 240 feet. The increasingly dilute effluent plume flows northward most of the year, out of Puget Sound. The West Point Plant also currently holds the NACWA Gold Award for excellent operation.

The West Point Plant is designed to provide secondary treatment for up to 300 mgd. Capacity between the 300-mgd capacity for secondary treatment and the 440-mgd peak capacity is used to manage captured CSO flows. After receiving CSO treatment (equivalent to primary treatment), these flows are mixed with secondary effluent for disinfection, dechlorination, and discharge at the deep marine outfall. The resulting effluent must meet secondary effluent quality limits.

The average non-storm wet-weather flow in 2005 through the West Point Treatment Plant was about 79 mgd with a maximum monthly flow of 91 mgd. No permit limit violations occurred in 2005. There were three episodes when a small volume of flow was diverted around secondary treatment because of mechanical problems. The flow was blended with fully treated effluent. The discharged blended effluent stayed within permit limitations.

11.1.3 Vashon Treatment Plant

The Vashon Treatment Plant is located on the east side of the Vashon Island, northeast of the unincorporated Town of Vashon. This secondary treatment plant was constructed in 1975 and operated by the Vashon Sewer District until 1999, when King County assumed responsibility for the plant. The plant is designed to manage a monthly average flow of 0.264 mgd and a peak flow of approximately 1.0 mgd. After secondary treatment and disinfection, the effluent is discharged through an outfall to Puget Sound. The outfall discharges 2,900 feet offshore at a depth of -200 feet mean lower low water (MLLW).

In the past, this treatment plant had frequent NPDES permit violations. Since King County assumed responsibility for plant operations and facilities, many improvements have been made to allow the plant to operate more consistently with far fewer violations. Improvements included removal of hydraulic restrictions in the outfall line to increase its peak-flow handling capacity, addition of a new ultraviolet disinfection process, improvement of sludge handling processes, and enhancement of the electrical and water utilities.

To ensure that the plant meets all permit limits in the future, construction began in 2004 on a new higher-capacity treatment plant with added backup systems. Construction is expected to be complete by late 2006. (See Chapter 6 for more information on the upgrades to the Vashon Treatment Plant.)

The average wet-weather flow at the Vashon plant in 2005 was 0.128 mgd with a maximum monthly flow of 0.171 mgd. There were two NPDES permit exceptions in 2005, one for weekly average total suspended solids and one for weekly fecal coliform bacteria. Three minor overflows of treated effluent occurred. Two were construction-related events. In all cases, the effluent was contained before reaching a water body.

WTD also owns and operates the Beulah Park/Cove Treatment Facility on Vashon Island. This facility began operating in November 2001 and received its first State Waste Discharge permit from The Washington State Department of Ecology (Ecology) on October 31, 2005. It collects wastewater from approximately 60 residences via a vacuum system and pump station; treats the wastewater with a series of septic tanks, recirculating sand filters, and ultraviolet disinfection; and then pumps the effluent to a drip field for percolation to subsurface soils. Before the treatment facility was constructed, the Washington State Department of Health declared the Beulah Park and Cove area a "severe public health hazard area."

11.2 Sanitary Sewer Overflow Prevention and Containment

Sanitary sewer overflows (SSOs) are discharges of wastewater from separated sewer systems and also from combined systems when no rain is occurring. SSOs can flow from manholes, broken pipes, or pump stations to city streets, water bodies, and basements. SSOs occur on rare occasions, typically during extreme storm events and power outages. Minimizing the discharge of untreated wastewater is fundamental to WTD's mission. Extensive resources have been committed to maintaining the integrity of the system and preventing SSOs. WTD's Maintenance and Asset Management groups maintain a regular schedule of inspection, maintenance, and repair to prevent mechanical failures and SSOs.

Table 11-1 shows that King County reported 10 SSOs in 2005, which is below the annual average of 15 (based on averages over a 15-year period). Three of the SSOs were diversions around secondary treatment during dry weather that were blended and discharged with other treated effluent into Puget Sound. One SSO flowed into the Sammamish River. The other five events were contained on land before reaching any water body. The overflows ranged in size from 20 gallons to 73 MG. While there is some short-term risk to public health and the environment from SSOs, there are no long-term effects from this volume of release. In all cases, WTD overflow response procedures were implemented. These procedures include posting the area, cleaning up the area as appropriate, and monitoring water quality in the vicinity of the overflow to determine when pollutant concentrations have returned to levels consistent with state Water Quality Standards.

Table 11-1. Sanitary Sewer Overflows in 2005

Date	Location	Estimated Volume (gallons)	Duration	Discharge Type	Receiving Water	Reason for Overflow
Feb. 10	West Point	73,800,000	3 minutes	Partially treated wastewater	Puget Sound	Digester cleaning
Feb. 20	Bunker Trail Pump Station 2 (Vashon)	20	About 2 days	Untreated wastewater	Uncertain whether the wastewater entered a water body	Equipment failure
May 31	Woodinville Pump Station	12,500	6 minutes	Untreated wastewater	Sammamish River	Power failure
June 1	Bunker Trail Pump Station 2 (Vashon)	10–100	About 2 days	Untreated wastewater	No discharge to a water body	Equipment failure resulting from lightning
June 21	West Point	760,000	14 minutes	Partially treated wastewater	Diversion around secondary and blended with fully treated effluent	Power failure resulting from lightning
June 26–27	Vashon Treatment Plant	1,000–2,000	9 hours	Treated wastewater	Contained in the construction trench and did not reach the creek or Puget Sound	Operator error
Sept. 26	Vashon Treatment Plant	1,500	< 60 minutes	Treated and disinfected wastewater	Contained in the construction trench and did not reach the creek or Puget Sound	Related to construction
Oct. 6	Vashon Treatment Plant	120	Unknown	Treated and disinfected wastewater	Contained in the construction trench and did not reach the creek or Puget Sound	Crack in existing outfall line discovered during construction of new line
Nov. 8	West Point	180,000	5 minutes	Treated and disinfected wastewater	Diversion around secondary and blended with fully treated effluent	Equipment failure
Dec. 15	West Point	< 100,000	< 3 minutes	Partially treated wastewater	Diversion around secondary and blended with fully treated effluent	Equipment failure

11.3 Combined Sewer Overflow Reduction

King County began to develop plans for controlling CSOs as early as 1979, after treatment plants and conveyance lines were in place. By May 2005, with completion of the projects specified in the 1988 CSO plan and the Mercer/Elliott West and Henderson/Norfolk facilities, about 17 of King County's 38 CSOs were controlled to the Washington State standard of an average of no more than one untreated discharge per year per outfall.[5] The remaining 21 uncontrolled CSOs will meet state standards as projects are completed between 2012 and 2030. Strategies for reducing CSOs include pollution prevention through source control, operational controls, upgrade of existing facilities, and construction of new facilities to provide storage and treatment

[5] An update and calibration of the hydraulic model, expected to be ready in 2007, will help to verify the control status of King County CSOs.

of excess flows prior to discharge. Figure 11-1 shows the estimated CSO reduction from 1988 through completion of the RWSP projects in 2030.

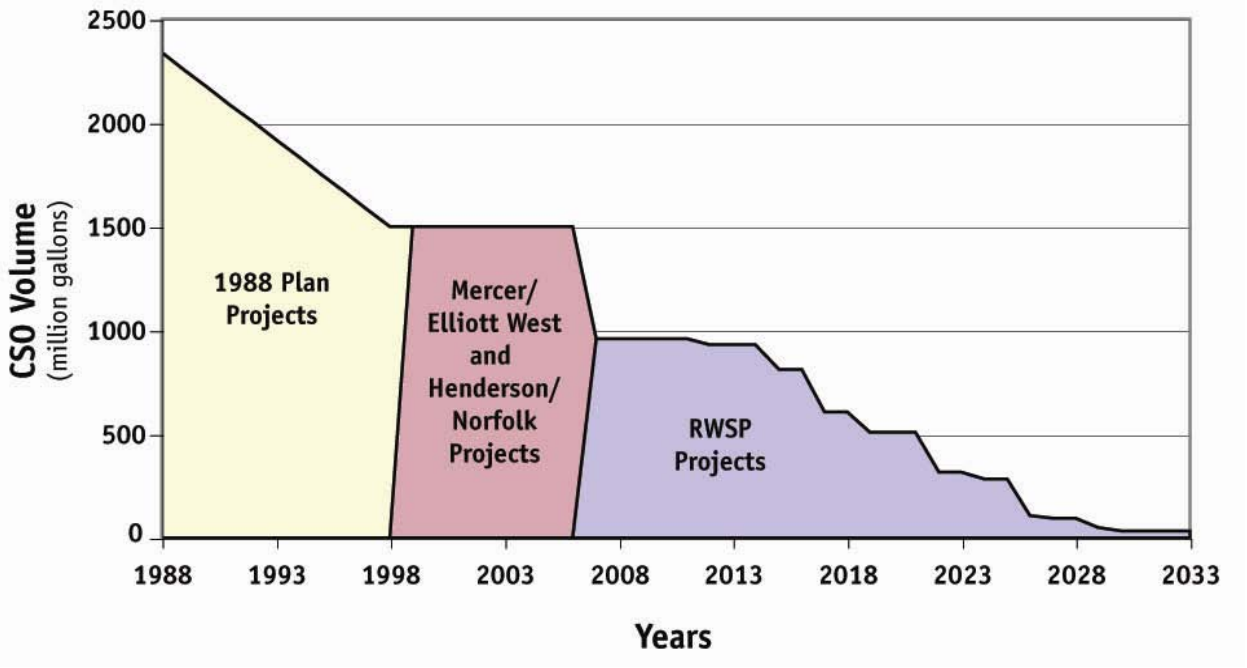


Figure 11-1. Actual and Planned CSO Reduction, 1988–2030

11.3.1 Frequencies and Volumes of Untreated CSOs

King County reports CSO data beginning in June of one year and ending in May of the next year. As shown in Figure 11-2, there is a pattern of decreasing volumes of untreated CSOs over time despite fluctuations in rainfall from year to year.[6]

[6] More information about specific CSOs can be found in the *Combined Sewer Overflow Program 2004–2005 Annual Report* at http://dnr.metrokc.gov/wtd/cso/2004-05-intro.htm.

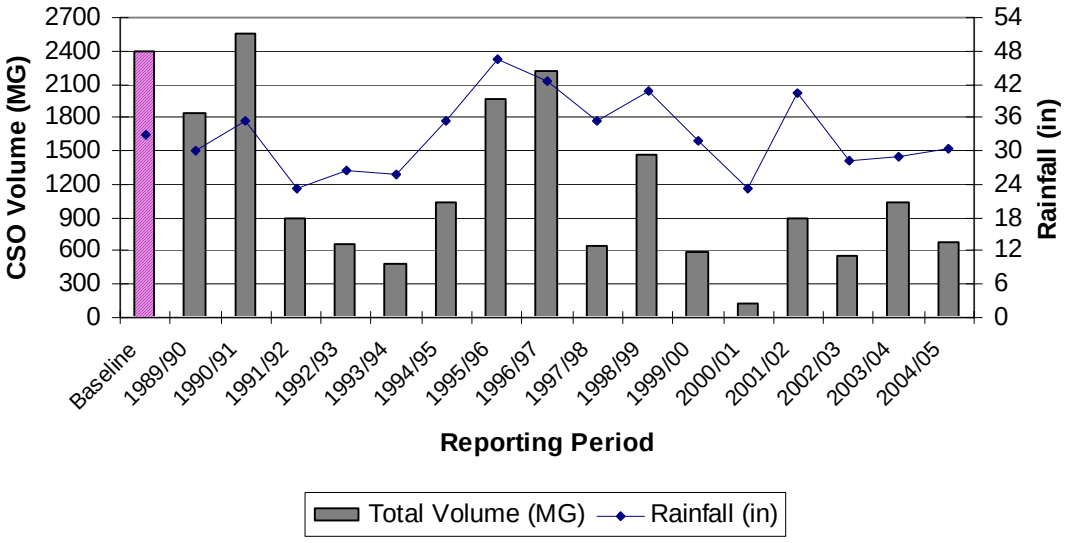


Figure 11-2. Annual CSO Volumes—1989 through 2005

Using Ecology's 24-hour inter-event interval definition of a CSO event, the total number of untreated CSO events in 2004–2005 was 198, with total volume of 702.50 MG. Of these events, 46 occurred in West Point's North Service Area, 138 occurred in West Point's South Service Area, and 14 occurred in the Alki Service Area. These numbers are approximately 54 percent lower than the baseline estimated in 1981–1983.

11.3.2 Frequencies and Volumes of Treated CSOs

For the 2004–2005 CSO year, there were 19 occurrences, totaling 351.78 MG, of treated CSO discharges from the West Point Treatment Plant.

In 2005, the pumping capacity of the Carkeek Pump Station was upgraded from 8.4 mgd to 9.2 mgd. This higher capacity raises the volume of flows conveyed to West Point and decreases the volume of flow to the Carkeek CSO Treatment Plant. The Carkeek plant had been exceeding NPDES permit limits for frequency and volume because the local service area was sending more flow to the plant than was expected when the plant was designed. For the 2004–2005 CSO year, there were four occurrences, totaling 4.04 MG, of treated CSO discharges from the Carkeek plant.

The Alki CSO Treatment Plant discharged treated CSOs only one time in 2004–2005, with a total volume of 20.4 MG. The West Seattle Tunnel, completed in 1998, has allowed much of the flow intended for the Alki plant to go to West Point via the Elliott Bay Interceptor. This increased transfer of Alki area flows to West Point has resulted in occasional permit compliance problems at the Alki CSO Treatment Plant. The plant now operates on average only two times per year. These events occur under the largest storms and so are the most dilute and difficult to

treat. Discussions with Ecology regarding permit requirements for the Alki plant are scheduled to begin soon.

See Chapter 5 for more information on the county's CSO Control Program.

11.4 Pollution Source Control

King County operates two source control programs: the Industrial Waste Program and the Local Hazardous Waste Management Program. Both programs work to control pollutants at their source, thereby keeping them out of the wastewater system and, in turn, out of surface waters and the environment. The two programs complement each other. The Industrial Waste Program focuses on larger businesses in a regulatory manner, issuing permits and discharge authorizations under a federally mandated pretreatment program. The Local Hazardous Waste Management Program focuses on smaller businesses and on households in a non-regulatory manner, providing technical assistance, resources, and education under a state-mandated program.

11.4.1 Industrial Waste Program

11.4.1.1 Permits, Authorizations, and Enforcement

The Industrial Waste Program (IWP) regulates industrial wastewater discharged into the King County wastewater system. The purpose of these activities is to ensure that industries treat wastewater for harmful substances such as metals, oils, acids, flammables, organic compounds, gases, and solids before discharging the wastewater to sewers. This program protects surface water and biosolids quality, the environment, public health, and the wastewater system and its workers.

IWP may regulate any industry, from largest to smallest, if the industry discharges to the wastewater system. To do this, the program issues two main kinds of discharge approvals: permits and discharge authorizations. Discharge authorizations are issued to smaller industries. Permits are issued to industries that discharge more than 25,000 gallons per day and/or that are included in federally regulated categories. The Environmental Protection Agency (EPA) requires at least 20 categories of industries to get permits, whatever their size or quantity of wastewater. Permits have more comprehensive operating and self-monitoring requirements than discharge authorizations.

IWP investigators inspect facilities before issuing discharge approvals and also inspect those with approvals to see that they are complying with regulations. Most companies are required to self-monitor their discharges. Industrial waste specialists take verification samples at facilities with permits to see whether wastewater discharges comply with regulations. If they find violations, the specialists conduct follow-up inspections and sampling.

The program issues a Notice of Violation when a company discharges more contaminants or volume than allowed, violates conditions of its discharge approval, or fails to submit required

reports. For enforcement, IWP uses tools such as compliance schedules, fines, charges for monitoring and inspections, and cost recovery for damages.

In 2005, 129 permits and 288 industrial waste discharge authorizations were in effect and 435 inspections were conducted. Table 11-2 shows the number of compliance samples collected versus the number of violations detected. During 2005, Notices of Violation for 90 violations were issued to 37 companies. Several companies had multiple violations in more than one category. The violations were as follows:

- 24 companies had 73 discharge violations
- 7 companies had 7 permit/code violations
- 8 companies had 10 reporting violations

The company with the most violations (38) was Puget Sound Recycling, a centralized waste treatment facility in Auburn. IWP issued six fines in 2005, totaling $27,969. The largest fine ($23,894) was issued to Argent Chemical Laboratories located in Redmond. None of the violations caused NPDES exceptions at King County wastewater treatment plants.

Table 11-2. Number of Discharge Compliance Samples and Discharge Violations in 2005

Parameter	Compliance Samples	Post-Violation	Discharge Violations
Cyanide			
Total cyanide	164	2	
Cyanide amenable to chlorination	26		
Metals	488	16	28
Organics			
BNA	65		12
VOA	223		4
Fats, oils, and grease (FOG)			
Total	0		
Polar[a]	38		
Non-polar	352		1
pH (field)[b]	632	1	
Surcharge	227		

Note: The information in this table will appear in the 2005 annual pretreatment report.
[a] The visual free-floating fats, oils, and grease (FOG) test was used to assess the presence of polar (animal-vegetable) FOG. No laboratory analyses were done.
[b] The number of pH samples is somewhat misleading because it shows only discrete pH samples collected and analyzed in the field, not readings from continuous pH measurement.

11.4.1.2 Lower Duwamish Waterway Source Control Project

Since 2002, the Industrial Waste Program has been working on the Lower Duwamish Waterway (LDW) Source Control Project in support of the WTD's Sediment Management Program. Its purpose is to coordinate with sediment cleanup efforts and to identify and manage sources of chemicals that reach site sediments. Its goals are to minimize the potential for chemicals in

sediments to exceed the state's Sediment Management Standards (WAC 173-204) and the LDW sediment cleanup goals.

Over 1,000 inspections of businesses have been completed in the LDW basin. In 2005, IWP investigators worked with Seattle Public Utilities (SPU) inspectors to conduct initial and follow-up inspections in the Diagonal Avenue South CSO/storm drain service area, the Norfolk basins, the Slip 4 early action cleanup site basin, and other areas draining to the former Slip 5 and Slip 6. As observed in previous years, the most common problems noted during these inspections are associated with stormwater source control and spill prevention and planning. (See Chapter 5 for more information on the Sediment Management Program and Lower Duwamish Waterway cleanup efforts.)

11.4.1.3 Categorical Pretreatment Regulation

During 2005, two noteworthy events occurred in the categorical pretreatment standard arena. In August, EPA issued a Notice of Availability of the *Preliminary Effluent Guidelines Plan for 2006,* and in October, it published the Final Pretreatment Streamlining Rule.

IWP submitted comments on the *Preliminary Effluent Guidelines Plan for 2006*. IWP supports EPA's findings that four of the seven industrial sectors being considered for categorical standards do not need these standards.[7] These industries do not have pass-through potential (pollutants will not pass through the treatment plant and enter receiving waters) and are adequately regulated by IWP's local limits. IWP expressed concern about the possibility that EPA would promulgate categorical standards for the health services industry and noted that IWP has already developed effective rules for two of the health service sectors: dental practices and large hospitals. EPA is going to conduct studies on the health industries.

The long-awaited *Final Pretreatment Streamlining Rule* became effective on November 14, 2005. The lengthy and complex rule covers 11 major areas of the General Pretreatment Regulations. The changes in the rule have the potential to reduce the costs for both regulatory agencies, such as IWP, and the regulated community. While some of these changes were effective immediately, others will require an ordinance change before they can be enacted. IWP staff will be working on enacting these changes to ordinance and procedures in 2006.

11.4.1.4 Dental Waste Program

The Dental Waste Program allows dentists to demonstrate that they are complying with local mercury limits without having to sample their wastewater and submit periodic self-monitoring reports. To comply, dentists must install an approved pretreatment unit commonly known as an amalgam separator unit. IWP staff performs random inspections of dental offices and monitor the levels of mercury in biosolids produced at the wastewater treatment plants.

This program, in conjunction with programs implemented by the Local Hazardous Waste Management Program, has reduced the annual median concentrations of mercury in King County

[7] Categorical standards require industries to obtain discharge permits. The four industries are food services, industrial laundries, photo processing, and printing and publishing.

biosolids. In 2004—the year in which dental practices achieved a 97-percent compliance rate—mercury levels in biosolids were approximately 50 percent lower than the levels in 2000, the year before King County began implementing the Dental Waste Program (Figure 11-3). The decline leveled out in 2005.

In 2005, approximately 75 dental offices were inspected. Only three of the offices were out of compliance and needed to install or maintain the appropriate pretreatment devices. Other activities in 2005 include (1) revision of the Dental Wastewater Fact Sheet used by dentists to determine what they need to do to comply with King County mercury limits and (2) continued participation in a national NACWA study of mercury concentrations in treatment plant influent, effluent, and biosolids.

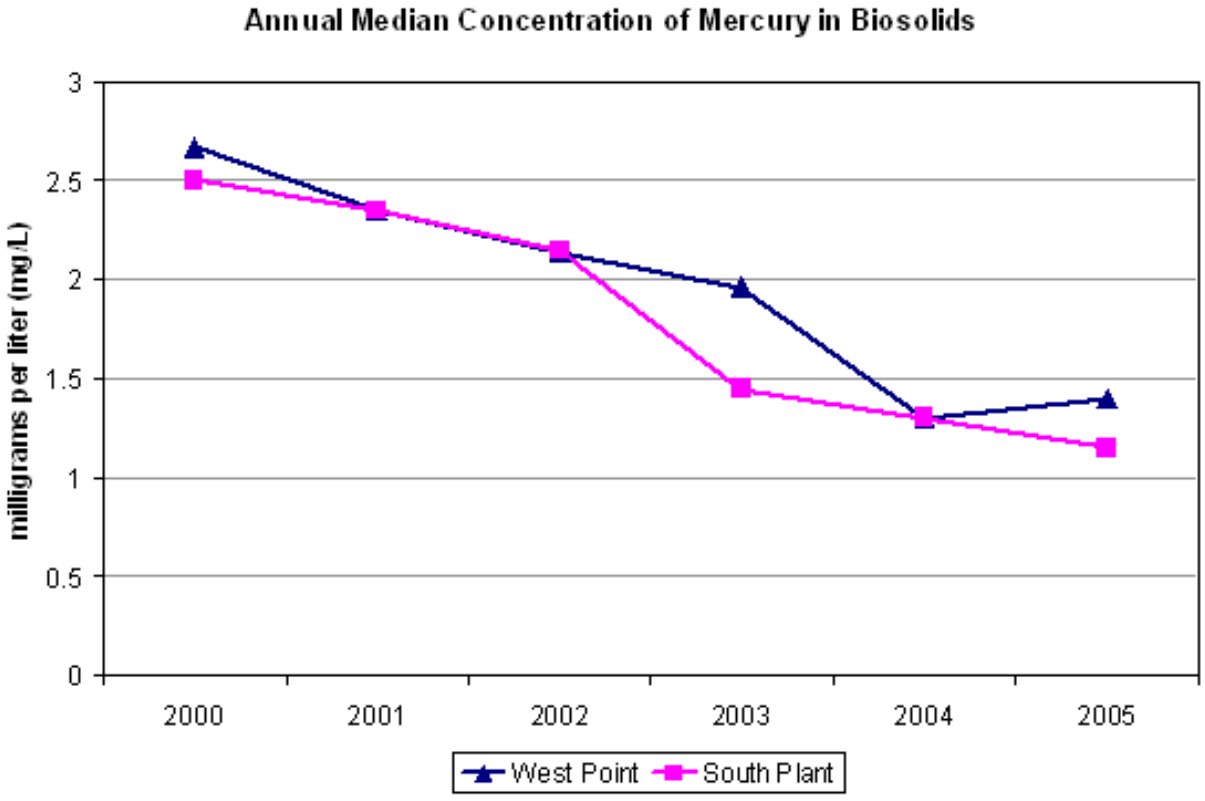


Figure 11-3. Decline of Mercury Concentrations in Biosolids, 2000 through 2005

11.4.1.5 Permitting Guidelines Project for the Biotechnology Industry

In 2005, the Industrial Waste Program evaluated the area's biotechnology industry to assess the need to develop a streamlined permitting process to assist biotechnology facilities in meeting local, state, and federal discharge regulations.

IWP staff convened a focus group consisting of representatives from local biotechnology industries and consultants. The group discussed the activities, processes, and operations that could generate industrial and hazardous wastes. With the help of the focus group, IWP developed a survey that was sent to biotechnology operations located in King County's wastewater service area. Following receipt of completed surveys, IWP conducted inspections at a number of biotechnology operations to learn more about their specific activities, operations, and waste streams discharged to sewers.

Using the information learned from the focus group, surveys, and inspections, IWP staff developed draft permitting guidelines for the biotechnology industry. Following a public review and comment period, these permitting guidelines will be implemented in 2006.

For more information, visit the Industrial Waste Program's Web site at http://dnr.metrokc.gov/wlr/indwaste/index.htm

11.4.2 Local Hazardous Waste Management Program

The Local Hazardous Waste Management Program (LHWMP) is a consortium of the King County Department of Natural Resources and Parks (the Water and Land Resources Division and the Solid Waste Division), the City of Seattle (Seattle Public Utilities), Public Health–Seattle & King County, and the Suburban Cities Association. The program provides technical assistance, reimbursement, and recognition to businesses that generate small quantities of hazardous waste. It also provides collection services for household hazardous wastes as well as public education aimed at proper handling and reduction in use of hazardous household products.

11.4.2.1 Small Business Incentive Program

EnviroStars, a service of the Local Hazardous Waste Management Program, is a program that certifies businesses for their efforts in preventing pollution and reducing hazardous waste. Certified EnviroStars businesses are given a two-to-five-star rating based on their commitment to reducing hazardous waste. The higher the star rating, the more proactive the business has been in protecting the environment. It is estimated that over time the program has helped reduce by 650 tons the amount of hazardous waste generated by dry cleaners and auto shops in a five-county area. The program brings benefit not only to the environment but also to the businesses themselves by improving employee morale and increasing the customer base. In 2005, the program added 39 King County businesses to its roster, bringing the total in the county to 354 businesses. Also during the year, 112 certifications were renewed. Renewals ensure that businesses continue to meet standards and learn of new waste-reducing and sustainable opportunities.

The Voucher Incentive Program helps businesses to better manage their hazardous materials by matching their investment in new technologies, in appropriate storage or containment systems, in testing of questionable wastes, and in disposal of hazardous wastes. Businesses can receive up to $500 per site. Through this incentive program, businesses have invested approximately $3 for every $1 spent by the program. In 2005, the program reimbursed approximately $140,000 to more than 380 businesses.

11.4.2.2 Mercury Reduction

The Local Hazardous Waste Management Program focuses much of its attention on reducing the risk from use and disposal of mercury-containing consumer products. Mercury was once used extensively in thermometers, barometers, manometers, electrical switches, and novelty items. It is still widely used in dental amalgam. Fortunately, there are effective non-mercury alternatives for most of these applications. Two examples of where LHWMP incentive and education efforts have helped to reduce mercury in the environment are in the areas of disposal of dental amalgam and recycling of fluorescent light tubes.

About half of the metal in dental amalgam, the silvery material used to fill cavities in teeth, is mercury. An estimated 300,000 amalgam fillings (representing more than 250 pounds of mercury) are replaced each year by King County dentists. In 2005, the quantity of mercury in county biosolids continued at the dramatic low level achieved in 2004, reflecting the reduction in mercury dental amalgam disposed of down the drain and into sewers. (See Figure 11-3 in the Industrial Waste Program discussion earlier in this chapter.)

LHWMP has worked with dentists for many years to help them prepare for installing and using amalgam separator units. A local dentist and a vendor designed amalgam separator units based on an LHWMP-created model. LHWMP tested the units at the University of Washington school of dentistry, did education/outreach, and proposed a regulation. LHWMP continues working with dentists through its incentive programs. In 2005, two more dentists joined the EnviroStars ranks, increasing the total to 142 EnviroStars-certified dentists in the region. Nine dentists received a total of $4,200 reimbursement from the Voucher Incentive Program for purchase of amalgam separators. Following King County's lead, neighboring counties have also starting working with their dentists.

Between 3.5 and 6.5 million fluorescent lamps, containing 132 to 321 pounds of mercury, are disposed of in King County each year. An estimated 37 percent of the mercury is recycled. In 2005, approximately 1.2 million lamps were recycled as the result of education and incentives provided by LHWMP to businesses and others.

11.4.2.3 Household Hazardous Waste Collection

In 2005, more than 80,000 customers used Local Hazardous Waste Management Program facilities or services to dispose of more than 1,800 tons of household hazardous waste. Approximately 17,000 customers disposed of more than 520 tons of household hazardous waste at Seattle's fixed facilities and more than 37,000 customers disposed of more than 660 tons at the Wastemobile and 450 tons at the Factoria Transfer Station. Were it not for LHWMP's collection services, much of this waste could have ended up in regional landfills, sewers, storm drains, and the environment.

For more information, visit the Local Hazardous Waste Management Program's Web site at http://www.govlink.org/hazwaste/about/

11.5 Compliance with the Endangered Species Act

11.5.1 Habitat Conservation Plan

Because of the listing of chinook salmon and bull trout as "threatened" and the Orca as "endangered" under the Endangered Species Act (ESA), projects that need a federal permit must go through an ESA Section 7 consultation process with NOAA Fisheries and U.S. Fish and Wildlife Services ("the Services"). To meet these requirements on a programmatic level, WTD undertook the creation of a Habitat Conservation Plan (HCP) for all WTD activities that have the potential to impact the listed species. The HCP was proposed as a voluntary two-phased 40-year agreement with the Services that would outline WTD's efforts to protect threatened and endangered species while carrying on its wastewater management activities.

The HCP effort was stopped in April 2005 after completion of the first phase. The WTD activities contained in the first-phase analyses included adequate avoidance and minimization measures, but any potential remaining impacts could not be quantified because of the uncertainty of effects of these activities on listed species. Because the commitment of resources required to match the high level of uncertainty was substantial, WTD chose to seek individual ESA Section 7 project consultations instead. All the materials and agreements that were developed in the first phase of the HCP were used in completing the federal permitting processes for the Brightwater facilities, the Carnation Treatment Plant, and other WTD construction projects. In addition, a small portion of the HCP budget was allocated to pursue a Programmatic Biological Assessment (PBA) with the Services for WTD construction activities and reclaimed water uses. These more focused agreements will streamline the ESA consultation process by getting advance approval for the majority of best management practices and methods of construction.

11.5.2 Endocrine-Disrupting Chemicals

Endocrine-disrupting chemicals (EDCs) are natural or synthetic chemicals that interfere with or mimic the hormones responsible for growth and development of an organism. Information is continually emerging about these natural and synthetic chemicals that people and industries use every day and dispose of down their drains and toilets. Because the potential impact of EDCs on aquatic life and wildlife is an issue of national and international scope, it is beyond the capability of a local agency or utility to solve alone. Studies will continue for many years before definitive answers are known and regulations adopted.

King County scientists are tracking this issue carefully to keep up-to-date on new findings. The Environmental Laboratory is investigating new analytical methods for the complex testing of some of these chemicals. Sampling for 15 suspected EDCs in King County marine and fresh waters found low levels of five types of EDCs: natural estrogen (estradiol), synthetic estrogen (ethynylestradiol), plasticizers (phthalates), surfactants from soaps (nonylphenol), and epoxy compounds (Bisphenol A).

Conventional secondary wastewater treatment, designed to remove solids and biodegradable organic material from wastewater, removes from 50 to 90 percent of many compounds known to be or suspected of being EDCs. Controlling chemicals at their source is the easiest and least expensive way to protect the environment and people from the harmful effects of all pollutants, including EDCs. WTD will continue its efforts to protect water quality and will adapt its programs, if needed, as more definitive information on EDCs emerges.

For more information, visit the EDC Web site at http://dnr.metrokc.gov/WTD/community/edc/

Appendices

Appendix A. Conveyance System Improvements Identified in Regional Needs Assessment

Appendix B. 2005 Summary of Odor Complaints

Appendix C. RWSP Project Reports

Appendix D. The Health of Our Waters, Water Quality Monitoring Results for 2005

Appendix A

Conveyance System Improvements Identified in Regional Needs Assessment

Appendix A

Conveyance System Improvements Identified in Regional Needs Assessment

Project #	Project List	Project Type	Year Online[1]	Estimated Project Cost[2]
1	Bear Creek Interceptor Extension	Gravity Line	1998	$400,000
2	Alderwood	Acquisition of Facilities	2001	$16,700,000
3	Swamp Creek	Gravity Line	2003	$10,700,000
4	ESI-11 - Wilburton Siphon/Wiburton Odor Contol	Gravity Line	2003	$3,900,000
5	Off-line Storage at North Creek	Storage Facility	2004	$33,800,000
6	ESI-1 (2)	Gravity Line	2004	$8,700,000
7	Fairwood Interceptor (formerly Madsen Creek)	Gravity Line	2005	$21,600,000
8	McAleer I/I Work	I/I rehab work (opportunity)	2005	$3,200,000
9	Pacific Pump Station	Pump Station Upgrade	2006	$7,800,000
10	York PS Subtotal	Pump Station Upgrade	2007	$10,000,000
11	Lake Line Connections and Flap Gates	Gravity Line	2007	$1,400,000
12	Juanita Bay Pump Station	Pump Station	2007	$33,100,000
13	Sammamish Plateau WSD	Acquisition of Facilities	2007	$9,400,000
14	Hidden Lake PS/Boeing Trunk	Pump Station Upgrade and Gravity Line	2008	$28,500,000
15	Kirkland Pump Station and Force Main Upgrade	Pump Station and Force Main Upgrade	2008	$9,600,000
16	Auburn	Interceptor Extension	2008	$11,500,000
17	[CSI] North Creek 1-A	Gravity Line	2009	$16,900,000
18	[CSI] Stuck River Diversion 1	Gravity Line	2009	$5,200,000
19	[CSI] Stuck River Diversion 2	Gravity Line	2009	$2,300,000
20	[CSI] Auburn West Valley Replacement - Section C	Gravity Line	2009	$12,400,000
21	[CSI] Auburn West Valley Replacement - Section A	Gravity Line	2009	$2,900,000
22	[CSI] Auburn West Valley Replacement - Section B	Gravity Line	2010	$25,200,000
23	[CSI] Soos Alternative 3A(3) - PS D w/ Conveyance	New Pump station, Force Main and Gravity Sewers	2010	$35,700,000
24	South Lake City: NWW13-02 TO NWW10-01	Gravity Line	2011	$100,000
25	[CSI] Soos Alternative 3A(3) - PS H w/ Conveyance	New Pump station, Force Main and Gravity Sewers	2011	$42,700,000
26	Piper Creek: T-12 to T-5	Gravity Line	2012	$500,000
27	Piper Creek: T-23 D TO T-12	Gravity Line	2013	$2,200,000
28	Issaquah1 Trunk Pipeline Bifurcation	New Gravity Line	2014	$1,400,000
29	Bellevue Influent Trunk	New Gravity Line	2015	$2,600,000
30	North Mercer and Enatai Interceptors	New Gravity Line	2016	$10,800,000
31	Medina Trunk Minor Upgrade	New Gravity Line	2019	$100,000
32	[CSI] Thornton Creek Interceptor - Sections 1 & 2	New Gravity Line	2019	$3,300,000
33	Bryn Mawr Storage	New Storage Facility	2020	$8,200,000

Project #	Project List	Project Type	Year Online[1]	Estimated Project Cost[2]
34	[CSI] Coal Trunk Replacement	New Gravity Line	2020	$6,800,000
35	Factoria Trunk and Wilburton Upgrade	New Gravity Line, Pump Station Upgrade	2020	$27,900,000
36	[CSI] Sammamish Plateau Diversion	New Gravity Line	2020	$18,800,000
37	[CSI] Thornton Creek Interceptor - Section 3	New Gravity Line	2022	$2,400,000
38	[CSI] Mill Creek Relief Sewer	New Gravity Line	2022	$5,000,000
39	North Soos Creek Interceptor	New Gravity Line	2022	$5,600,000
40	Heathfield/Sunset Pump Station and Force Main Upgrade	New Force Main, Pump Station Upgrade	2022	$16,000,000
41	Eastgate Trunk	New Gravity Line	2022	$1,800,000
42	Medina New Storage	New Storage Facility	2023	$3,600,000
43	[CSI] Soos Alternative 3A(3) - PS B w/ Conveyance	New Force Main, New Pump, New Gravity Line	2023	$10,600,000
44	Northwest Lake Sammamish Interceptor	New Gravity Line	2024	$28,900,000
45	Rainier Vista Trunk	New Gravity Line	2024	$600,000
46	Garrison Creek Trunk	New Gravity Line	2024	$12,900,000
47	Lake Hills Trunk Fourth Barrel Addition	New Gravity Line	2025	$12,400,000
48	[CSI] North Creek 2-A	Gravity Line	2026	$45,500,000
49	[CSI] Swamp Creek Parallel - Section 1B	New Gravity Line	2026	$7,300,000
50	Algona Pacific Trunk Stage 1	New Gravity Line	2026	$4,300,000
51	[CSI] Issaquah New Storage	New Storage Facility	2026	$15,100,000
52	[CSI] Sammamish Plateau Storage	New Storage Facility	2027	$20,500,000
53	Issaquah Creek Highlands New Storage	New Storage Facility	2029	$3,900,000
54	Planning, Studies, Administration, and Program Development	Ongoing Program	2030	$15,200,000
	Sub-Total of Projects Needed by 2030			***$648,000,000***
55	Auburn3 New Storage	New Storage Facility	2030-2050	$33,800,000
56	[CSI] North Creek 3-A	New Gravity Line	2030-2050	$6,700,000
57	Lakeland Trunk	New Gravity Line	2030-2050	$4,800,000
58	ULID 1 Contract 4	New Gravity Line	2030-2050	$2,300,000
59	Issaquah2 Trunk	New Gravity Line	2030-2050	$2,300,000
60	South Renton Interceptor	New Gravity Line	2030-2050	$6,900,000
61	North Creek Trunk	New Gravity Line	2030-2050	$4,000,000
62	Algona Pacific Trunk Stage 2	New Gravity Line	2030-2050	$1,300,000
63	Lakeland Hills Pump Station Upgrade	New Force Main, Pump Station Upgrade	2030-2050	$3,700,000
34-2nd phase	[CSI] Coal Trunk Replacement	New Gravity Line	2030-2050	$7,000,000
30-2nd phase	North Mercer and Enatai Interceptors	New Gravity Line	2030-2050	$12,000,000
36-2nd phase	[CSI] Sammamish Plateau Diversion	New Gravity Line	2030-2050	$4,600,000
40-2nd phase	Heathfield/Sunset Pump Station and Force Main Upgrade	New Force Main, Pump Station Upgrade	2030-2050	$21,900,000
52-2nd phase	[CSI] Sammamish Plateau Storage	New Storage Facility	2030-2050	$7,200,000
51-2nd phase	[CSI] Issaquah New Storage	New Storage Facility	2030-2050	$4,900,000
48-2nd phase	[CSI] North Creek 2-A	Gravity Line	2030-2050	$7,200,000
	Sub-Total of Projects Needed between 2031 & 2050			***$130,600,000***
	Total of Project Cost Estimates[1]			**$778,600,000**

[1] Year online balances capacity needs with estimated funding availability.
[2] All estimated costs are in 2003 dollars.

Appendix B

2005 Summary of Odor Complaints

Appendix B

2005 Summary of Odor Complaints

Location	Date	Complaint	Resolution
West Point Treatment Plant (TP)			
West Point TP	7/15/05	General odor complaint sent to WTD Division Director via office of King County Council Chair. Complainant was walking on the beach and sensed pungent odor from plant in the evening.	The plant's operations log was checked but no unusual activities were recorded. WTD Division Director responded to the complainant via e-mail to Chair of the King County Council.
West Point TP	8/12/05	Complainant reported very strong odors from the beach area, forcing them to leave area.	Odors potentially from the digester area, where a grit truck had just finished loading. The grit had been recently stirred, resulting in strong odors. The area was hosed and the grit placed back in the storage channel and wetted down to minimize odors.
West Service Area Offsite			
City of Lake Forest Park, 182nd and Perkins Way	2/16/05	Odors found emanating from a pinched/ruptured gas line caused by a contractor working for Puget Sound Energy.	The problem was identified and designated as a non-county complaint.
North Portal	2/28/05	General odor complaint filed by nearby resident.	Investigation did not reveal any odors near the North Portal area. Observed many people on the Burke-Gilman trail and no one seemed bothered by any odors. No further action taken.
3200 Commodore Way #103	4/01/05	General odor complaint filed by resident inside her condominium.	Odor was reported coming from the drains inside her unit, though she didn't know if the odors were sewer related. Since her description of the odor didn't seem like the typical sewage odor, no further action was taken. Designated as a non-county complaint.
North Portal	4/25/05	General odor complaint filed by same resident as 2/28/05 complaint.	Investigation at Matthew revealed that the chemical pump for the odor control unit was found airbound, thus not operating. The problem was corrected and the complainant was contacted with the investigative results.
Lakeline/Riviera Place	4/26/05	General odor complaint filed by nearby resident.	The operator checked the odor control unit at Matthews and it was operational. However, a supply fan was found on that should have been off, resulting in excess air being put into the wet well. This causes odors to be forced back up the lakeline. The problem was corrected and the complainant notified.
North Portal / Matthews Pump Station	5/09/05	General odor complaint filed by same resident as 2/28/05 complaint.	Investigation found that the pH and ORP readings on the odor control unit were out of the normal range, and foul air was sensed around the exhaust fan. Added chemical to the wet scrubber to correct the problem and notified the complainant.

Location	Date	Complaint	Resolution
3637 Thorndyke Ave W.	6/24/05	General odor complaint filed by employee of nearby business.	Recent work in the area disturbed seals in manholes and lift slabs causing odor leak points in the collection system. Lift slabs and manholes have been resealed and the mobile odor control unit at the Interbay force main discharge was restarted to maintain negative pressure in the conveyance system.
North Portal	7/20/05	Complaint filed via letter to King County Council Member regarding frequent complaints (same residents as 2/28/05 complaint).	Recurring odor problems near residence not resolved to their satisfaction. Response letter sent out to King County Council member highlighting what King County has done to alleviate odors at the Matthews Pump Station, as well as construction updates, upgrades and other activities performed to enhance odor control.
Perkins Way / McAleer Odor Control Unit	8/22/05	General odor complaint filed by nearby resident. Complainant sensed “metallic” odors on Perkins Way.	The carbon in the scrubber was removed and replaced a few weeks later.
Dexter Regulator Station	8/25/05	Complaint filed via e-mail to WTD Community Relations. Tried to phone in complaint but the facility ID sign in front of building was out of date, with a disconnected phone number. For the past three weeks, complainant had noticed strong intermittent odors at the regulator station.	Investigative results found that maintenance had recently worked on a fan and it was not turned back on after repair. The fan was turned back on and a new sign for the front of the station ordered to reflect current contact information.
Carkeek Park Treatment Plant	9/01/05	Complaint received from Seattle Public Utilities via the Puget Sound Clean Air Agency about odors noticed by park visitors.	Representative from the Seattle Public Utilities concerned that modifications to the vent lines in the manhole lids as promised by King County in previous conversations had not been made. At the time of the complaint, 3 of the manhole lids were already modified and the fourth and final one was being worked on.
3030 West Commodore Way / Bifurcation Structure	9/20/05	General odor complaint filed by citizen.	Operator investigated manholes at complainant site. The majority of them were the responsibility of Seattle Public Utilities, who responded by sealing the manholes. However, odors were then found from the Bifurcation Structure. Pressure and hydrogen sulfide dataloggers in manholes that had high hydrogen sulfide levels will be installed to monitor system.
3637 Thorndyke Ave W.	10/05/05	General odor complaint filed by employee of nearby business (same business as 6/24/05 complaint). Recurring odor problem (6/24/05); complainant has sensed odors for a few weeks.	Operators found the fan for the mobile odor control unit at the Wheeler Street Discharge Structure was inoperative. Electricians were called out to repair the fan for the mobile unit and all manholes in front of the complainant’s address were sealed.
3640 West Commodore Way	10/05/05	Original complaint filed last year in August, ongoing odor problem yet to be resolved.	Odors thought to be originating from storm drains in the area that somehow are tied into the King County system. Currently there is no resolution to the odor issue, as the storm drains do not belong to King County.
Matthews Beach Pump Station	11/12/05	General odor complaint filed by nearby resident (same resident as 2/28/05 complaint). Complainant sensed odor on the Burke-Gilman Trail.	Investigation revealed that the odor control unit at the station was not operating properly at the time of the complaint. The make-up water meter was clogged, thereby limiting the solution level into the sump and shutting down the recirculation pump when the liquid level was low enough. The meter was cleaned, sump refilled and the odor control system placed back into service.

Location	Date	Complaint	Resolution
801 NW 50th St	11/16/05	Complaint reported by personnel in the Seattle Public Utilities Drainage Drainage and Wastewater section.	Odors in area where the 8th Avenue Interceptor connects to the Ballard Trunk, though there are no documented complaints from this area in King County's files. The complainant feels that the source of the odor is from a vent. An odor block was placed in the pipe as well as covering the top of the vent with plastic.
South Treatment Plant (TP)			
South TP	2/26/05	Complainant has sensed odors off and on for a year near the following South Plant locations: Interurban Avenue and Grady Way, next to the Fun Center, and his residence a mile north of the plant.	All odor control units were in operation, with the biofilter running. Complainant did not require a response and did not want to be contacted. No further action taken.
900 Oaksdale Avenue	3/08/05	Complainant thought odor was emanating from the South Treatment Plant.	Investigation showed that the odor sensed was from Groco-like product that was placed around the building. The strong ammonia odor from this product was entering the building through their HVAC system. Informed the Biosolids group about this complaint. Designated as a non-county complaint.
South TP (Renton Park and Ride)	7/26/05	General odor complaint filed by KC Transit driver while stationed at the Renton Park and Ride Lot. Bus driver noticed odor (rotten meat) each time she was at the Park and Ride Lot.	The area between the Park and Ride lot and South Plant was investigated; no odors were sensed. All odor control units at the plant were operational. A few days later a moderate "composted manure" odor was sensed along Grady Way. The odor was traced back to newly spread bark planted by the city of Renton. No further action was taken.
South TP	7/28/05	Odor complaint filed by individual who has registered complaints since 1994.	The complainant has never accepted an invitation to meet with KC staff, visit the plant or discuss the complaints. Response letter sent out by WTD Community Relations. No further action taken at this time.
South TP (Interurban Avenue and Grady Way)	8/01/05	General odor complaint filed by KC Transit driver while driving her route along Interurban Avenue and Grady Way (same driver of 7/26/05 complaint).	No odors sensed outside plant fenceline at the time of investigation. Drove to the intersection of Grady Way and Interurban and could not detect any odors. All odor control systems in the plant operational and no unusual plant activities recorded in the Operations Log. No further action taken.
7221 South 135th St., Skyway	8/13/05	General odor complaint filed by resident.	Resident lives over a mile away from the South Plant. No sewage odors detected in area, but noticed strong odors from bark pile from neighbor's house. At the time of the complaint, the wind was blowing towards the south, making it highly unlikely that the source of the odor was from the plant. Designated as a non-county complaint.
South/East Service Area Offsite			
Wilburton Siphon Scrubber at Medina Discharge	3/25/05 & 3/28/05	Recurring odor complaint from car dealership employee parking area located just north of the odor control unit. Off and on odors from the scrubber sensed by employees.	Unit was checked 3 days before the complaint, with low H2S coming out from the exhaust (12 ppb). On the day of the complaint, H2S readings were 10 times greater (150 ppb). Informed complainant that the carbon in the scrubber will be changed out. Issue to be brought up at the Odor/Corrosion Task Force to determine long-range solutions.
Wilburton Siphon Scrubber at Medina Discharge	4/01/05	Odor complaint from Car Dealership employee parking area located just north of the odor control unit. (same business as 3/25/05 complaint).	Carbon in the odor control unit was changed out 4/8/05. Short-term fix is more frequent carbon changes and long-term fix is adding a polishing scrubber next to the existing scrubber.

Location	Date	Complaint	Resolution
Heathfield Pump Station	4/25/05	General odor complaint filed by nearby resident.	The odor control unit was checked; no sulfide was detected from the exhaust. The carbon in the unit was changed out the previous month. Odors and high sulfide levels were detected from the storm water catch basins and manholes that were tied in with the detention basin located at the entrance to the station. Informed complainant that the contents of the basin will be pumped out.
Wilburton Siphon Scrubber at Medina Discharge	6/10/05	Odor complaint from Car Dealership employee parking area located just north of the odor control unit. (same business as 3/25/05 complaint). Slight odor sensed by Car Dealership employee. The odor was not as strong as those sensed in the past were but they wanted to inform King County before they got worse.	The scrubber was monitored two days before the complaint. The carbon was scheduled to be changed out in 2 weeks but with this odor complaint, it was changed out immediately.
116th Ave & 256th St. Manholes – Kent / Cascade line	6/17/05	General odor complaint from nearby residences relayed to King County via Puget Sound Clean Air Agency.	Investigation revealed that strong odors and positive pressure were blowing out of the two force main discharge manholes where flows from Soos Creek enters the King County sewer line. The manholes were temporarily sealed to mitigate the odors. The complaint will be addressed at the Odor/Corrosion Task Force meeting.
North Mercer Pump Station	6/20/05	General odor complaint filed by nearby resident.	Problems with the Pepcon odor control unit the week before the complaint was called in. Maintenance staff continuing to work on the unit.
North Mercer Pump Station	6/29/05	General odor complaint file by nearby resident	At the time of the complaint, the operators were running the emergency generator, which created a lot of smoke and diesel fumes. No sewer odors were sensed at the time of the complaint. The Pepcon odor control unit was operational.
Henderson / CSO Outlet Regulator Station	6/30/05	General odor complaints filed by nearby resident relayed to South Plant Operations via Project Manager of the station.	The first complaint was due to sewage in the tunnel (full capacity) for at least a week for operational testing and training. Not enough air could be evacuated due to one of the odor scrubbers at the inlet regulator being out of service for repair. The tunnel was drained to alleviate the odors. The second complaint occurred when contractors were performing work at the station and left all the hatches open. South Plant personnel were not informed of these complaints until weeks after they occurred. The engineer was given the South Plant Main Control phone number as the point of contact for all future odor complaints regarding this site.
North Mercer Pump Station	7/14/05	General odor complaint filed by nearby resident.	No odors were sensed upon investigation. Recent mechanical and equipment failures with the Pepcon odor control unit may have been the cause of the complaint. New parts will be installed to avoid malfunction of the Pepcon unit and the exhaust stack redirected to avoid airflow in the direction of the receptors.
Barton Street Pump Station	8/08/05	General odor complaint filed by Washington State Ferry ticket booth employee.	Upon investigation found the odor control unit fan off. The operator turned the odor control fan back on. There was no alarm on the unit that registered fan operational status back to South Plant Main Control so a work request was submitted to install one.

Location	Date	Complaint	Resolution
2709 SE 16th Street, Renton	8/09/05	General odor complaint by resident sensed the day before but reported odor the next day, when there were no longer odors.	There are no KC facilities or conveyance lines within complainant's vicinity. Provided contact numbers for the Soos Creek Sewer and Renton Public Works to complainant. Designated as a non-county complaint.
Wilburton Siphon Scrubber at Medina Discharge	9/07/05	Odor complaint from Car Dealership employee parking area located just north of the odor control unit. (same business as 3/25/05 complaint)	Problem with odors sensed at the Eastside Chrysler/Jeep dealership. High hydrogen sulfide from the Wilburton Siphon Inlet resulting in frequent carbon change-outs. The last carbon change-out for this unit was only one month ago. The inlet duct was also found in poor condition (crumbling in places). The odor control unit is undersized for the amount of sulfide entering. A new permanent unit is at least two years away.
Henderson Outlet Regulator Station	9/17/05	General odor complaint filed by nearby resident relayed to South Plant Operations via Project Manager of the station.	Recurring odors sensed in backyard of complainant's residence. Contractors still working in the station, sometimes leaving doors and hatches open. Further investigation found sewer gas odors coming from two roof vents. The Project Manager and contractors removed a ladder that prevented the hatch from closing all the way and passive carbon filters were installed in the roof vents.
South Mercer Pump Station	9/19/05	General odor complaint received from nearby resident.	Upon investigation, operator did not sense any odors at the station; the carbon tower was in service. The operator pumped and hosed down the wet well and switched the carbon tower that was in service to the one containing new media.
ESI Section 12 – Wilburton Relining Project	9/29/05	Complainant's office is right above location where the sewer is opened up each night for the ESI section 12 relining project.	On the day of the complaint, the contractor exhausted pipeline air from the manhole using a small fan. The air must have entered and recirculated through the complainant's building ventilation system. The fan was redirected so the exhaust was not pointed directly at the office building.
Wilburton Siphon Scrubber at Medina Discharge	10/05/05	Odor complaint from Car Dealership employee parking area located just north of the odor control unit. (same business as 3/25/05 complaint)	The carbon was last changed on 9/14. No sulfide was detected from the scrubber exhaust but could sense a slight "sweet organic" odor. Suspect that complainant is sensing the "organic-like" odor that is produced when the foul air is treated through caustic-impregnated carbon. The Odor/Corrosion Task Force concluded that a mobile odor unit should be placed after the existing scrubber to act as a polishing unit.
Wilburton Siphon Scrubber at Medina Discharge	10/07/05	Odor complaint from Car Dealership employee parking area located just north of the odor control unit. (same business as 3/25/05 complaint)	Same as complaint on 10/05. The carbon was last changed on 9/14. No sulfide was detected from the scrubber exhaust but could sense a slight "sweet organic" odor. Suspect that complainant is sensing the "organic-like" odor that is produced when the foul air is treated through caustic-impregnated carbon. The Odor/Corrosion Task Force concluded that a mobile odor unit should be placed after the existing scrubber to act as a polishing unit. Also a slight chance that the odors were emanating from the ESI Section 12 relining project.

Location	Date	Complaint	Resolution
North Creek Force Main Discharge	12/07/05	General odor complaint from nearby business.	Odors sensed by landscaping business personnel adjacent to structure. Investigation by operator did not detect sewer odors, only “carbon” odors (created when foul air is treated through caustic-impregnated carbon.) The north scrubber carbon was changed the previous week and caustic shock dosing at North Creek Pump Station has been occurring weekly. Instructed operator to place the scrubbers in series operation and asked complainant that if odors persist the next day to call the South Plant and the other scrubber’s carbon will be changed.

Appendix C

RWSP Project Reports

Appendix C

RWSP Project Reports

The RWSP reporting policies call for details on RWSP capital projects, including a project schedule, an expenditures summary (including staff labor and miscellaneous services), a description of any adjustments to costs and schedules, and a status of the project contracts. This appendix meets these requirements and includes a project report for the year 2005 on the following RWSP capital projects that are in design or construction:

- Brightwater Treatment Plant, project #423484[1]
- Brightwater Conveyance, project # 423575
- Vashon Treatment Plant, project # 423460
- Carnation Treatment Plant, project #423557
- Bellevue Pump Station, project #423521
- Kent/Auburn Conveyance System Improvements, project #423582
- Hidden Lake Pump Station and Boeing Creek Trunk, project #423365
- Pump Station D (Soos Creek Improvements), project #423583
- Fairwood Interceptor Sewer Project, project #423494
- Juanita Bay Pump Station, project #423406
- Pacific Pump Station, project #423518
- RWSP Local System I/I Control, project #423297
- Sediment Management Program, project #423368
- Lower Duwamish Waterway Superfund, project #423589
- RWSP Water/Wastewater Conservation, project #423523

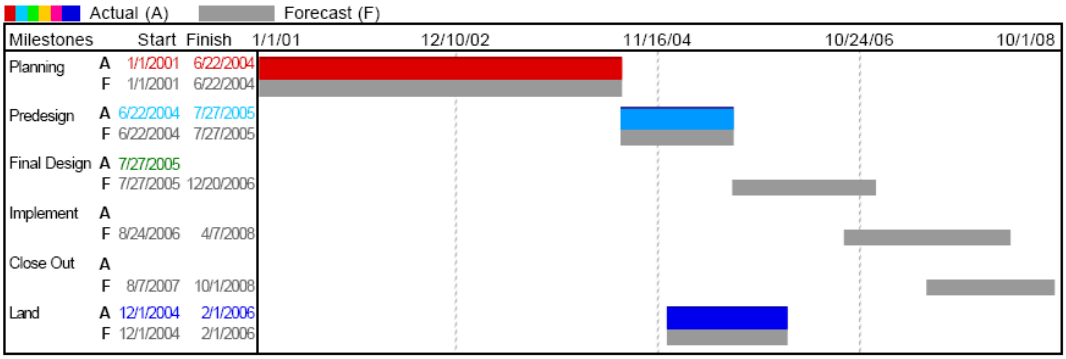
[1]Each wastewater capital project is assigned a six-digit number such as 423484. The first two numbers (42) identify this as a wastewater project (as opposed to a transit or roads project). The third number (3) identifies the project as capital project (as opposed to operating) and the last three numbers are sequential numbers reflecting the order the projects were assigned in a particular year.

Each report is generated from the Wastewater Treatment Division (WTD) Project Management and Financial Forecast Database. An explanation of the information provided in each report follows.

Schedule and Cost Summary Page

The second page of each report shows the project's milestone schedule in a bar graph format. The graph includes timelines for the various phases of a project: planning, predesign, final design, implementation, close out, and land acquisition. An example of a project schedule follows.

Milestone Schedule



The cost summary table provides expenditure information for the year 2005 and lifetime budget information based on the adopted 2005 budget. An example of a project cost summary table and an explanation of how to read the summary follows.

Cost Summary

	Annual Expenditures				2005 Annual Budgeting			Lifetime Expenditures and Budgeting			
Expense	IBIS DEC-05	IBIS YTD DEC-05	Other Comtd	IBIS YTD +Comtd	Annual Budget	%Spent Budget	Annual Planned	IBIS LTD DEC-05	Lifetime Budget	%Budget Spent	Lifetime Planned
CONSTRUCTION	652,633	2,539,808	-7,560	2,532,248	1,599,086	158.4 %	1,732,001	2,663,584	4,175,623	63.6 %	4,376,672
Construction Contracts	652,633	2,538,713	-7,560	2,531,153	1,599,086	%	1,732,001	2,662,284	4,175,623	%	4,376,466
Other Capital Charges	0	1,094	0	1,094	0	%	0	1,300	0	%	206
Owner Furnished	0	0	0	0	0	%	0	0	0	%	0
NON-CONSTRUCTION	102,512	520,664	9,709	530,373	447,344	118.6 %	437,251	2,347,956	2,900,655	81.3 %	2,723,095
Engineering	62,874	161,884	0	161,884	268,696	%	200,832	1,513,765	1,998,313	%	1,795,112
Misc. Services	2,366	7,344	42	7,386	23,898	%	23,201	23,355	50,805	%	40,002
Permitting & Agency	3,671	25,870	73	25,943	0	%	0	50,362	34,099	%	24,492
Planning & Mgt Svs	1,656	16,307	2,812	19,119	0	%	0	17,707	0	%	0
Right-of-Way	0	600	0	600	0	%	0	9,900	30,000	%	9,300
Staff Labor	31,945	308,660	6,782	315,442	154,751	%	213,217	732,868	787,438	%	854,189
PROJECT RESERVE	0	0	0	0	0	0.0 %	0	0	729,934	0.0 %	708,674
Project Reserve	0	0	0	0	0	%	0	0	729,934	%	708,674
Total $	755,145	3,060,472	2,149	3,062,621	2,046,430	149.7 %	2,169,252	5,011,540	7,806,212	64.2 %	7,808,441

Expense
CONSTRUCTION
Construction Contracts
Other Capital Charges
Owner Furnished
NON-CONSTRUCTION
Engineering
Misc. Services
Permitting & Agency
Planning & Mgt Svs
Right-of-Way
Staff Labor
PROJECT RESERVE
Project Reserve

The Expense column of the cost summary table is broken down into three main headings.

- Costs associated with Construction.
- Non-Construction Costs. These are the costs associated with outside engineering services, permitting and other agency support (costs for permits), planning and management services, right-of-way (costs associated with acquisition and easements), and WTD Staff Labor costs.
- Project Reserve costs. These are costs associated with project contingency.

Annual Expenditures			
IBIS DEC-05	IBIS YTD DEC-05	Other Comtd	IBIS YTD +Comtd
652,633	2,539,808	-7,560	2,532,248
652,633	2,538,713	-7,560	2,531,153
0	1,094	0	1,094
0	0	0	0
102,512	520,664	9,709	530,373
62,874	161,884	0	161,884
2,366	7,344	42	7,386
3,671	25,870	73	25,943
1,656	16,307	2,812	19,119
0	600	0	600
31,945	308,660	6,782	315,442
0	0	0	0
0	0	0	0
755,145	3,060,472	2,149	3,062,621

The columns under Annual Expenditures of the cost summary table reflect expenditures for 2005. The four headings under annual expenditures include:

- IBIS* DEC-05. This column reflects the expenditures for the month of December 2005.
- IBIS YTD DEC-05. This column reflects the expenditures for the year 2005, from January through December 2005.
- Other Comtd. This column refers to costs that have been posted to IBIS, but are not reflected in year-end total expenditures.
- IBIS YTD+Comtd. This column refers to the total project costs expended in 2005, and the costs posted to IBIS.

* IBIS refers to King County's financial reporting system.

2005 Annual Budgeting		
Annual Budget	%Spent Budget	Annual Planned
1,599,086	158.4 %	1,732,001
1,599,086	%	1,732,001
0	%	0
0	%	0
447,344	118.6 %	437,251
268,696	%	200,832
23,898	%	23,201
0	%	0
0	%	0
0	%	0
154,751	%	213,217
0	0.0 %	0
0	%	0
2,046,430	149.7 %	2,169,252

The 2005 Annual Budgeting columns of the cost summary table refer to the project budget that was adopted by the King County Council in November 2004 for the year 2005. There are four headings:

- Annual Budget. These costs reflect the approved appropriation and breakdown by expense category for the year 2005.
- %Spent Budget. This column reflects the percentage expended of the 2005 budget by main expense category (Construction, Non-Construction, or Project Contingency costs).
- Annual Planned. The costs in this column reflect what was anticipated to be expended of the 2005 council-approved project budget in preparation for the 2006-2011 adopted budget submittal.
  Project Managers begin developing their project budget submittals nine months before a budget is adopted and appropriated. Changes may occur from the time a budget is developed as compared to the actual budget year. These changes may cause an annual budget to be over or under expended. Such changes may result from new information that could affect the project's scope or schedule, construction delays, or permitting and environmental review complexities.

Lifetime Expenditures and Budgeting			
IBIS LTD DEC-05	Lifetime Budget	%Budget Spent	Lifetime Planned
2,663,584	4,175,623	63.6 %	4,376,872
2,662,284	4,175,623	%	4,376,466
1,300	0	%	206
0	0	%	0
2,347,956	2,900,655	81.3 %	2,723,095
1,513,765	1,998,313	%	1,795,112
23,355	50,805	%	40,002
50,362	34,099	%	24,492
17,707	0	%	0
9,900	30,000	%	9,300
732,868	787,438	%	854,189
0	729,934	0.0 %	708,674
0	729,934	%	708,674
5,011,540	7,806,212	64.2 %	7,808,441

The columns under Lifetime Expenditures and Budgeting of the cost summary table include the following four columns:

- IBIS LTD Dec-05. The costs in this column refer to total project expenditures through December 2005.
- Lifetime Budget. The costs in this column refer to projected total inflated project costs as adopted in the 2005-2010 budget (November 2004).
- % Budget Spent. This column reflects the percentage expended of the adopted lifetime budget by main expense category (Construction, Non-Construction, or Project Contingency costs).
- Lifetime Planned Budget. The costs in this column reflect the projected total inflated project costs as adopted in the 2006-2011 budget (November 2005). As noted earlier, project managers begin developing their project budget submittals around nine months before a budget is adopted and appropriated. The next year's (2006) budget submittal takes into account changes to the project scope or schedule, or new information identified since the current year's (2005) budget was adopted.

Contract Status

The third page of each project report includes information on contract status, if there are contracts associated with the project.

The contract status table provides the name of the contract, the original contract amount, amounts associated with amendments or change orders, and percentage paid of contract. The 'Phased Amendments' column refers to additional planned phases of the contract; the value of those planned phase amendments are included in the 'Phased Amendment' column. If work associated with the contract was not planned when the original contract was signed, the costs associated with that work is seen in the 'Non-Phased amendments or change orders' column.

An example of the contract status table follows.

Contract	Original Contract Amount	Phased Amendments	Non-Phased Amendments or Change Orders	Am. or Change Order %	No. of Am. or CO's to Date	Current Contract Amount	Amount Paid	Through Payment No.	% Complete
C33096C Pacific Pump Construction	$3,792,143		$519,710	14%	6	$4,311,853	$3,336,113	19	77%
E03006E Pacific Pump Engineering	$1,351,537		$373,756	28%	1	$1,725,293	$1,565,449	61	91%

DECEMBER 2005

423484 Brightwater Treatment Plant

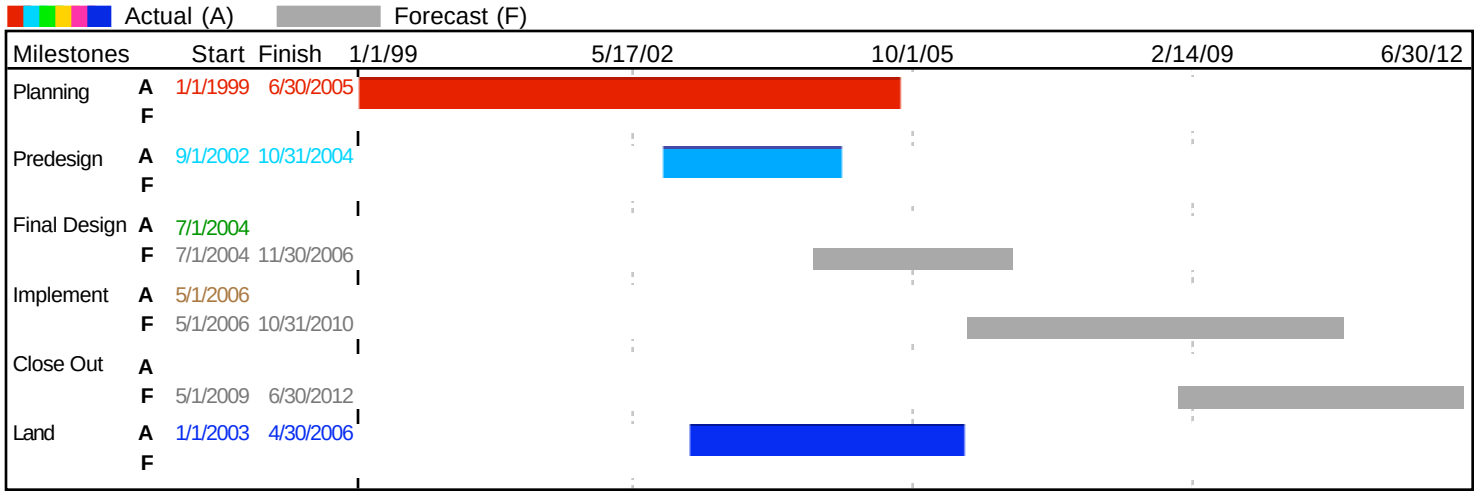
Project Description

The Brightwater Treatment Plant is a new wastewater treatment facility to be located just east of State Route 9 and north of State Route 522 and Woodinville. The Brightwater plant will provide 36 million gallons per day (mgd) of treatment capacity (average wet weather flow) by 2010 and 54 mgd of capacity by 2040. The Brightwater plant includes membrane bioreactor (MBR) secondary treatment systems, Class B biosolids and reclaimed water production, odor control systems, and disinfection.

King County

Department of
Natural Resources and Parks
Wastewater Treatment Division

Milestone Schedule



Schedule Adjustments

Cost Summary

	Annual Expenditures				2005 Annual Budgeting			Lifetime Expenditures and Budgeting			
Expense	IBIS DEC-05	IBIS YTD DEC-05	Other Comtd	IBIS YTD +Comtd	Annual Budget	%Spent Budget	Annual Planned	IBIS LTD DEC-05	Lifetime Budget	%Budget Spent	Lifetime Planned
CONSTRUCTION	225,550	2,683,801	0	2,683,801	15,038,000	17.8 %	727,615	3,259,461	333,983,260	1.0 %	384,459,253
Construction Contracts	224,061	2,043	0	2,043	15,038,000		727,615	499,733	333,958,840	%	384,421,268
Other Capital Charges	1,489	2,681,711	0	2,681,711	0	%	0	2,725,298	0	%	3,601
Owner Furnished	0	47	0	47	0	%	0	34,431	24,420	%	34,384
NON-CONSTRUCTION	12,337,563	61,949,111	0	61,949,111	50,671,191	122. %	82,818,064	159,570,189	243,669,302	65.5 %	239,434,190
Engineering	4,328,467	10,554,090	0	10,554,090	17,236,564	%	20,939,359	43,831,211	94,189,658	%	80,716,336
Misc. Services	84,318	398,136	0	398,136	1,573,465	%	321,822	2,997,942	11,135,282	%	7,267,036
Permitting & Agency	90,569	819,279	0	819,279	1,117,648	%	10,261,011	2,788,516	19,068,038	%	24,373,345
Planning & Mgt Svs	-140,029	2,764,433	0	2,764,433	0	%	0	9,198,446	0	%	0
Right-of-Way	7,134,225	43,438,905	0	43,438,905	27,604,000	%	48,572,389	88,971,405	91,723,240	%	101,641,682
Staff Labor	840,013	3,974,270	0	3,974,270	3,139,515	%	2,723,483	11,782,669	27,553,085	%	25,435,790
PROJECT RESERVE	0	0	0	0	0	%	0	0	11,480,504	%	20,935,645
Project Reserve	0	0	0	0	0	%	0	0	11,480,504	%	20,935,645
Total $	12,563,113	64,632,912	0	64,632,912	65,709,191	98.4%	83,545,679	162,829,650	589,133,067	27.4%	644,829,087

Cost/Budget Adjustments

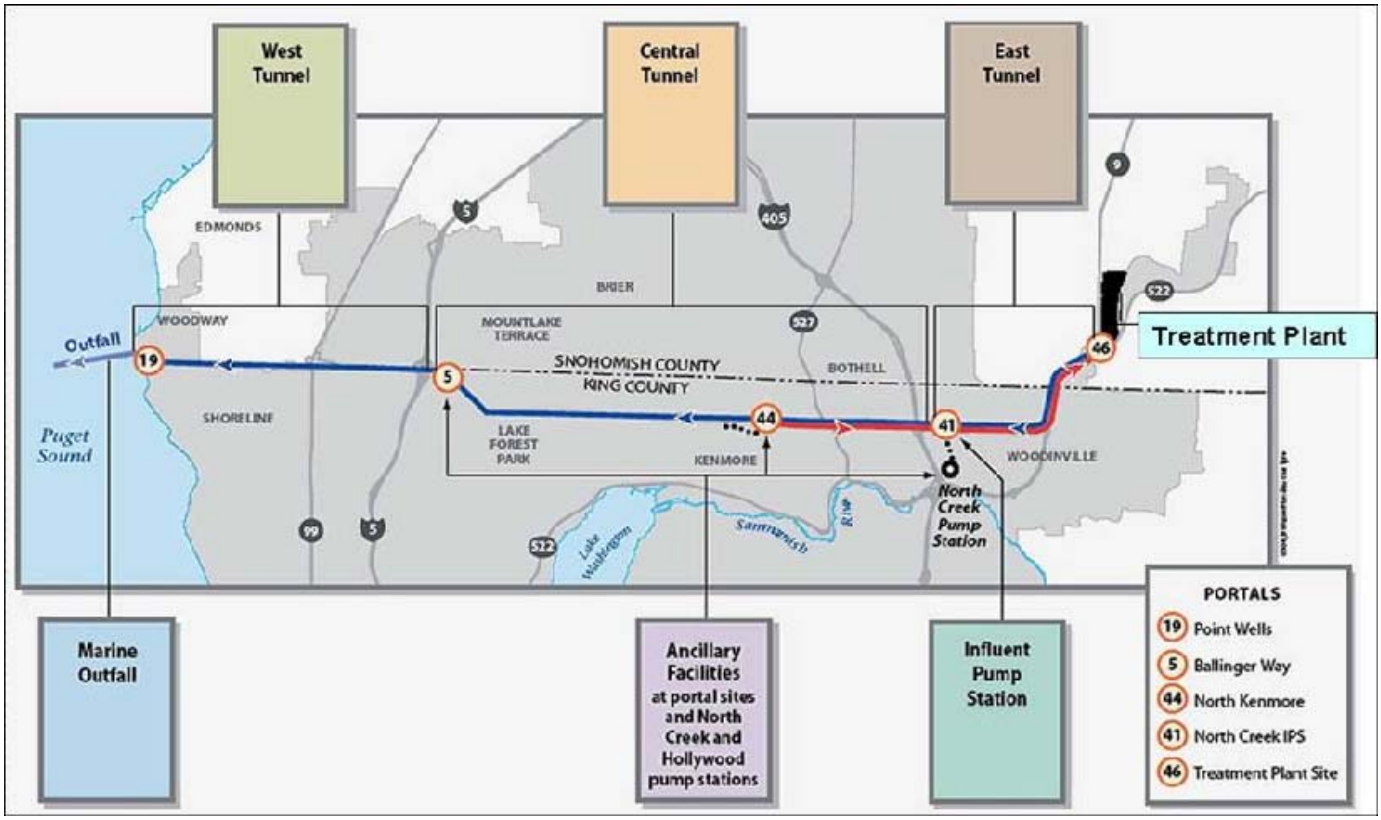
Construction expenditures are expected to start in May 2006 on both the NMA and Site Preparation MACC portions of the HCC contract, with the initial invoices processed by the July report. Engineering and construction management services invoices for December were processed after the close of January, resulting in lower expenditures year to date than planned. Mitigation payments under the Snohomish county agreement are expected to begin mid-year. The acquisitions of two properties on the treatment plant site were completed in January reflecting the expenditure of most of the planned Right-of-Way costs for 2006.

Contract Status - Brightwater Treatment Plant 423484

Contract	Original Contract Amount	Phased Amendments	Non-Phased Amendments or Change Orders	Am. or Change Order %	No. of Am. or CO's to Date	Current Contract Amount	Amount Paid	Through Payment No.	% Complete
E13035E CH2M Hill - Design	$9,719,364	$31,747,643	$9,085,087	22%	17	$50,552,094	$38,404,650	22-LS	76%
P93012P CH2M Hill - Site	$4,617,000		$7,629,920	165%	11	$12,246,920	$11,990,483	68	98%
P03012P URS Corp. - Program	$8,205,521		$2,840,830	35%	3	$11,046,351	$9,122,130	42	83%
P53007P Construction Mgt. Services	$1,497,206		$0	0%	0	$1,497,206	$48,771	1	3%
C38138C GCCM Contract Predesign	$1,424,428		$183,600	13%	1	$1,608,028	$1,058,748	19	66%
C53037C TP Site Demolition	$147,700		$7,952	5%	1	$155,652	$100,105	3	64%

DECEMBER 2005

423575 Brightwater Conveyance



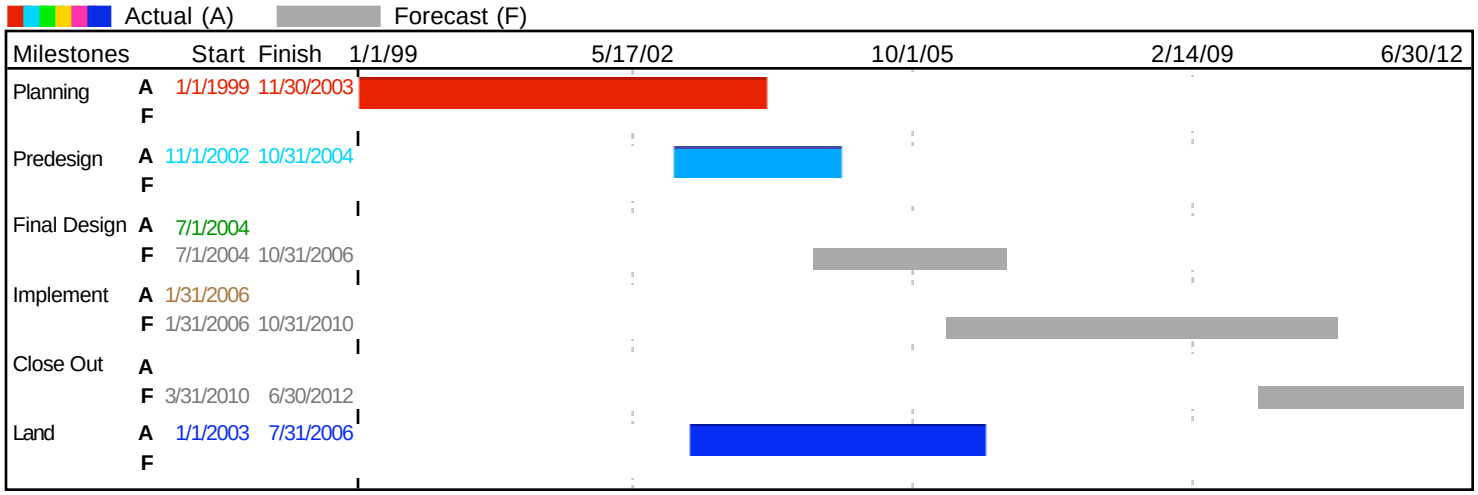
Project Description

The Brightwater conveyance system is a 14.9 mile long system will carry wastewater to and from the treatment plant located on the Route 9 site. Serving south Snohomish County and north King County, the system includes pipelines to carry untreated wastewater from King County's existing pipelines in the Lake Forest Park, Kenmore, and Bothell areas to the treatment plant, and a pipeline to carry treated wastewater from the treatment plant to the outfall.

King County

Department of
Natural Resources and Parks
Wastewater Treatment Division

Milestone Schedule



Schedule Adjustments

N/A

Cost Summary

	Annual Expenditures				2005 Annual Budgeting			Lifetime Expenditures and Budgeting			
Expense	IBIS DEC-05	IBIS YTD DEC-05	Other Comtd	IBIS YTD +Comtd	Annual Budget	%Spent Budget	Annual Planned	IBIS LTD DEC-05	Lifetime Budget	%Budget Spent	Lifetime Planned
CONSTRUCTION	162,554	5,025,882	0	5,025,882	16,206,752	31.0 %	256,499	5,158,696	633,208,005	0.8 %	705,313,807
Construction Contracts	159,992	174,438	0	174,438	16,206,752	%	126,499	175,696	633,208,004	%	705,052,251
Other Capital Charges	2,562	4,847,158	0	4,847,158	0	%	0	4,891,133	0	%	43,975
Outside Agency	0	3,869	0	3,869	0	%	130,000	3,869	0	%	130,000
Owner Furnished	0	418	0	418	0	%	0	87,999	1	%	87,580
NON-CONSTRUCTION	6,954,568	31,947,023	0	31,947,023	31,458,869	100.9%	56,299,457	95,944,608	199,206,900	30.2 %	258,404,599
Engineering	5,093,816	19,014,874	0	19,014,874	16,341,549	%	27,361,852	50,080,268	119,302,246	%	175,765,605
Misc. Services	111,302	325,496	0	325,496	1,055,791	%	363,938	2,761,546	9,203,883	%	6,760,951
Permitting & Agency	6,218	557,807	0	557,807	2,654,958	%	9,673,021	1,176,802	7,007,123	%	22,105,038
Planning & Mgt Svs	986,915	2,438,517	0	2,438,517	0	%	0	15,804,986	0	%	0
Right-of-Way	66,663	6,230,916	0	6,230,916	7,519,000	%	15,111,782	12,365,121	38,676,890	%	21,357,503
Staff Labor	689,654	3,379,414	0	3,379,414	3,887,571	%	3,788,864	13,755,885	25,016,758	%	32,415,503
PROJECT RESERVE	0	0	0	0	170,248	%	0	0	82,056,924	%	59,925,547
Project Reserve	0	0	0	0	0	%	0	0	82,056,924	%	59,925,547
Total $	7,117,122	36,972,905	0	36,972,905	47,835,869	77. 2%	56,555,956	101,103,304	914,471,829	11.2%	1,023,643,953

Cost/Budget Adjustments

N/A

Contract Status - Brightwater Conveyance 423575

Contract	Original Contract Amount	Phased Amendments	Non-Phased Amendments or Change Orders	Am. or Change Order %	No. of Am. or CO's to Date	Current Contract Amount	Amount Paid	Through Payment No.	% Complete
E23006E HDR - Predesign	$11,217,376	$0	$0	0%	5	$11,217,376	$10,892,357	33	97%
E23007E CDM - Geotechnical	$11,474,386	$5,180,039	$210,165	2%	3	$16,864,590	$13,538,822	35.2	80%
E33015 MWH Jacobs -Final Design	$24,013,721	$0	$0	0%	0	$24,013,721	$13,863,724	17	58%
E43010E Reclaimed Water	$1,918,771	$0	$0	0%	1	$1,918,771	$975,971	13	51%
P43020P Construction Mgt. Services	$13,327,255	$0	$962,548	7%	1	$14,289,803	$1,094,212	7	8%
C53019C Portal 41 Bldg. Demolition	$144,000	$0	$7,235	5%	1	$151,235	$135,467	3	90%

DECEMBER 2005

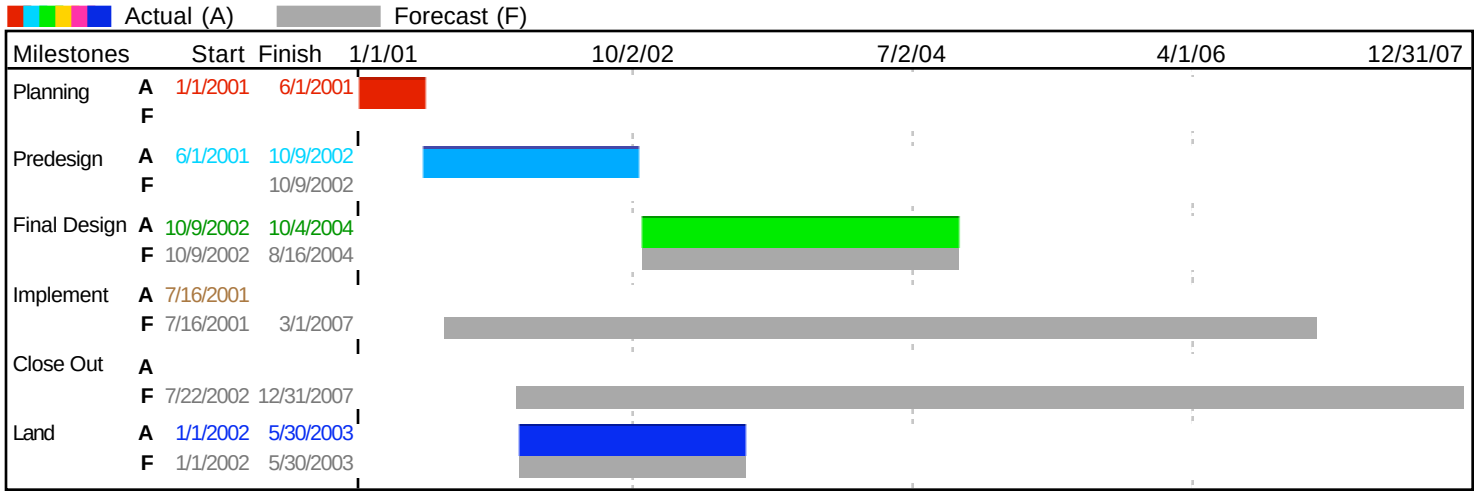
423460 Vashon Island T.P. Upgrade

Project Description

In accordance with a contract executed in 1999 with the Vashon Sewer District, King County is upgrading and expanding the existing Vashon Island Wastewater Treatment Plant and outfall. Under this agreement, King County has also worked with the local sewer district in implementation of operational and safety improvements in the local sewage collection systems.

King County
Department of
Natural Resources and Parks
Wastewater Treatment Division

Milestone Schedule



Schedule Adjustments

The completion of the construction of the Vashon Wastewater Treatment Plant was delayed early in 2005 due to the discovery of contaminated soils on the site characteristic of areas impacted by the ASSARCO smelter plume. Change orders to the contract were issued to cover this condition and construction resumed on the plant. The new Vashon plant is scheduled to start-up in late summer 2006. KCWTD is under a compliance order with the Department of Ecology to have plant in operation in the first quarter of 2007.

Cost Summary

	Annual Expenditures				2005 Annual Budgeting			Lifetime Expenditures and Budgeting			
Expense	IBIS DEC-05	IBIS YTD DEC-05	Other Comtd	IBIS YTD +Comtd	Annual Budget	%Spent Budget	Annual Planned	IBIS LTD DEC-05	Lifetime Budget	%Budget Spent	Lifetime Planned
CONSTRUCTION	534,736	5,315,699	-2,711	5,312,988	5,009,534	106.1 %	3,746,000	9,627,265	14,940,310	53.6 %	13,683,162
Construction Contracts	534,736	5,315,699	-2,711	5,312,988	5,009,534	%	3,746,000	9,473,647	14,935,470	%	13,671,948
Other Capital Charges	0	0	0	0	0	%	0	148,778	0	%	6,374
Owner Furnished	0	0	0	0	0	%	0	4,839	4,839	%	4,839
NON-CONSTRUCTION	162,385	1,182,330	99,093	1,281,423	230,767	555.3 %	695,000	5,354,212	4,378,029	119.9 %	5,707,039
Engineering	29,787	413,172	36,272	449,443	118,533	%	350,000	2,817,039	2,619,802	%	3,127,669
Misc. Services	6,253	34,292	1,509	35,801	0	%	0	376,584	382,632	%	500,967
Permitting & Agency	4,387	22,152	313	22,464	0	%	92,500	175,295	142,247	%	258,518
Planning & Mgt Svs	90,265	388,610	52,474	441,084	0	%	0	443,390	0	%	0
Right-of-Way	0	0	0	0	0	%	0	0	0	%	0
Staff Labor	31,693	324,105	8,526	332,631	112,234	%	252,500	1,541,904	1,233,348	%	1,819,884
PROJECT RESERVE	0	0	0	0	0	0.0 %	0	0	1,000	0.0 %	0
Project Reserve	0	0	0	0	0	%	0	0	1,000	%	0
Total $	697,120	6,498,029	96,382	6,594,411	5,240,301	125.8 %	4,441,000	14,981,477	19,319,339	77.5 %	19,390,201

Cost/Budget Adjustments

Two major change orders were issued in early 2005 to add work to the Vashon construction contract related to the discovery of metal contaminated surface soils and an adjustment to the grading plan. These two change orders included both the additional work and compensation to the contractor for delays connected with this additional work. The total cost of these two change orders is about $1.15 million. Construction has continued and only minor cost and schedule adjustments have been required since the first two major change orders were issued.

Contract Status - Vashon Treatment Plant 423460

Contract	Original Contract Amount	Phased Amendments	Non-Phased Amendments or Change Orders	Am. or Change Order %	No. of Am. or CO's to Date	Current Contract Amount	Amount Paid	Through Payment No.	% Complete
C46131C Vashon Construction	$7,164,201		$1,274,491	18%	9	$8,438,692	$7,501,623	22	89%
C33127C Vashon Outfall Improvements	$204,454		$0	0%	0	$204,454	$204,454	2	100%

DECEMBER 2005

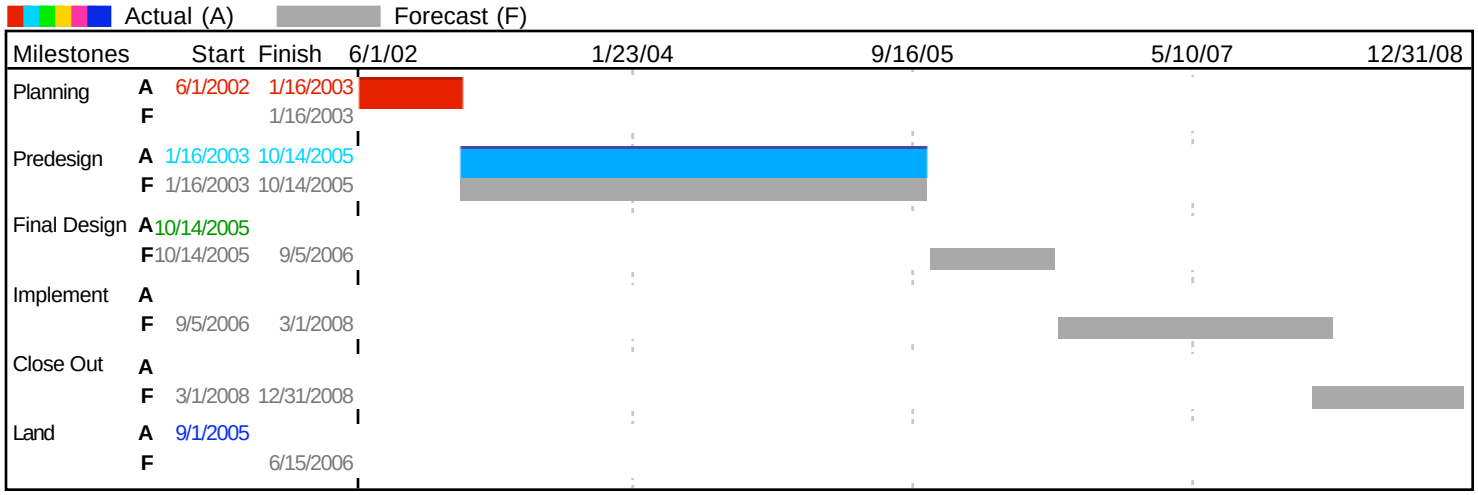
423557 Carnation Treatment Plant

Project Description

The City of Carnation determined there was a need to replace on-site septic systems with a wastewater treatment facility to protect public health and the environment, achieve the City's comprehensive plan goals, and maintain and enhance community livability. The City contracted with King County to design, build, operate, and maintain a new treatment plant and associated discharge facilities. The City will design and build the local wastewater collection system.

King County
Department of
Natural Resources and Parks
Wastewater Treatment Division

Milestone Schedule



Schedule Adjustments

The 90% design submittal was delayed several months because additional time was needed to incorporate the MBR design shop drawings that were received from Zenon, the MBR manufacturer. Construction of the Carnation Wastewater Treatment Facility is scheduled to begin in September 2006. The City of Carnation is scheduled to complete their new sewage collection by the end of 2007 and the treatment plant startup schedule must be closely coordinated with the collection system construction.

Cost Summary

	Annual Expenditures				2005 Annual Budgeting			Lifetime Expenditures and Budgeting			
Expense	IBIS DEC-05	IBIS YTD DEC-05	Other Comtd	IBIS YTD +Comtd	Annual Budget	%Spent Budget	Annual Planned	IBIS LTD DEC-05	Lifetime Budget	%Budget Spent	Lifetime Planned
CONSTRUCTION	10,050	12,359	0	12,359	979,400	1.3 %	0	12,359	6,224,917	0.2 %	9,056,733
Construction Contracts	10,050	12,359	0	12,359	979,400	%	0	12,359	6,224,917	%	8,011,283
Other Capital Charges	0	0	0	0	0	%	0	0	0	%	0
Owner Furnished	0	0	0	0	0	%	0	0	0	%	1,045,450
NON-CONSTRUCTION	699,623	2,007,395	85,549	2,092,944	902,948	231. 8 %	1,503,782	4,053,395	3,965,878	104. 4 %	4,746,384
Engineering	641,162	1,485,695	78,231	1,563,926	512,057	%	1,050,000	2,609,369	2,631,335	%	2,598,772
Misc. Services	3,583	12,842	0	12,842	0	%	8,795	50,755	17,597	%	69,427
Permitting & Agency	1,519	25,799	0	25,799	38,625	%	3,333	40,302	83,402	%	130,897
Planning & Mgt Svs	12,294	19,069	0	19,069	0	%	0	32,168	0	%	0
Right-of-Way	0	11,250	0	11,250	0	%	110,000	11,250	0	%	223,300
Staff Labor	41,065	452,740	7,318	460,058	352,266	%	331,654	1,309,551	1,233,544	%	1,723,988
PROJECT RESERVE	0	0	0	0	0	0.0 %	0	0	917,891	0.0 %	0
Project Reserve	0	0	0	0	0	%	0	0	917,891	%	0
Total $	709,673	2,019,754	85,549	2,105,303	1,882,348	111. 8 %	1,503,782	4,065,754	11,108,686	36.6 %	13,803,117

Cost/Budget Adjustments

Increases in commodity pricing and changes to the treatment plant design necessary to meet permit requirements, including the raising of the plant elevation based on flood plain conditions that were updated in late 2005 have resulted in higher construction cost estimates. WTD requested a budget transfer through a formal King County process.

Contract Status - Carnation Treatment Plant 423557

Contract	Original Contract Amount	Phased Amendments	Non-Phased Amendments or Change Orders	Am. or Change Order %	No. of Am. or CO's to Date	Current Contract Amount	Amount Paid	Through Payment No.	% Complete
E23020E Carnation Treatment Design	$629,804	$2,587,391	$37,845	1%	3	$3,255,040	$3,126,720	41	96%
C43092C Hazardous Materials	$200,000		$0	0%	0	$200,000	$100,429	16	50%
P43007P Archaeological	$100,000		$0	0%	0	$100,000	$38,527	12	39%

DECEMBER 2005

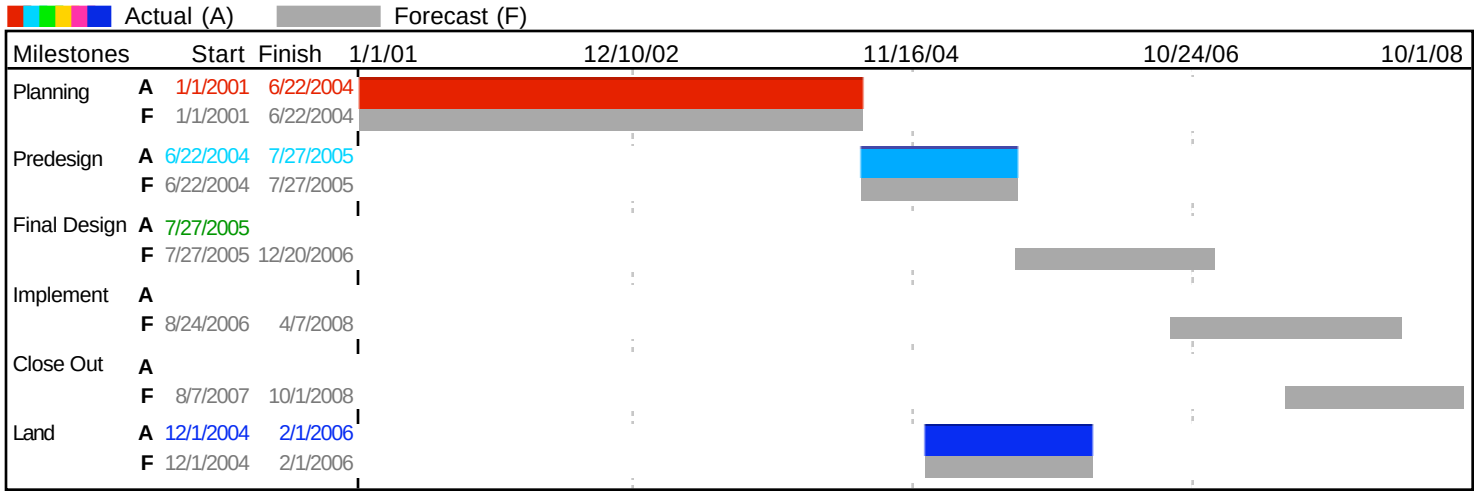
423521 Bellevue Pump Station

Project Description

The Bellevue Pump Staion project will upgrade station capacity and the electrical and control systems. The project also includes a new 5,300-foot-long, 24-inch-diameter pipe from the Bellevue Pump Station directly to the Eastside Interceptor, a large regional pipe near Interstate 405.

King County
Department of
Natural Resources and Parks
Wastewater Treatment Division

Milestone Schedule



Schedule Adjustments n/a

Cost Summary

	Annual Expenditures				2005 Annual Budgeting			Lifetime Expenditures and Budgeting			
Expense	IBIS DEC-05	IBIS YTD DEC-05	Other Comtd	IBIS YTD +Comtd	Annual Budget	%Spent Budget	Annual Planned	IBIS LTD DEC-05	Lifetime Budget	%Budget Spent	Lifetime Planned
CONSTRUCTION	0	0	0	0	0	0.0 %	0	0	17,050,588	0.0 %	13,371,213
Construction Contracts	0	0	0	0	0	%	0	0	17,050,588	%	13,265,092
Other Capital Charges	0	0	0	0	0	%	0	0	0	%	106,121
Outside Agency	0	0	0	0	0	%	0	0	0	%	31,836
Owner Furnished	0	0	0	0	0	%	0	0	0	%	0
NON-CONSTRUCTION	1,148,241	1,655,570	5,408	1,660,978	1,520,230	109. %	2,267,965	2,287,866	5,226,021	43.9 %	4,720,294
Engineering	1,093,501	1,442,450	506	1,442,957	936,631	%	1,675,001	1,786,512	3,484,505	%	2,936,092
Misc. Services	1,701	6,560	0	6,560	0	%	5,917	8,532	1,440	%	28,019
Permitting & Agency	0	526	0	526	51,500	%	150,000	1,162	51,500	%	150,636
Planning & Mgt Svs	25,207	25,207	0	25,207	0	%	0	25,388	0	%	0
Right-of-Way	0	3,000	0	3,000	325,263	%	107,500	5,000	520,692	%	117,225
Staff Labor	27,831	177,827	4,901	182,728	206,836	%	329,547	461,272	1,167,884	%	1,488,322
PROJECT RESERVE	0	0	0	0	49,440	0.0 %	200,000	0	101,684	0.0 %	200,000
Project Reserve	0	0	0	0	49,440	%	200,000	0	101,684	%	200,000
Total $	1,148,241	1,655,570	5,408	1,660,978	1,569,670	105. %	2,467,965	2,287,866	22,378,293	10.2 %	18,323,343

Cost/Budget Adjustments n/a

Contract Status - Bellevue Pump Station 423521

Contract	Original Contract Amount	Phased Amendments	Non-Phased Amendments or Change Orders	Am. or Change Order %	No. of Am. or CO's to Date	Current Contract Amount	Amount Paid	Through Payment No.	% Complete
E23015E Bellevue Engineering	$775,015	$3,614,297	$0	0%	1	$4,389,312	$2,315,449	23	53%
P33005P Management Services	$500,000		$0	0%	0	$500,000	$185,131	14	37%
E23040E A/E Civil/Structural	$500,000		$106,649	21%	1	$606,649	$327,641	29	54%

DECEMBER 2005

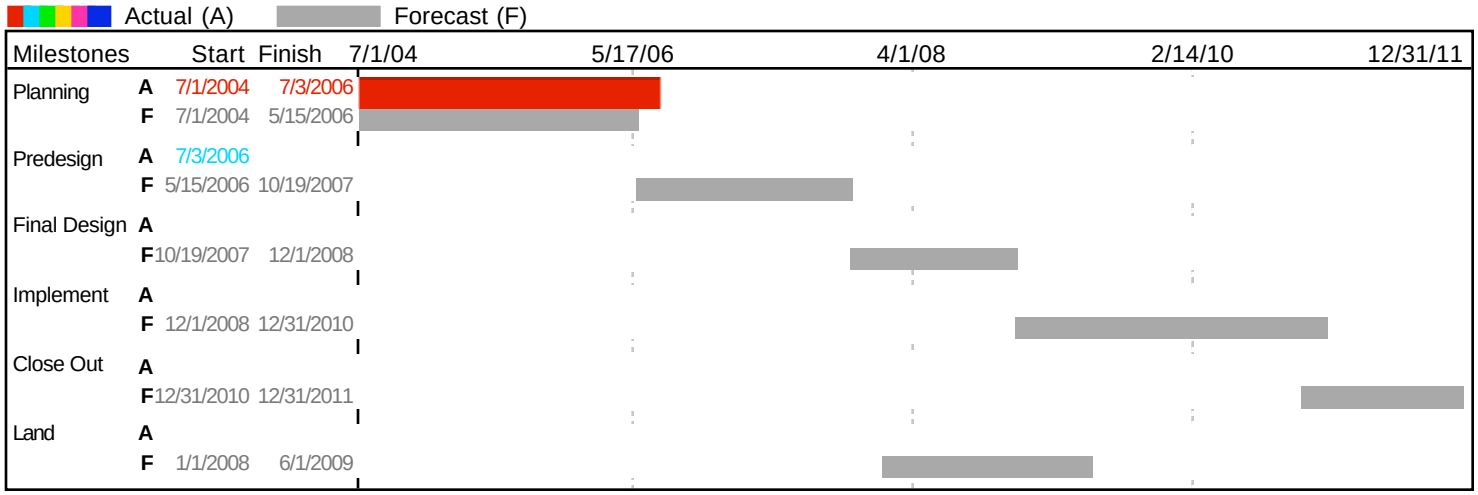
423582 SW Interceptor

Project Description

The Kent/Auburn Conveyance System Improvements project will provide additional capacity needed in Kent, Auburn, and Algona. To meet these needs, the county is looking at constructing approximately 6 miles of new pipe, ranging from 30- to 54-inch-diameter, or constructing a combination of new pipes and storage facilities.

King County
Department of
Natural Resources and Parks
Wastewater Treatment Division

Milestone Schedule



Schedule Adjustments

• Anticipate consultant contract NTP for pre-design in May 2006.

Cost Summary

	Annual Expenditures				2005 Annual Budgeting			Lifetime Expenditures and Budgeting			
Expense	IBIS DEC-05	IBIS YTD DEC-05	Other Comtd	IBIS YTD +Comtd	Annual Budget	%Spent Budget	Annual Planned	IBIS LTD DEC-05	Lifetime Budget	%Budget Spent	Lifetime Planned
CONSTRUCTION	0	0	0	0	0	0.0 %	0	0	27,749,931	0.0 %	28,875,404
Construction Contracts	0	0	0	0	0	%	0	0	27,749,931	%	28,875,404
Other Capital Charges	0	0	0	0	0	%	0	0	0	%	0
Owner Furnished	0	0	0	0	0	%	0	0	0	%	0
NON-CONSTRUCTION	12,624	86,672	680	87,351	1,961,163	4.5 %	693,566	101,727	11,611,598	0.9 %	10,889,660
Engineering	0	0	506	506	1,356,501	%	400,000	0	7,062,591	%	6,949,741
Misc. Services	3,396	5,678	0	5,678	542,098	%	0	6,008	3,813,524	%	626
Permitting & Agency	0	0	0	0	0	%	0	0	331,985	%	200,449
Right-of-Way	0	0	0	0	0	%	0	0	206,463	%	200,449
Staff Labor	9,228	80,994	173	81,167	62,565	%	293,566	95,719	197,036	%	3,538,394
PROJECT RESERVE	0	0	0	0	0	0.0 %	0	0	6,430,365	0.0 %	5,428,910
Project Reserve	0	0	0	0	0	%	0	0	6,430,365	%	5,428,910
Total $	12,624	86,672	680	87,351	1,961,163	4.5 %	693,566	101,727	45,791,894	0.2 %	45,193,974

Cost/Budget Adjustments

None at this time.

Contract Status - Kent/Auburn Conveyance Improvements - 423582

Contract	Original Contract Amount	Phased Amendments	Non-Phased Amendments or Change Orders	Am. or Change Order %	No. of Am. or CO's to Date	Current Contract Amount	Amount Paid	Through Payment No.	% Complete
E53009E Kent Auburn Engineering	$2,686,967		$0	0%	0	$2,686,967	$0		0%

DECEMBER 2005

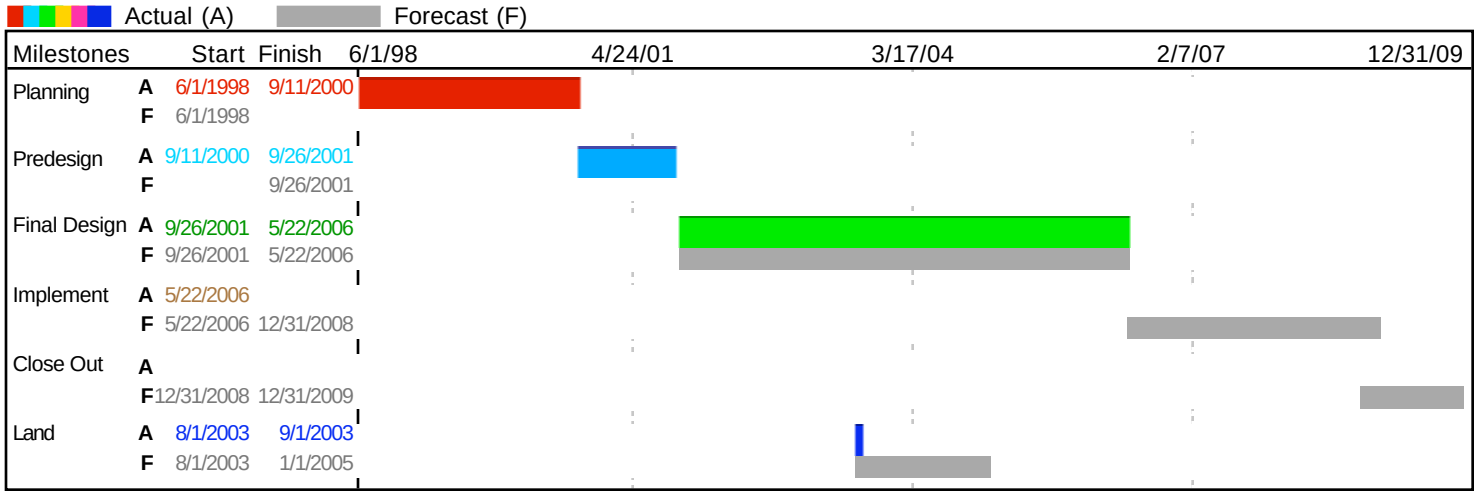
423365 HIDDEN LAKE PS/BOEING CREEK TRUNK

Project Description

The Hidden Lake Pump Station/Boeing Creek Trunk Project will construct a new Hidden Lake pump station, approximately 12,000 feet of new sewer pipeline, and a 500,000 gallon underground storage pipe. The project is located in the City of Shoreline. The pipelines will be constructed by open trenching and mircotunneling. The pump station will be constructed by conventional above ground methods. Construction will start in May 2006 and should be complete by the end of 2008/early 2009.

King County
Department of
Natural Resources and Parks
Wastewater Treatment Division

Milestone Schedule



Schedule Adjustments

none

Cost Summary

	Annual Expenditures				2005 Annual Budgeting			Lifetime Expenditures and Budgeting			
Expense	IBIS DEC-05	IBIS YTD DEC-05	Other Comtd	IBIS YTD +Comtd	Annual Budget	% Spent Budget	Annual Planned	IBIS LTD DEC-05	Lifetime Budget	%Budget Spent	Lifetime Planned
CONSTRUCTION	0	59,212	0	59,212	6,961,304	0.9 %	2,054,780	161,404	13,460,623	1.2 %	25,916,992
Construction Contracts	0	59,212	0	59,212	6,961,304	%	954,780	161,404	13,460,623	%	24,816,992
Other Capital Charges	0	0	0	0	0	%	1,100,000	0	0	%	1,100,000
Owner Furnished	0	0	0	0	0	%	0	0	0	%	0
NON-CONSTRUCTION	178,394	2,487,902	65,459	2,553,361	1,444,044	176. %	1,525,874	6,541,781	7,023,069	94.1 %	8,718,157
Engineering	72,322	785,154	6,234	791,388	594,520		1,124,106	4,057,498	3,957,087	%	6,692,397
Misc. Services	22,418	38,103	-6,542	31,561	10,957	%	15,334	135,854	136,488	%	137,743
Permitting & Agency	0	1,127,134	62,496	1,189,630	48,373	%	20,000	1,160,951	204,603	%	53,816
Planning & Mgt Svs	51,051	71,192	0	71,192	0	%	0	72,398	0	%	0
Right-of-Way	0	143,200	0	143,200	147,143	%	180,000	149,633	204,286	%	331,835
Staff Labor	32,603	323,120	3,271	326,391	643,051	%	186,434	965,448	2,520,606	%	1,502,367
PROJECT RESERVE	0	0	0	0	0	0.0 %	0	0	4,036,154	0.0 %	0
Project Reserve	0	0	0	0	0	%	0	0	4,036,154	%	0
Total $	178,394	2,547,114	65,459	2,612,573	8,405,348	31.1 %	3,580,654	6,703,185	24,519,846	27.3 %	34,635,150

Cost/Budget Adjustments

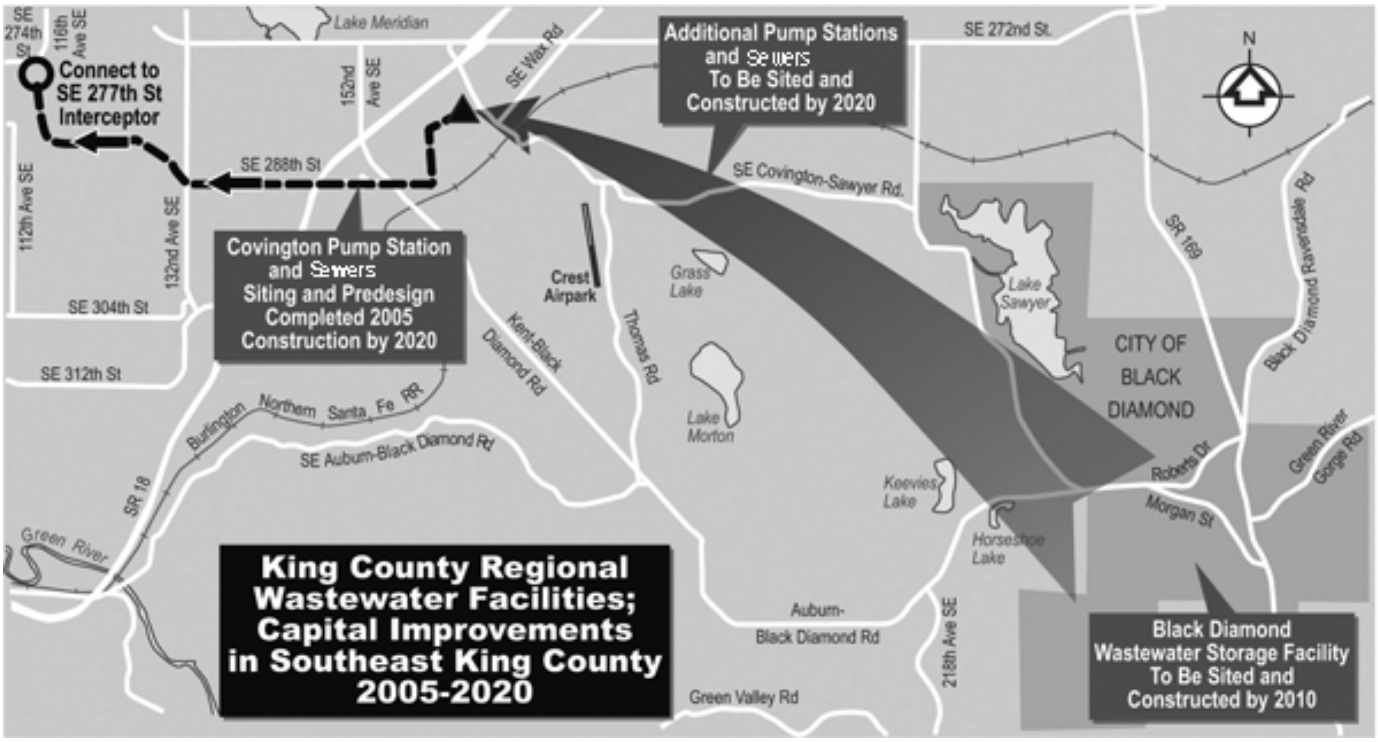
n/a

Contract Status - Hidden Lake PS/Boeing Creek Trunk - 423365

Contract	Original Contract Amount	Phased Amendments	Non-Phased Amendments or Change Orders	Am. or Change Order %	No. of Am. or CO's to Date	Current Contract Amount	Amount Paid	Through Payment No.	% Complete
C53108C Hidden Lake Construction	$20,929,000		$0	0%	0	$20,929,000	$0		0%
E03036E Hidden Lake Engineering	$2,699,191	$2,381,297	$0	0%	1	$5,080,488	$4,044,747	48	80%
P43017P Hidden Lake Construction Mgt	$1,500,071		$0	0%	0	$1,500,071	$0		0%
MOA3415 Hidden Lake Mitigation	$1,100,000		$0	0%	0	$1,100,000	$0		0%

DECEMBER 2005

423583 Soos Creek Pump Station D and Pipeline D



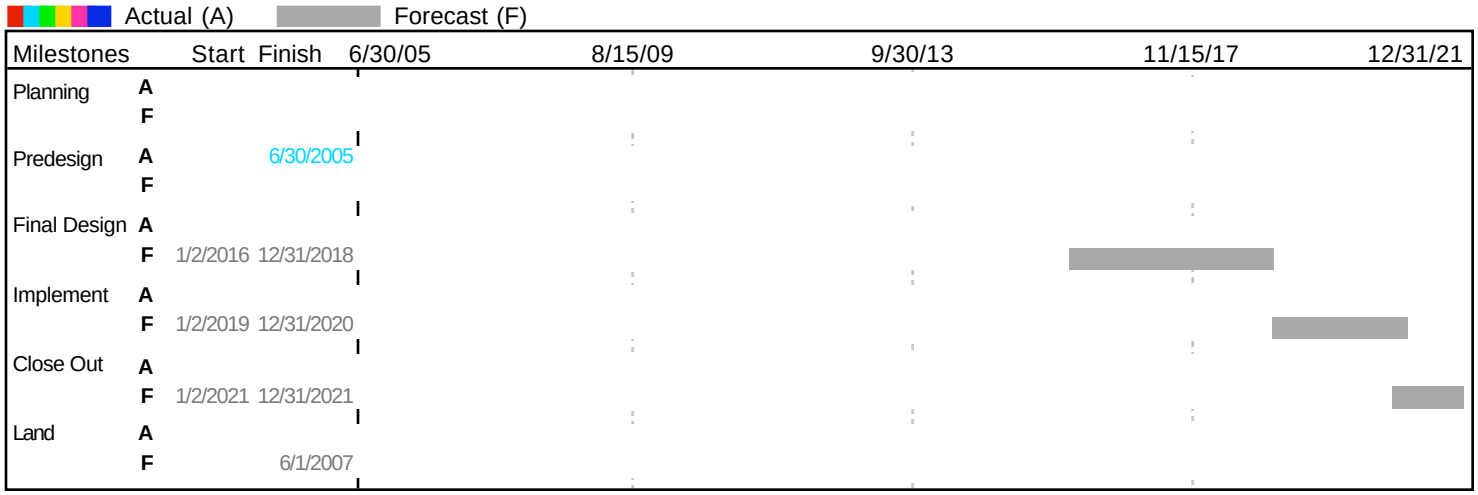
Project Description

In 2002, King County signed an agreement with the Soos Creek Water and Sewer District, committing to build and operate three pump stations and 10 miles of sewer to meet the long-term needs of this rapidly growing area. A preferred location for Pump Station D (now called the Covington Pump Station) was identified. When the estimated cost of the Covington Pump Station and pipeline turned out to be significantly higher than anticipated, alternative options were explored. This analysis determined that the most critical short-term capacity need is in Black Diamond. The revised plan will address that need by constructing a wastewater storage facility in Black Diamond by 2010 and delay the start of design for the Covington Pump Station and pipeline until 2015.

King County

Department of
Natural Resources and Parks
Wastewater Treatment Division

Milestone Schedule



Schedule Adjustments

none

Cost Summary

	Annual Expenditures				2005 Annual Budgeting			Lifetime Expenditures and Budgeting			
Expense	IBIS DEC-05	IBIS YTD DEC-05	Other Comtd	IBIS YTD +Comtd	Annual Budget	%Spent Budget	Annual Planned	IBIS LTD DEC-05	Lifetime Budget	%Budget Spent	Lifetime Planned
CONSTRUCTION	0	0	0	0	0	0.0 %	0	0	27,239,508	0.0 %	29,142,920
Construction Contracts	0	0	0	0	0	%	0	0	27,239,508	%	27,307,420
Other Capital Charges	0	0	0	0	0	%	0	0	0	%	1,724,588
Outside Agency	0	0	0	0	0	%	0	0	0	%	110,912
Owner Furnished	0	0	0	0	0	%	0	0	0	%	0
NON-CONSTRUCTION	46,732	927,476	1,482	928,959	1,525,519	60.9 %	1,259,464	1,542,293	8,759,897	17.6 %	8,469,822
Engineering	38,707	800,286	506	800,793	440,611	%	1,086,214	1,290,722	5,517,086	%	5,387,815
Misc. Services	1,647	9,624	615	10,239	40,452	%	24,000	15,794	170,234	%	133,809
Permitting & Agency	0	7,623	0	7,623	241,461	%	0	7,623	331,649	%	417,407
Planning & Mgt Svs	0	1,929	0	1,929	0	%	0	1,929	0	%	0
Right-of-Way	0	300	0	300	253,137	%	0	300	393,573	%	1,039,270
Staff Labor	6,378	107,715	361	108,075	549,858	%	149,250	225,925	2,347,354	%	1,491,520
PROJECT RESERVE	0	0	0	0	0	0.0 %	0	0	5,064,991	0.0 %	5,241,416
Project Reserve	0	0	0	0	0	%	0	0	5,064,991	%	5,241,416
Total $	46,732	927,476	1,482	928,959	1,525,519	60.9 %	1,259,464	1,542,293	41,064,396	3.8 %	42,854,158

Cost/Budget Adjustments

none

Contract Status - Soos Creek Pump Station D and Pipeline D - 423583

Contract	Original Contract Amount	Phased Amendments	Non-Phased Amendments or Change Orders	Am. or Change Order %	No. of Am. or CO's to Date	Current Contract Amount	Amount Paid	Through Payment No.	% Complete
E23033E Soos Creek Engineering	$1,810,263		$0	0%	0	$1,810,263	$1,376,889	30	76%

DECEMBER 2005

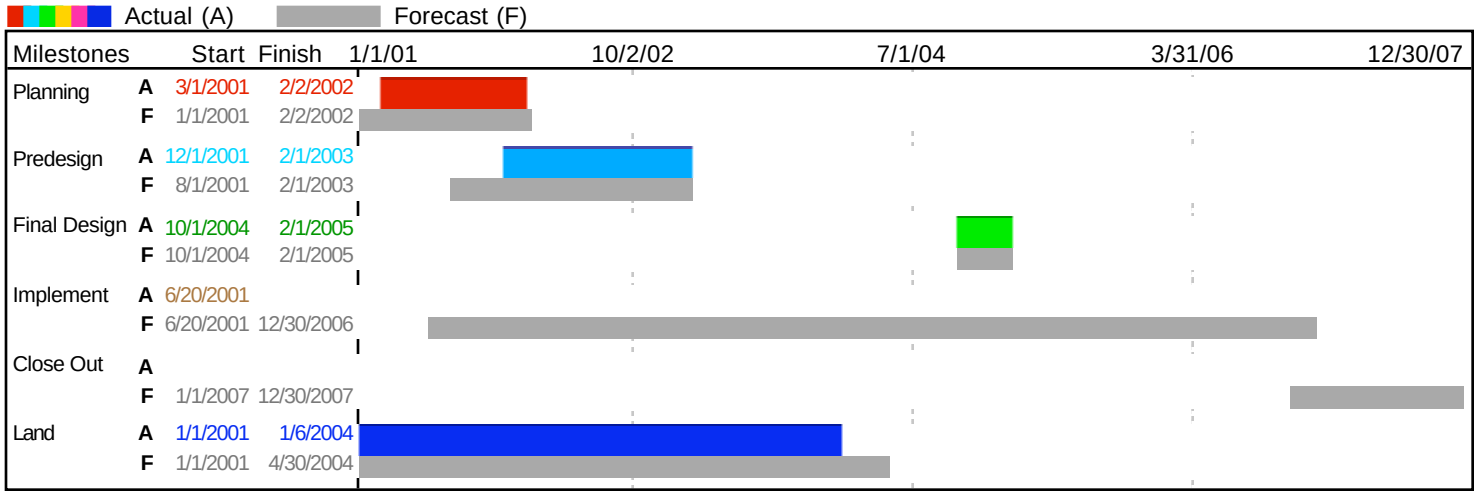
423494 Fairwood Interceptor (formerly Madsen Creek)

Project Description

Wastewater flows from the Fairwood community through a pipeline in the Madsen Creek ravine. The pipeline is unstable and located in a sensitive area prone to landslides and erosion. The project will redirect flow to the new Fairwood Interceptor and upsize existing Cedar River Water and Sewer District pipelines.

King County
Department of
Natural Resources and Parks
Wastewater Treatment Division

Milestone Schedule



Schedule Adjustments

N/A

Cost Summary

	Annual Expenditures				2005 Annual Budgeting			Lifetime Expenditures and Budgeting			
Expense	IBIS DEC-05	IBIS YTD DEC-05	Other Comtd	IBIS YTD +Comtd	Annual Budget	% Spent Budget	Annual Planned	IBIS LTD DEC-05	Lifetime Budget	%Budget Spent	Lifetime Planned
CONSTRUCTION	915,149	3,403,158	354,688	3,757,846	4,163,608	90.3 %	2,903,130	11,461,120	16,542,815	71.4 %	17,487,923
Construction Contracts	915,149	3,403,158	354,688	3,757,846	4,163,608	%	2,902,943	11,460,994	16,542,815	%	17,487,544
Other Capital Charges	0	0	0	0	0	%	187	126	0	%	380
Owner Furnished	0	0	0	0	0	%	0	0	0	%	0
NON-CONSTRUCTION	100,718	499,149	14,603	513,751	808,578	63.5 %	688,233	3,544,445	4,734,234	75.2 %	4,122,576
Engineering	54,040	96,659	3,635	100,294	355,000	%	194,713	2,101,770	2,665,034	%	2,343,981
Misc. Services	7,597	19,426	76	19,502	59,450	%	59,253	41,214	203,585	%	148,254
Permitting & Agency	217	65,383	0	65,383	168,850	%	163,932	334,637	624,189	%	433,186
Planning & Mgt Svs	229	864	809	1,674	0	%	0	16,248	0	%	0
Right-of-Way	0	32,952	0	32,952	12,631	%	63,000	198,182	201,388	%	235,440
Staff Labor	38,634	283,865	10,082	293,947	212,647	%	207,335	852,394	1,040,039	%	961,714
PROJECT RESERVE	0	0	0	0	0	0.0 %	0	0	1,092,727	0.0 %	0
Project Reserve	0	0	0	0	0	%	0	0	1,092,727	%	0
Total $	1,015,867	3,902,307	369,291	4,271,597	4,972,187	85.9 %	3,591,363	15,005,564	22,369,776	67.1 %	21,610,499

Cost/Budget Adjustments

• Approximately $1 million was deleted from overall project contingency in early 2006 as construction was proceeding apace and bid came in low.
• Some unspent budget for engineering will be transferred to construction contingency to pay for change orders, including additional road and sidewalk restoration that was originally unanticipated. Overall change order rate is very low to date.
• No overall increase to budget is anticipated at this time, and no change to overall yearly cash flow estimates.

Contract Status - Fairwood Interceptor - 423494

Contract	Original Contract Amount	Phased Amendments	Non-Phased Amendments or Change Orders	Am. or Change Order %	No. of Am. or CO's to Date	Current Contract Amount	Amount Paid	Through Payment No.	% Complete
C53002C Fairwood Phase 2B	$7,699,750		$1,051	0%	1	$7,700,801	$6,056,332	11	79%
E03002E Fairwood Design	$385,376	$2,058,746	$189,325	8%	2	$2,633,447	$2,097,188	65	80%

DECEMBER 2005

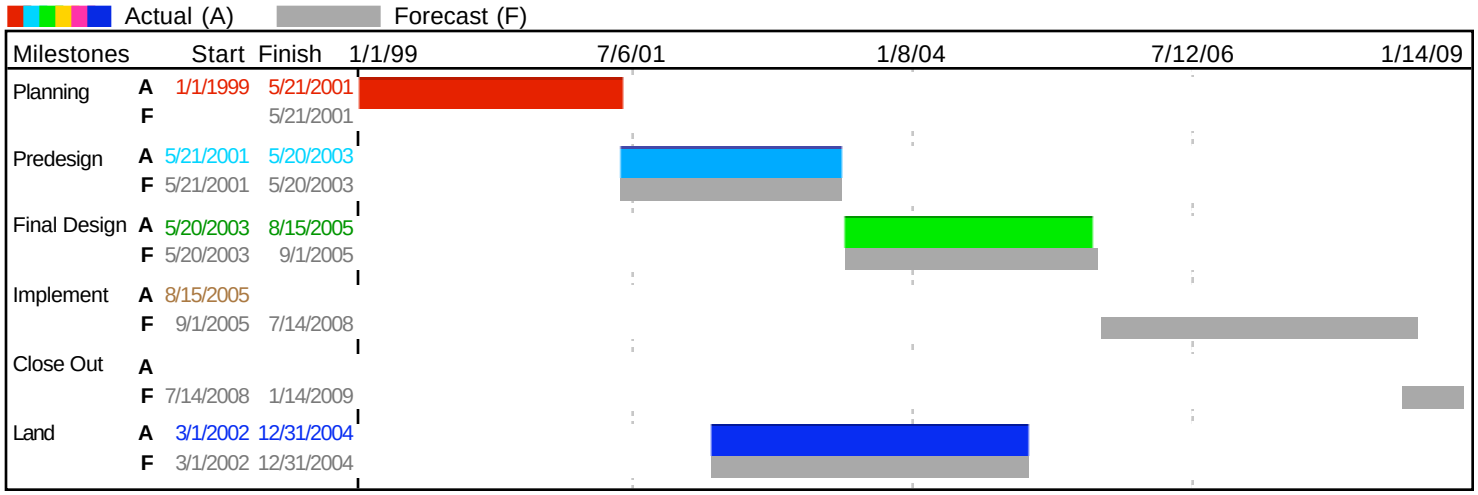
423406 JUANITA BAY PS - MODIFICATIONS

Project Description

This project will construct a 30.6 million gallon per day wastewater pump station to increase the capacity of and replace an aging pump station. The existing and future pump stations are located at the intersection of NE Juanita Drive and 93rd Ave NE in Kirkland. The station will include four pairs of two-stage pumps, odor control and chemical addition systems for odor and corrosion prevention, equipment lifting devices, equipment sound attenuation, and a standby generator. A large portion of the facility will be in an underground 86-foot diameter, 50-foot deep circular structure. The underground structure will be constructed with 4-foot diameter reinforced concrete secant (interlocking) piles.

King County
Department of
Natural Resources and Parks
Wastewater Treatment Division

Milestone Schedule



Schedule Adjustments

• Design completion was delayed in 2005 when additional construction permit comments and conditions were received from the permitting agency. Permit comments and conditions were incorporated into the final design, and the pump station construction contract was bid in April 2005.

Cost Summary

	Annual Expenditures				2005 Annual Budgeting			Lifetime Expenditures and Budgeting			
Expense	IBIS DEC-05	IBIS YTD DEC-05	Other Comtd	IBIS YTD +Comtd	Annual Budget	% Spent Budget	Annual Planned	IBIS LTD DEC-05	Lifetime Budget	%Budget Spent	Lifetime Planned
CONSTRUCTION	1,604,800	1,604,800	0	1,604,800	5,314,800	30.2 %	2,928,360	1,620,546	19,693,686	8.2 %	24,180,757
Construction Contracts	1,604,800	1,604,800	0	1,604,800	5,314,800	%	2,862,360	1,620,546	19,693,686	%	23,942,637
Other Capital Charges	0	0	0	0	0	%	66,000	0	0	%	238,119
Owner Furnished	0	0	0	0	0	%	0	0	0	%	0
NON-CONSTRUCTION	392,816	908,418	23,056	931,474	1,946,883	47.8 %	1,025,818	8,612,366	14,028,930	61.6 %	11,586,159
Engineering	287,856	330,559	0	330,559	1,415,502	%	558,963	5,495,839	9,699,744	%	6,911,320
Misc. Services	34,103	56,213	1,379	57,592	474,511	%	0	76,255	1,933,602	%	27,131
Permitting & Agency	0	38,905	0	38,905	0	%	27,022	51,286	81,267	%	202,435
Planning & Mgt Svs	2,461	20,543	1,805	22,348	0	%	0	70,804	0	%	0
Right-of-Way	0	25,873	0	25,873	3,015	%	500	1,541,751	1,510,402	%	1,516,377
Staff Labor	68,396	436,326	19,871	456,197	53,854	%	439,333	1,376,430	803,915	%	2,928,896
PROJECT RESERVE	0	0	0	0	448,722	0.0 %	0	0	1,967,800	0.0 %	0
Project Reserve	0	0	0	0	448,722	%	0	0	1,967,800	%	0
Total $	1,997,616	2,513,218	23,056	2,536,274	7,710,404	32.9 %	3,954,178	10,232,911	35,690,415	28.7 %	35,766,916

Cost/Budget Adjustments

The construction cashflow during the early phase of construction is lower due to slower-than-expected construction progress.

Contract Status - Juanita Bay PS - 423406

Contract	Original Contract Amount	Phased Amendments	Non-Phased Amendments or Change Orders	Am. or Change Order %	No. of Am. or CO's to Date	Current Contract Amount	Amount Paid	Through Payment No.	% Complete
C43085C Juanita Construction	$18,988,000		$28,957	0%	2	$19,016,957	$4,121,404	6	22%
E03037E Juanita Engineering	$1,849,354	$4,725,799	$0	0%	1	$6,575,153	$5,926,936	61	90%

DECEMBER 2005

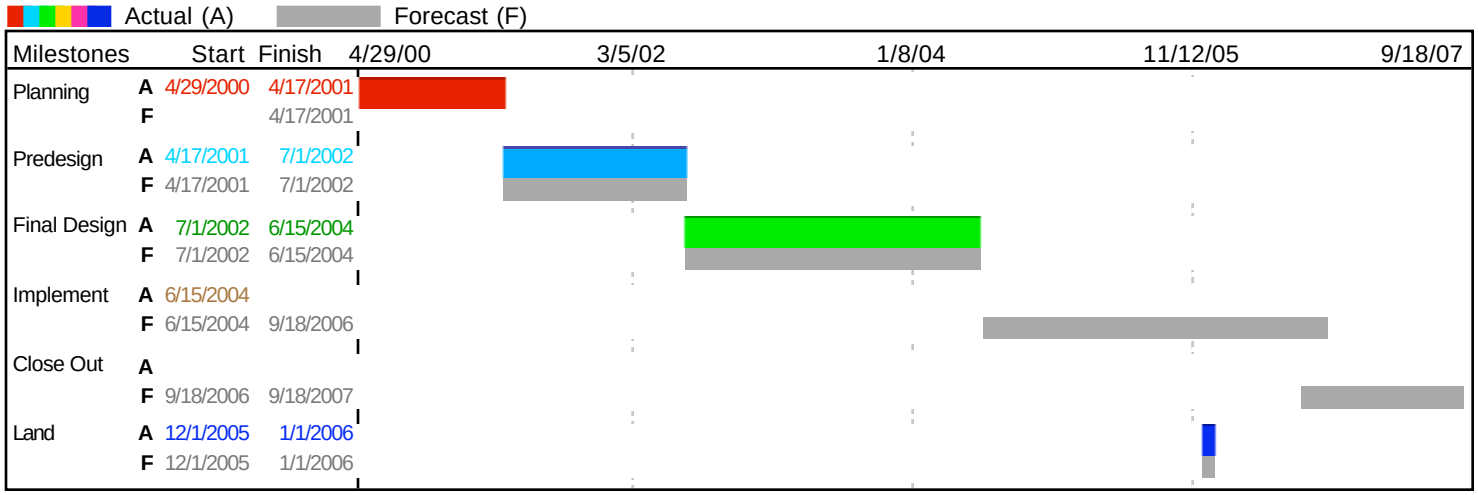
423518 Pacific Pump Station

Project Description

The existing 1.6-mgd Pacific Pump Station has insufficient capacity to convey existing and projected future peak flows. To meet flow demands through 2030, a new 3.3-mgd pump station will be constructed in an industrial zone site two blocks west of the existing station.

King County
Department of
Natural Resources and Parks
Wastewater Treatment Division

Milestone Schedule



Schedule Adjustments

No change.

Cost Summary

	Annual Expenditures				2005 Annual Budgeting			Lifetime Expenditures and Budgeting			
Expense	IBIS DEC-05	IBIS YTD DEC-05	Other Comtd	IBIS YTD +Comtd	Annual Budget	%Spent Budget	Annual Planned	IBIS LTD DEC-05	Lifetime Budget	%Budget Spent	Lifetime Planned
CONSTRUCTION	652,633	2,539,808	-7,560	2,532,248	1,599,086	158.4 %	1,732,001	2,663,584	4,175,623	63.6 %	4,376,672
Construction Contracts	652,633	2,538,713	-7,560	2,531,153	1,599,086	%	1,732,001	2,662,284	4,175,623	%	4,376,466
Other Capital Charges	0	1,094	0	1,094	0	%	0	1,300	0	%	206
Owner Furnished	0	0	0	0	0	%	0	0	0	%	0
NON-CONSTRUCTION	102,512	520,664	9,709	530,373	447,344	118.6 %	437,251	2,347,956	2,900,655	81.3 %	2,723,095
Engineering	62,874	161,884	0	161,884	268,696	%	200,832	1,513,765	1,998,313	%	1,795,112
Misc. Services	2,366	7,344	42	7,386	23,898	%	23,201	23,355	50,805	%	40,002
Permitting & Agency	3,671	25,870	73	25,943	0	%	0	50,362	34,099	%	24,492
Planning & Mgt Svs	1,656	16,307	2,812	19,119	0	%	0	17,707	0	%	0
Right-of-Way	0	600	0	600	0	%	0	9,900	30,000	%	9,300
Staff Labor	31,945	308,660	6,782	315,442	154,751	%	213,217	732,868	787,438	%	854,189
PROJECT RESERVE	0	0	0	0	0	0.0 %	0	0	729,934	0.0 %	708,674
Project Reserve	0	0	0	0	0	%	0	0	729,934	%	708,674
Total $	755,145	3,060,472	2,149	3,062,621	2,046,430	149.7 %	2,169,252	5,011,540	7,806,212	64.2 %	7,808,441

Cost/Budget Adjustments

No change.

Contract Status - Pacific Pump Station - 423518

Contract	Original Contract Amount	Phased Amendments	Non-Phased Amendments or Change Orders	Am. or Change Order %	No. of Am. or CO's to Date	Current Contract Amount	Amount Paid	Through Payment No.	% Complete
C33096C Pacific Pump Construction	$3,792,143		$519,710	14%	6	$4,311,853	$3,336,113	19	77%
E03006E Pacific Pump Engineering	$1,351,537		$373,756	28%	1	$1,725,293	$1,565,449	61	91%

DECEMBER 2005

423297 RWSP Local System I/I Control

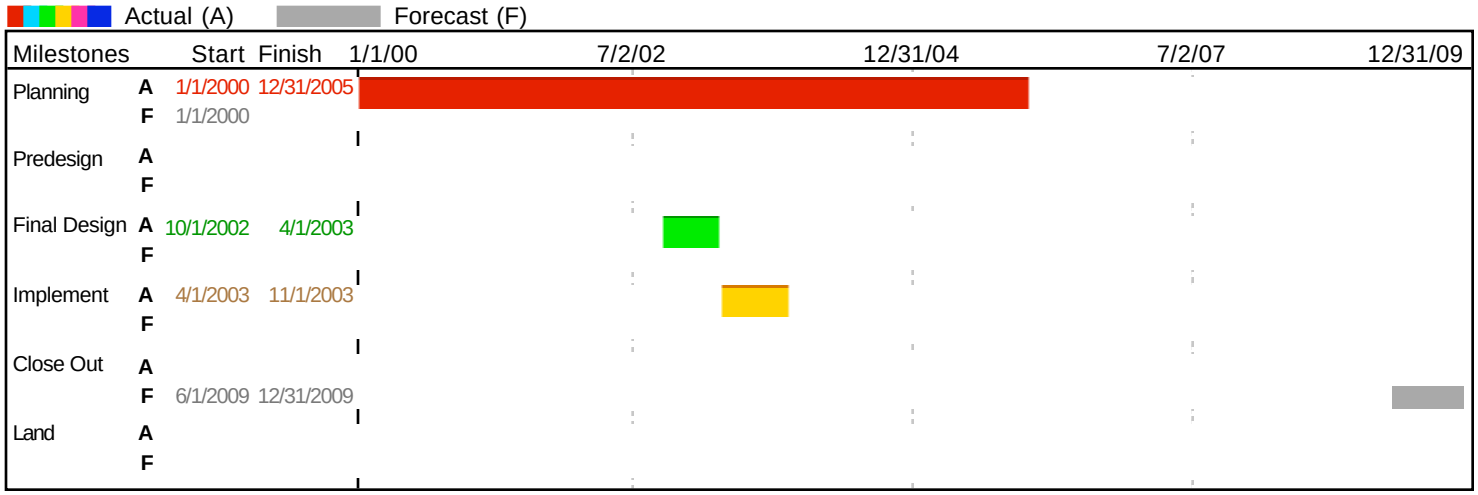
Project Description

The Inflow/Infiltraton (I/I) Control Program is designed to reduce I/I that flows into the County's wastewater conveyance and treatment system from local component agency sewers. This program, based on a cooperative partnership between King County and its 34 local component agencies is designed to:

- meter and identify I/I sources in local sewer systems
- conduct pilot I/I rehabilitation projects in order to identify cost effective I/I removal techniques
- regionally evaluate control solutions and their benefit
- design a long-term enforceable control program to reduce I/I coming from local sewer systems.

King County
Department of
Natural Resources and Parks
Wastewater Treatment Division

Milestone Schedule



Schedule Adjustments

None

Cost Summary

	Annual Expenditures				2005 Annual Budgeting			Lifetime Expenditures and Budgeting			
Expense	IBIS DEC-05	IBIS YTD DEC-05	Other Comtd	IBIS YTD +Comtd	Annual Budget	%Spent Budget	Annual Planned	IBIS LTD DEC-05	Lifetime Budget	%Budget Spent	Lifetime Planned
CONSTRUCTION	0	2,720	0	2,720	0	0.0 %	0	5,455,025	5,420,430	100. %	5,452,305
Construction Contracts	0	2,720	0	2,720	0	%	0	5,419,822	5,417,425	%	5,417,102
Other Capital Charges	0	0	0	0	0	%	0	9,131	0	%	9,131
Owner Furnished	0	0	0	0	0	%	0	26,073	3,005	%	26,073
NON-CONSTRUCTION	299,905	1,996,919	7,290	2,004,209	3,053,950	65.6 %	4,214,600	32,599,711	39,555,898	82.4 %	39,634,207
Engineering	219,037	1,374,249	0	1,374,249	2,163,000	%	3,000,000	25,116,285	29,203,220	%	28,571,309
Misc. Services	11,594	52,021	197	52,218	67,980	%	27,600	590,919	929,565	%	736,678
Permitting & Agency	0	0	0	0	0	%	0	1,865,036	1,865,036	%	1,865,036
Planning & Mgt Svs	0	0	0	0	0	%	0	45,533	0	%	0
Right-of-Way	0	0	0	0	0	%	0	0	0	%	0
Staff Labor	69,274	570,648	7,094	577,742	822,970	%	1,187,000	4,981,938	7,558,077	%	8,461,184
PROJECT RESERVE	0	0	0	0	0	0.0 %	0	0	0	0.0 %	0
Project Reserve	0	0	0	0	0	%	0	0	0	%	0
Total $	299,905	1,999,639	7,290	2,006,929	3,053,950	65.7 %	4,214,600	38,054,736	44,976,328	84.6 %	45,086,512

Cost/Budget Adjustments

None

Contract Status - RWSP Local System I/I Control - 423297

Contract	Original Contract Amount	Phased Amendments	Non-Phased Amendments or Change Orders	Am. or Change Order %	No. of Am. or CO's to Date	Current Contract Amount	Amount Paid	Through Payment No.	% Complete
E93051E Regional Inflow Engineering	$19,410,131		$8,445,941	44%	4	$27,856,072	$24,747,312	71	89%

DECEMBER 2005

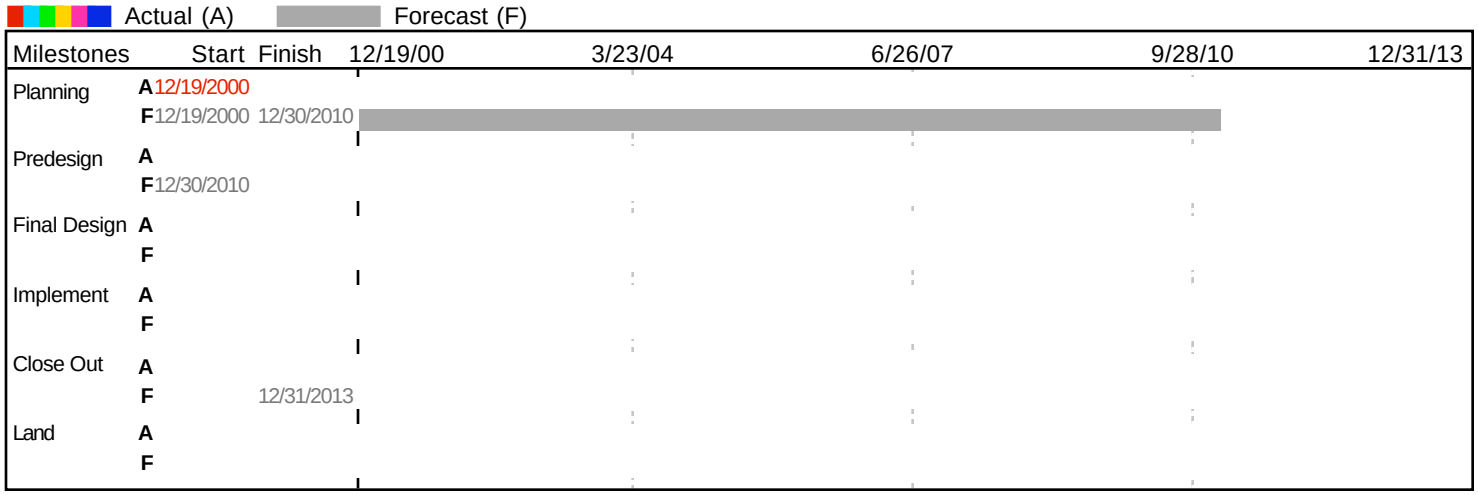
423368 Sediment Managment Plan

Project Description

The Sediment Management Program addresses sediment contamination cleanups required under federal CERCLA and state MTCA regulations. The SMP objectives are to repair potential environmental damage in a timely, efficient and economical process, to prevent harm to public health, and to limit future liability.

King County
Department of
Natural Resources and Parks
Wastewater Treatment Division

Milestone Schedule



Schedule Adjustments

• Portion of construction costs for start of Denny will be delayed into the 2007-8 dredging window as Ecology has not assigned a site manager.
• Portion of construction costs are for a share of Hanford/Landor costs that the Port of Seattle incurred during a navigation dredging in 2004-5. MOA signed with the Port and Seattle will likely move allocation process into 2007 so no construction money will be dispersed until at least 2007.

Cost Summary

	Annual Expenditures				2005 Annual Budgeting			Lifetime Expenditures and Budgeting			
Expense	IBIS DEC-05	IBIS YTD DEC-05	Other Comtd	IBIS YTD +Comtd	Annual Budget	%Spent Budget	Annual Planned	IBIS LTD DEC-05	Lifetime Budget	%Budget Spent	Lifetime Planned
CONSTRUCTION	0	0	0	0	553,242	0.0 %	0	5,412	28,214,787	0.0 %	27,772,951
Construction Contracts	0	0	0	0	553,242	%	0	0	28,209,376	%	27,767,539
Other Capital Charges	0	0	0	0	0	%	0	0	0	%	0
Owner Furnished	0	0	0	0	0	%	0	5,412	5,412	%	5,412
NON-CONSTRUCTION	210,854	688,743	5,404	694,146	1,326,029	52.3 %	1,845,846	5,218,226	11,411,875	45.8 %	12,048,394
Engineering	170,624	268,902	0	268,902	647,094	%	1,107,000	1,195,496	5,371,015	%	4,463,656
Misc. Services	4,629	87,001	0	87,001	678,935	%	287,000	1,589,602	4,916,322	%	2,080,329
Permitting & Agency	0	0	0	0	0	%	50,000	96,034	96,034	%	419,455
Planning & Mgt Svs	0	13,640	0	13,640	0	%	0	360,702	0	%	0
Right-of-Way	0	0	0	0	0	%	0	0	0	%	0
Staff Labor	35,600	319,199	5,404	324,603	0	%	401,846	1,976,392	1,028,504	%	5,084,954
PROJECT RESERVE	0	0	0	0	0	0.0 %	0	0	0	0.0 %	0
Project Reserve	0	0	0	0	0	%	0	0	0	%	0
Total $	210,854	688,743	5,404	694,146	1,879,271	36.9 %	1,845,846	5,223,638	39,626,662	13.2 %	39,821,345

Cost/Budget Adjustments

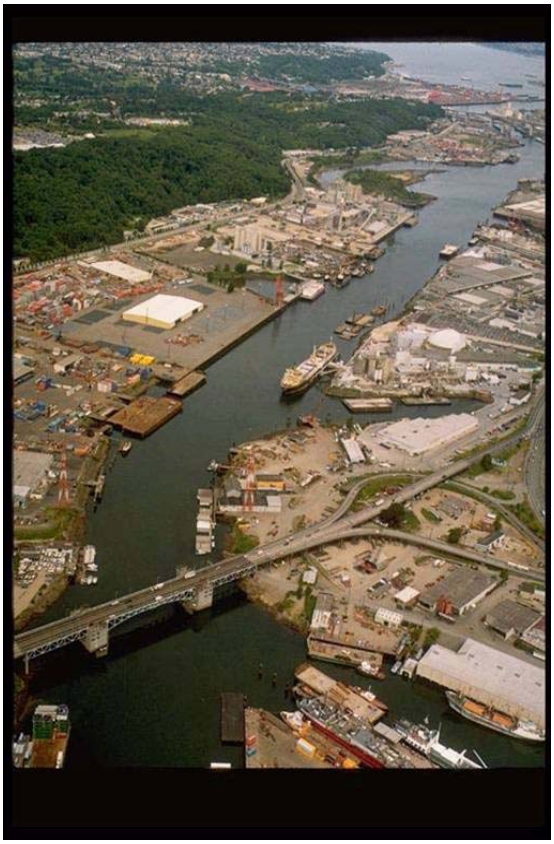
• Construction costs projected in 2006 are delayed into 2007 for Denny
• Construction costs for Hanford/Lander are delayed into future years due to negotiations with Port of Seattle and City of Seattle to conduct joint work on East Waterway. Allocation process will determine cost shares and timing of payments.

Contract Status - Sediment Management Plan - 423368

Contract	Original Contract Amount	Phased Amendments	Non-Phased Amendments or Change Orders	Am. or Change Order %	No. of Am. or CO's to Date	Current Contract Amount	Amount Paid	Through Payment No.	% Complete
P23009P Sediment Management	$526,052		$0	0%	0	$526,052	$312,279	38	59%
P39020P Phase 2 Discharge Modeling	$266,664		$0	0%	0	$266,664	$212,729	6	80%
P03014P Discharge Modeling	$53,692		$10,136	19%	1	$63,828	$63,383	12	99%

DECEMBER 2005

423589 Lower Duwamish Waterway Superfund

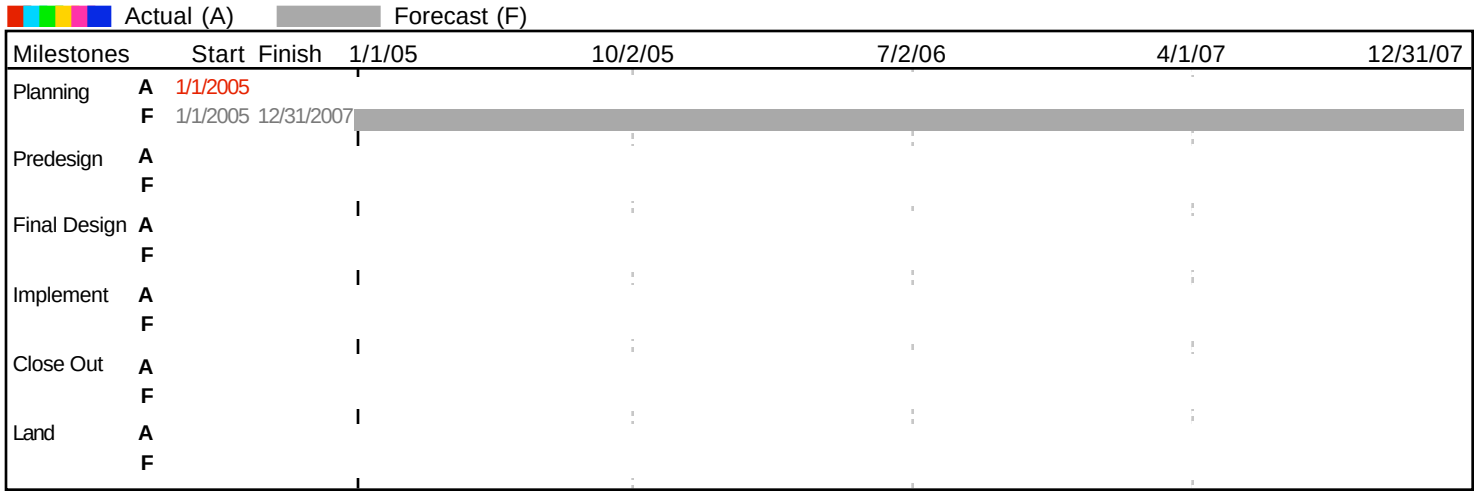


Project Description

The project implements the County's shared responsibilities under a signed Administrative Order on Consent (AOC) to conduct a remedial investigation/feasibility study for the Lower Duwamish Waterway Superfund Site and pay for EPA and Ecology oversight costs.

King County
Department of
Natural Resources and Parks
Wastewater Treatment Division

Milestone Schedule



Schedule Adjustments

none

Cost Summary

	Annual Expenditures				2005 Annual Budgeting			Lifetime Expenditures and Budgeting			
Expense	IBIS DEC-05	IBIS YTD DEC-05	Other Comtd	IBIS YTD +Comtd	Annual Budget	%Spent Budget	Annual Planned	IBIS LTD DEC-05	Lifetime Budget	%Budget Spent	Lifetime Planned
CONSTRUCTION	0	0	0	0	0	0.0 %	0	0	0	0.0 %	0
Construction Contracts	0	0	0	0	0	%	0	0	0	%	0
Other Capital Charges	0	0	0	0	0	%	0	0	0	%	0
Owner Furnished	0	0	0	0	0	%	0	0	0	%	0
NON-CONSTRUCTION	347,211	1,548,981	23,200	1,572,181	1,445,060	108. %	1,977,495	1,548,981	3,845,217	40.0%	4,980,416
Engineering	797	11,315	0	11,315	803,885	8 %	1,252,585	11,315	1,748,949	%	3,006,824
Misc. Services	218,436	1,070,515	12	1,070,527	293,550	%	285,000	1,070,515	66,625	%	682,953
Permitting & Agency	0	0	0	0	0	%	0	0	0	%	0
Planning & Mgt Svs	988	988	7,004	7,991	0	%	0	988	0	%	0
Right-of-Way	0	0	0	0	0	%	0	0	0	%	0
Staff Labor	126,991	466,164	16,185	482,348	347,625	%	439,910	466,164	2,029,644	%	1,290,638
PROJECT RESERVE	0	0	0	0	0	0.0 %	0	0	0	0.0 %	0
Project Reserve	0	0	0	0	0	%	0	0	0	%	0
Total $	347,211	1,548,981	23,200	1,572,181	1,445,060	108. %	1,977,495	1,548,981	3,845,217	73.9 %	4,980,416

8

Cost/Budget Adjustments

Total Project costs are projected to increase to $5.7 million due to increased effort for all sampling conducted to date and expected increased costs in developing and gaining EPA approval of final deliverables.

DECEMBER 2005

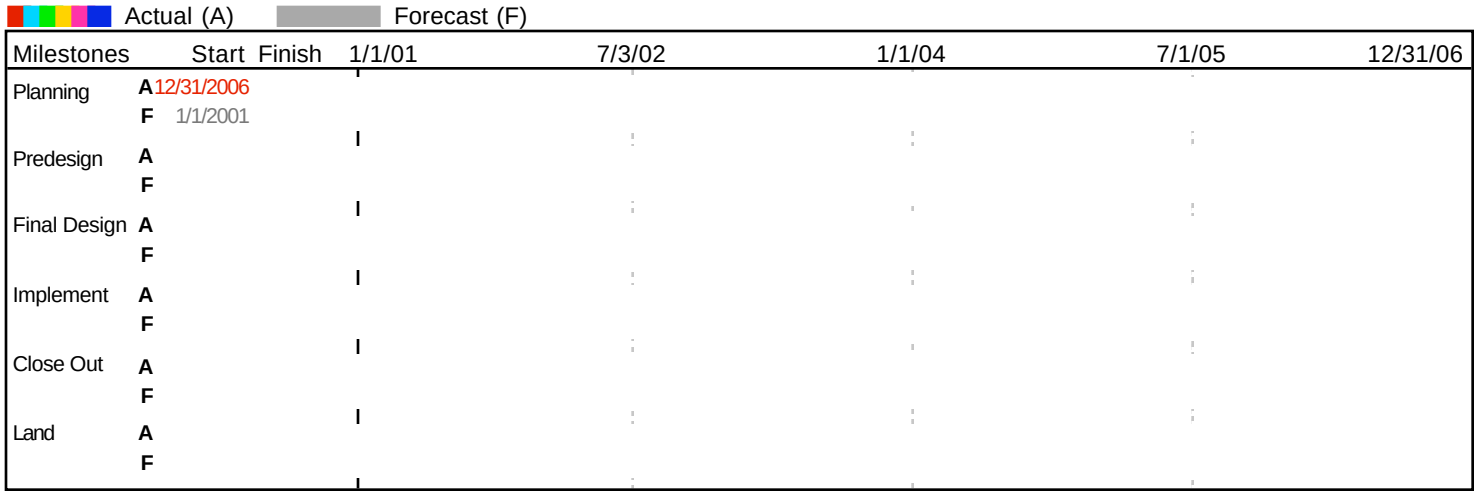
423523 RWSP Water/Wastewater Conservation Program

Project Description

Water conservation is a critical component of holistic water resource management. This project has allowed staff to work cooperatively with regional water purveyors, to implement model projects that demonstrate how water conservation can save water and money and provide a variety of public education tools on water conservation.

King County
Department of
Natural Resources and Parks
Wastewater Treatment Division

Milestone Schedule



Schedule Adjustments

Due to a reorganization at Facilities Maintenance and plumbers being taken from this job to higher internal priority jobs in 2005, the project is extended for one year to complete the work begun in 2005 by the end of 2006.

Cost Summary

	Annual Expenditures				2005 Annual Budgeting			Lifetime Expenditures and Budgeting			
Expense	IBIS DEC-05	IBIS YTD DEC-05	Other Comtd	IBIS YTD +Comtd	Annual Budget	%Spent Budget	Annual Planned	IBIS LTD DEC-05	Lifetime Budget	%Budget Spent	Lifetime Planned
CONSTRUCTION	0	-482	0	-482	0	0.0 %	0	60,386	20,562	293. %	20,562
Construction Contracts	0	0	0	0	0	%	0	0	0	%	0
Other Capital Charges	0	0	0	0	0	%	0	0	0	%	0
Owner Furnished	0	-482	0	-482	0	%	0	60,386	20,562	%	20,562
NON-CONSTRUCTION	2,968	111,578	32	111,610	313,635	35.6 %	313,635	1,102,106	1,433,569	76.9 %	1,433,569
Engineering	0	0	0	0	0	%	0	0	231,132	%	231,132
Misc. Services	455	97,173	0	97,173	313,635	%	313,635	544,291	1,341,618	%	1,341,618
Permitting & Agency	0	0	0	0	0	%	0	0	0	%	0
Planning & Mgt Svs	0	0	0	0	0	%	0	231,132	0	%	0
Right-of-Way	0	0	0	0	0	%	0	0	0	%	0
Staff Labor	2,514	14,405	32	14,437	0	%	0	326,683	-139,182	%	-139,182
PROJECT RESERVE	0	0	0	0	0	0.0 %	0	0	0	0.0 %	0
Project Reserve	0	0	0	0	0	%	0	0	0	%	0
Total $	2,968	111,096	32	111,128	313,635	35.4 %	313,635	1,162,492	1,454,131	79.9 %	1,454,131

Cost/Budget Adjustments

Although there are no changes in the allocated funds for this project, the project was extended for one year to spend the remainder of 2005 funding because several projects begun in 2005 were not finished. (For the health facilities retrofits, Facilities Management labor were reassigned to other higher priority projects for that department, these efforts were shifted into 2006. For the King County WTD building audits, the jail project took more time than planned and audits and implementation of retrofits shifted into 2006.)

Appendix D

The Health of Our Waters, Water Quality Monitoring Results for 2005

Appendix D

The Health of Our Waters, Water Quality Monitoring Results for 2005

Contents

This appendix presents a summary of the quality of King County's marine water and freshwater bodies in 2005. The summary is followed by more detailed information on water quality monitoring locations, procedures, and results. The information satisfies the RWSP reporting policies that call for inclusion of yearly water quality monitoring results as a part of the RWSP annual report.

Summary of 2005 Water Quality

Monitoring activities in 2005 found that in general, the quality of marine and fresh waters in King County is good.

As in the previous five years, all offshore marine monitoring locations in Puget Sound—both ambient and outfall sites—met the fecal coliform bacteria standard in 2005. The percentage of nearshore marine sites (beaches) that met the standards has nearly doubled since 1998.[1] The three nearshore sites of highest concern—Pipers Creek Mouth, Shilshole Bay, and Alki Point South—are near freshwater sources with high fecal coliform counts. The overall quality of marine water, as indicated by the water quality index, is good. The percentage of monitoring locations ranked as moderate or high concern has declined to zero in the past two years, from a peak of 22 percent in 2000.

The quality of major lakes in King County, as indicated by fecal coliform bacteria levels, is also good. For non-beach areas, 100 percent of Lake Sammamish samples, 97 percent of Lake Washington samples, and 86 percent of Lake Union samples taken in 2005 met the exceptionally high fecal coliform standard used for lake water. These percentages represent a slight increase for Lakes Sammamish and Washington and a slight decrease for Lake Union. The completion of two major combined sewer overflow control projects in 2005 will likely reduce levels in Lake Union.

At lake swimming beaches, fecal coliform levels were also acceptable. All samples collected at Green Lake met the fecal coliform standard for the second year in a row. In Lake Sammamish, 89 percent of the samples collected in 2005 met the standards, down slightly from 2004 (91 percent). In Lake Washington, 85 percent of the samples met the standards, up from 79 percent in 2004. Four beaches at Lake Washington were temporarily closed because of high fecal coliform levels. These levels were primarily the result of inflowing streams or waterfowl. In terms of overall water quality, as measured by the Trophic State Index, Lakes Sammamish, Washington, and Union were ranked as good or moderate.

Given the large population and the growing urbanization in King County, overall stream water quality, as measured by the Water Quality Index for rivers and streams, is fairly good. In 2005, water quality at 36 of the 56 sites, or 64 percent, was considered either low or moderate concern, while 20 sites (or 36 percent) were rated high concern. Urbanization is impacting the normal patterns of streamflow. For 10 streams, "flashiness" was compared between actual data and a

[1] About 75 percent of the marine beach sites met the geometric mean standard and about 50 percent met the peak standard for fecal coliform bacteria.

watershed model simulation under fully forested conditions over a period of 50 years. Seven of the ten streams were flashier (higher peak flows and less annual flow) than if they had existed in forested conditions.

Monitoring Programs

To protect public health and its significant investment in water quality improvements, King County regularly monitors major lakes, beaches, streams, marine waters, and wastewater effluent (Table D-1). The biological, chemical, and physical parameters used to assess a water body's health under Washington State's Water Quality Standards are fecal coliform bacteria, dissolved oxygen, temperature, pH, ammonia, turbidity, and a variety of chemical compounds. King County also uses other indicators in addition to these parameters.

Treatment Plant Effluent

King County's three regional wastewater treatment plants continue to be in compliance with the terms and conditions of their NPDES permits, and so are in compliance with the Washington State Water Pollution Control Law, the Federal Water Pollution Control Act, and the Federal Clean Water Act.

The county regularly samples wastewater effluent from the plants and analyzes these samples at process laboratories at the plants and at its environmental laboratory in Seattle.

Ongoing Freshwater Monitoring

The major lakes monitoring program collects samples from 25 open-water sites in Lake Union and the Ship Canal, Lake Washington, and Lake Sammamish. Sampled parameters include temperature, dissolved oxygen, pH, conductivity, clarity (Secchi Transparency), phosphorus, nitrogen, and fecal coliform bacteria.

The swimming beach monitoring program assesses 21 beaches on Lake Sammamish, Lake Washington, and Green Lake every summer. This effort, ongoing since 1996, tests for fecal coliform bacteria as an indicator of risk to human health.

Some water quality indicators…

Fecal coliform bacteria. The presence of fecal indicator bacteria indicates that the water has been contaminated with the fecal material of humans, birds, or other warm-blooded animals. One type of fecal indicator bacteria, fecal coliforms, may enter the aquatic environment from domestic animals, wildlife, stormwater runoff, wastewater discharges, and failing septic systems. Although these bacteria are usually not harmful, they often occur with other disease-causing bacteria and their presence indicates the potential for pathogens to be present and to pose a risk to human health.

Dissolved oxygen. Aquatic plants and animals require a certain amount of dissolved oxygen (DO) for respiration and basic metabolic processes. Waters that contain high amounts of DO are generally considered healthy ecosystems. DO concentrations are most important during the summer season when oxygen-depleting processes are at their peak.

Temperature. Temperature influences many of the chemical components of the water, including DO concentration. Temperature also exerts a direct influence on the biological activity and growth and, therefore, the survival of aquatic organisms. Temperature levels in waters that bear salmonids are also very important.

The stream monitoring program targets rivers and streams that cross sewer trunk lines and those that are considered a potential source of pollutant loading to a major water body. This long-term program has sampled at 54 sites on four rivers and twenty-eight streams for many years.

Ongoing Marine Monitoring

King County's marine monitoring program routinely evaluates nutrient, fecal coliform bacteria, dissolved oxygen, and stratification levels at offshore locations in the main basin of Puget Sound. Samples are collected near treatment plant and combined sewer overflow (CSO) outfalls to assess potential effects to water quality from wastewater discharges. Additional samples are collected at ambient locations to better understand regional water quality and to provide data needed to identify trends that might show impacts from long-term cumulative pollution.

Ongoing marine monitoring also includes fecal coliform bacteria monitoring of water at Puget Sound beaches near outfalls and at ambient locations and sediment quality monitoring near outfalls and at ambient locations.

Other Monitoring

In addition to ongoing water and sediment quality monitoring, the county conducts special intensive investigations. Currently, studies are under way to understand water quality issues and needs, to project future growth impacts, and to identify any needed improvements to salmon habitat in the two primary watersheds in King County. Other studies are under way to support decision-making, siting, and construction of wastewater capital projects.

In 2005, analysis was conducted of data collected in 2004 on shoreline armoring along Puget Sound in King County. The amount and locations of shoreline armoring, such as seawalls and bulkheads, are generally considered to be indicators of the condition of marine shorelines.

Web-Based Monitoring Data

In 2005, King County's regional data management program completed substantial upgrades to the methods used to store and disseminate monitoring data. The public now has the ability to directly download substantial amounts of data from the Web, instead of requesting data from county staff.

The Swimming Beach monitoring page was upgraded to provide tables, graphs, and maps of monitoring results as they become available each week and to provide the most current information on beach closures. The Swimming Beach page is found at http://dnr.metrokc.gov/wlr/waterres/swimbeach/default.aspx.

The Large Lakes, Streams, and Marine Monitoring pages were upgraded to provide tables and graphs of the monitoring results as they become available each month and to allow for direct data download from the Web. Locations for these pages are as follows:

- Large Lakes Monitoring page: http://dnr.metrokc.gov/wlr/waterres/lakes/index.htm
- Streams Monitoring page: http://dnr.metrokc.gov/wlr/waterres/streamsdata/
- Marine Monitoring page: http://dnr.metrokc.gov/wlr/waterres/marine/Index.htm.

Table D-1. Summary of King County Water Quality Monitoring Programs

Program	Media and Locations	Parameters	Methods	Sampling Frequency	Program Purpose	Duration
Ambient Monitoring						
Marine monitoring	Water and sediments in areas of Puget Sound away from outfalls and CSOs; shellfish and algae from Puget Sound beaches	Water samples: temperature, salinity, clarity, DO, nutrients, chlorophyll, and bacteria Beach sediment: grain size, solids, TOC, metals, and organic compounds Shellfish: lipids, bacteria, metals, and organic compounds Macroalgae samples: metals	Water samples collected at multiple depths, ranging from 1 to 200 m Sediments, shellfish, and algae: from single sites	Water samples: monthly Beach sediment: annually Shellfish & macroalgae: annually	Voluntary—to assess potential effects to water quality from nonpoint pollution sources and to compare quality against point source data	Ongoing
Major lakes monitoring	Cedar-Sammamish Watershed (WRIA 08) only: Lakes Washington, Sammamish, and Union	Temperature, DO, pH, conductivity, clarity, phosphorus, nitrogen, and fecal coliform; micorcystin is measured at select stations	Samples collected every 5 m from 1 m below the surface to near the lake center bottom and around the shoreline	Biweekly during the growing season; monthly during the rest of the year	Voluntary—to monitor the integrity of the wastewater conveyance system and the condition of lakes	Ongoing
Small lakes monitoring	Volunteers monitor 51 small lakes in King County	Precipitation, lake level, temperature, Secchi depth, phosphorus, nitrogen, chlorophyl-a, phytoplankton	Single-point and vertical profiles	Rainfall & lake level: daily Temperature & Secchi depth: weekly Other parameters: every 2 weeks April to October	Voluntary—to characterize and identify trends in water quality	Ongoing

BOD = biochemical oxygen demand; DO = dissolved oxygen; TOC = total organic carbon; TSS = total suspended solids; SAP = sampling and analysis plan.

Table D-1. Summary of King County Water Quality Monitoring Programs

Program	Media and Locations	Parameters	Methods	Sampling Frequency	Program Purpose	Duration
Rivers and streams monitoring	Rivers and streams of both watersheds; emphasis on those that cross wastewater conveyance lines or that could be a source of pollution	Baseflow and storm samples: turbidity, TSS, pH, temperature, conductivity, DO, nutrients, ammonia, bacteria Storm samples: trace metals Sediment quality at selected stations	Various	Monthly sampling under baseflow conditions Three to six times per year at mouth of streams under storm conditions	Voluntary—to monitor the integrity of the wastewater conveyance system and the condition of streams and rivers	Ongoing
Swimming beach monitoring	Cedar-Sammamish Watershed: Lake Washington, Lake Sammamish, and Green Lake	Bacteria	Water samples at swimming beaches	Summer	Voluntary—to evaluate human health risks and necessity for beach closures	Ongoing
Benthic macroinvertebrate monitoring	Wade-able stream sub-basins	Size and distribution of aquatic macroinvertebrate populations	Samples colllected with a Surber stream bottom sampler	Yearly	Voluntary—to establish a baseline for identifying long-term trends	Ongoing
Wastewater Plant Outfall Monitoring						
Marine wastewater plant outfall water column and beach monitoring	Water in Puget Sound near treatment plant outfalls; sediment, shellfish and algae at beaches near outfalls	Same parameters as in the marine ambient monitoring program	Water samples at outfalls: collected at multiple depths, ranging from 1 to 150 m	Water samples: monthly Beach sediment: annually Shellfish & macroalgae: annually	Voluntary—to assess potential effects to water quality from wastewater discharges	Ongoing
Marine NPDES sediment monitoring	Sediments in Puget Sound near treatment plant outfalls and the Denny Way CSO	Sediment samples at outfalls: grain size, solids, sulfides, ammonia-nitrogen, oil & grease, TOC, metals, organic compounds, and (at South and West Point plants) benthic infauna	Sediment samples in a grid pattern as defined in the SAP approved by Ecoloogy	Sediment samples at outfalls once per permit cycle	NPDES permit requirement	Ongoing

BOD = biochemical oxygen demand; DO = dissolved oxygen; TOC = total organic carbon; TSS = total suspended solids; SAP = sampling and analysis plan.

Table D-1. Summary of King County Water Quality Monitoring Programs

Program	Media and Locations	Parameters	Methods	Sampling Frequency	Program Purpose	Duration
Special Studies						
Sammamish-Washington Analysis and Modeling Project (SWAMP)	Water and sediments in major lakes—and their inflowing streams	Broad spectrum of water quantity and quality, sediment quality, biological, and physical parameters	Various		Voluntary—to develop a computer model of the watershed	Complete in 2006
Sediment Study	Lakes Washington, Sammamish, and Union	Toxic chemicals & benthic community structure	Grab samples	Lake Sammamish in 1999; Lake Washington in 2000; Lake Union in 2001	Voluntary—to develop a baseline characterization	Completed in 2001; report issued in 2004
Ecological and Human Health Risk Assessment	Water bodies in Cedar-Sammamish watershed	Existing water, sediment, and tissue data	Various, using a tiered approach	Using existing data from other sampling efforts	Voluntary—to assess ecological and human health risk associated with exposure to chemicals of concern	Complete in 2006
Green-Duwamish Water Quality Assessment (G-DWQA)	Water in Green and Duwamish Rivers—and their inflowing rivers and streams	Broad spectrum of water quantity and quality, biological, and physical parameters	Various	Intensive	Voluntary—to develop models, evaluate BMPs, prepare risk assessments	Complete in 2006
Storm Impact Water Quality Monitoring	Water in Green and Duwamish Rivers—and their inflowing rivers and streams—under storm flow conditions	Broad spectrum of water quantity and quality, sediment quality, biological, and physical parameters	Various	Intensive	Voluntary—to evaluate conditions and to support modeling and WRIA planning	Completed in 2003; report issued in 2004
Loadings Calculations	Water in Green and Duwamish Rivers—and their inflowing rivers and streams	Broad spectrum of water quantity and quality, sediment quality, biological, and physical parameters	Estimates based on water quality data and on literature reviews for land use classifications		Voluntary	Complete in 2006

BOD = biochemical oxygen demand; DO = dissolved oxygen; TOC = total organic carbon; TSS = total suspended solids; SAP = sampling and analysis plan.

Table D-1. Summary of King County Water Quality Monitoring Programs

Program	Media and Locations	Parameters	Methods	Sampling Frequency	Program Purpose	Duration
Temperature and DO Studies	Water in Green and Duwamish Rivers—and their inflowing rivers and streams	Daily fluctuations in temperature and DO, especially in the summer	Continuously recording data loggers	Intensive	Voluntary—to evaluate conditions and to support modeling and WRIA planning	Completed in 2003; temperature report issued in 2004; DO report to be issued in 2006
Microbial Source-Tracking Study	Green River and its tributaries	Land uses and bacterial sources associated with bacterial populations		Intensive	Voluntary—to assist in setting and measuring TMDLs	Completed in 2004; report will be issued in 2006
Brightwater Outfall Studies (wastewater capital project)	Water, sediment, & eelgrass for the proposed Brightwater outfall site Upland soils at outfall Portal 19	Water quality: temperature, salinity, DO, nutrients, and fluoresence Sediments: borings for chemicals Upland soils: total petroleum hydrocarbons, lead, and volatiles	Water column samples and continuous buoy readings Borings Soil samples Eel grass diver survey	Intensive	Voluntary--to support the design of the Brightwater outfall	Complete in 2010
Brightwater Surface Water Characterization (wastewater capital project)	Water samples of surface runoff from proposed treatment plant site and Little Bear Creek upstream and downstream of site.	Temperature, pH, DO, specific conductance, alkalinity, BOD, total dissolved solids,TSS, and turbidity	Auto-samplers	Intensive	Voluntary—to support permitting of the Brightwater plant	Completed in 2004; draft report was issued in 2005
Norfolk post-remediation sediment monitoring (wastewater capital project)	Sediment near the Norfolk CSO on the Duwamish River	Chemicals	Sediment samples per approved SAP	Intensive	Regulatory—under a 1991 Consent Decree	Completed in 2004

BOD = biochemical oxygen demand; DO = dissolved oxygen; TOC = total organic carbon; TSS = total suspended solids; SAP = sampling and analysis plan.

Table D-1. Summary of King County Water Quality Monitoring Programs

Program	Media and Locations	Parameters	Methods	Sampling Frequency	Program Purpose	Duration
Denny Way/Lake Union pre-remediation sediment monitoring (wastewater capital project)	Sediment near the Denny Way and Lake Union CSOs	Benthic communities	Sediment samples per approved SAP	Intensive	Regulatory—under a NOAA Fisheries Section 7 ESA consultation	Completed in 2004
Diagonal/Duwamish post-remediation sediment monitoring (wastewater capital project)	Sediments near the Seattle Diagonal storm drain (includes City and county CSO) and the county's Duwamish CSO	Sediment chemistry, turbidity, cap surveys	Sediment samples per approved SAP	Intensive	Regulatory—under an EPA/Ecology Order	Through 2013

BOD = biochemical oxygen demand; DO = dissolved oxygen; TOC = total organic carbon; TSS = total suspended solids; SAP = sampling and analysis plan.

Marine Water

This section describes the results of marine monitoring activities in 2005. The discussion focuses on fecal coliform bacteria levels and on overall water quality as measured by the water quality index. It ends with a description of shoreline armoring along the Puget Sound shoreline.

Monitoring Locations

Figures D-1 and D-2 show ambient and outfall monitoring locations in Puget Sound. Ambient sites are chosen to reflect general environmental conditions. Outfall monitoring sites are located at King County wastewater treatment plant and CSO outfalls. Both offshore and nearshore (beach) areas are monitored.

Fecal Coliform Bacteria

Offshore Ambient and Outfall Locations

Levels of fecal coliform bacteria at offshore Puget Sound locations are measured to gauge the risk posed to human health from recreational uses of these waters. For marine surface waters, the current fecal coliform standard is a geometric mean of 14 colony forming units (cfu)/100 mL. All ambient and outfall sites met the fecal coliform standard in 2005; and in the five previous years. Bacteria levels tend to be higher in Elliott Bay than at other sites because of quantity of freshwater that carries fecal coliform to the bay.

Nearshore (Beach) Ambient and Outfall Locations

Fecal coliform bacteria levels in Puget Sound beach locations are measured to assess the health effects from direct contact with marine waters during activities such as swimming, wading, SCUBA diving, and surfing. To meet the state standard, the geometric mean of samples collected should not exceed 14 cfu/100 mL and not more than 10 percent of the samples used to calculate the geometric mean should exceed 43 cfu/100 mL (the peak standard).

In 2005, 17 Puget Sound beach sites were monitored monthly for fecal coliform bacteria. The results indicate that 9 of the 17 sites meet both the geometric mean and peak standards and are at a low level of concern, 5 sites meet the geometric mean standard but not the peak standard, and 3 sites do not meet either standard. The three sites of highest concern—Pipers Creek Mouth, Shilshole Bay, and Alki Point South—are near freshwater sources or storm drains with high fecal coliform counts. Specialized sampling conducted at Alki Point South in 2005 to determine the possible source of the bacteria indicate that a freshwater flow is the likely cause. The number of fecal coliform exceedances at beaches near outfalls was similar to beaches without a known point source nearby.

The percentage of Puget Sound beach sites meeting fecal coliform standards in 2005 has almost doubled since 1998 (Figure D-3). The fluctuation in water quality over time is most likely caused by annual variability in amount and intensity of rainfall. For example, 1996 through 1999 were substantially wetter than average years, which is the likely explanation for higher fecal coliform levels in 1998 and 1999.

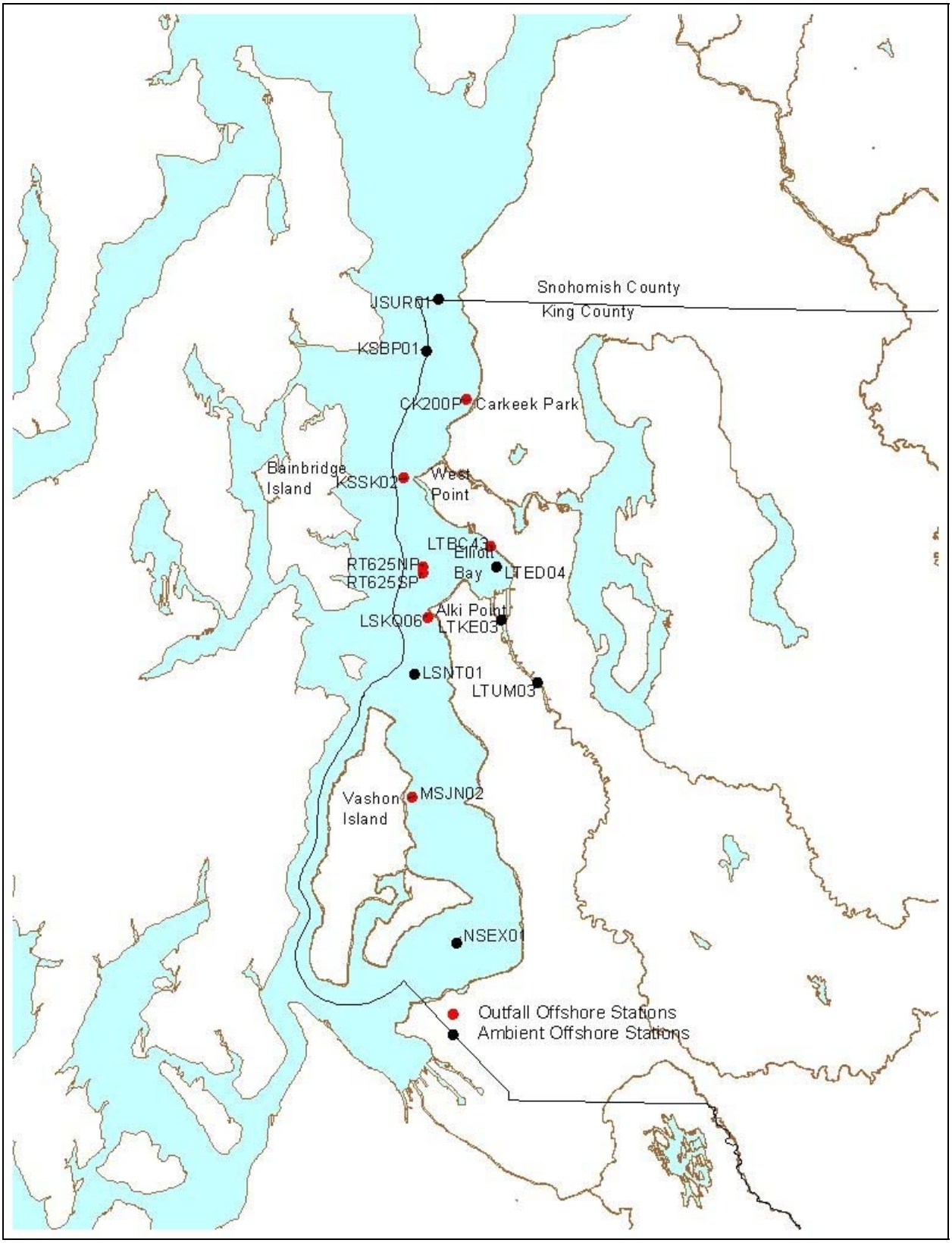


Figure D-1. Offshore Ambient and Outfall Monitoring Locations in Puget Sound

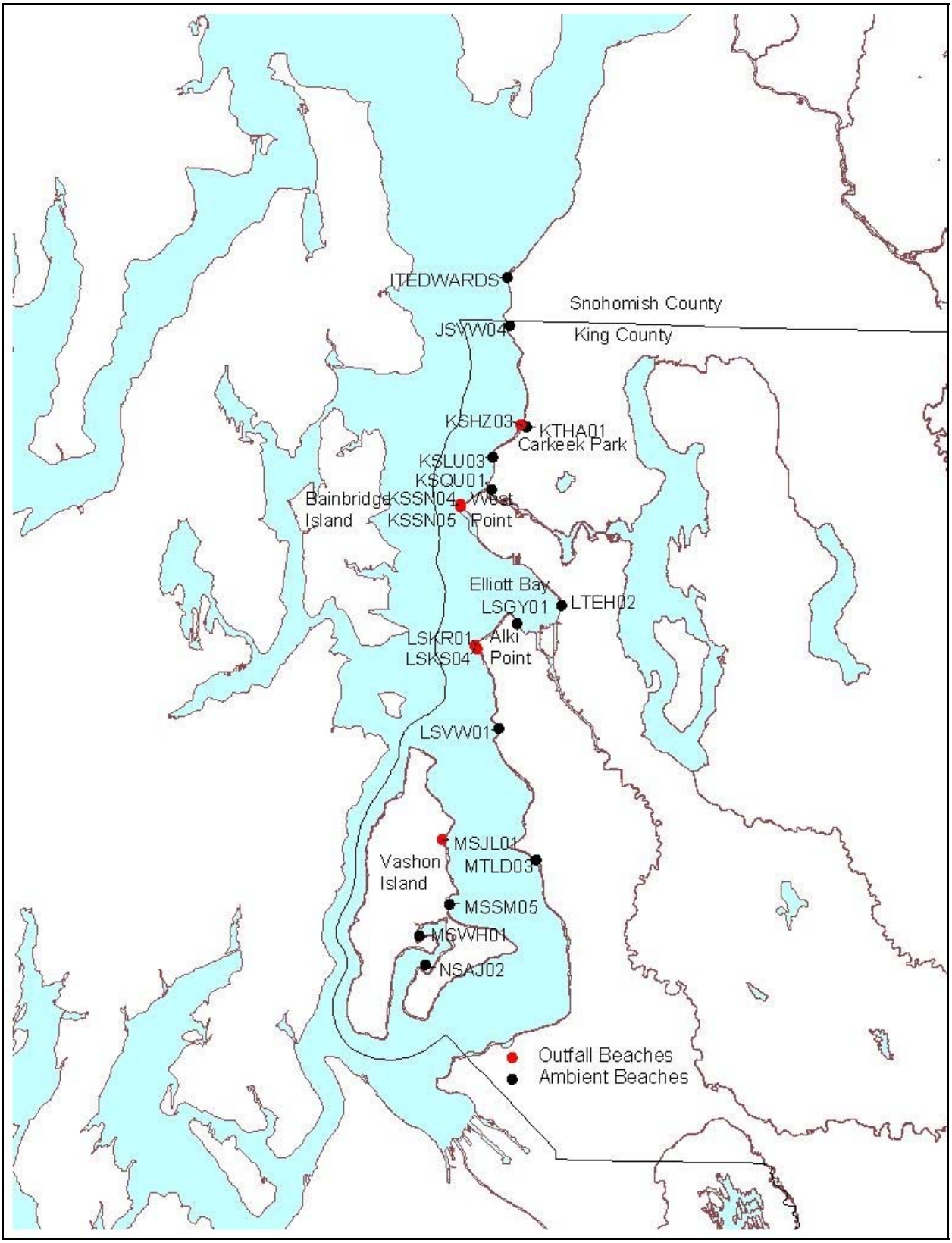


Figure D-2. Nearshore (Beach) Ambient and Outfall Monitoring Locations in Puget Sound

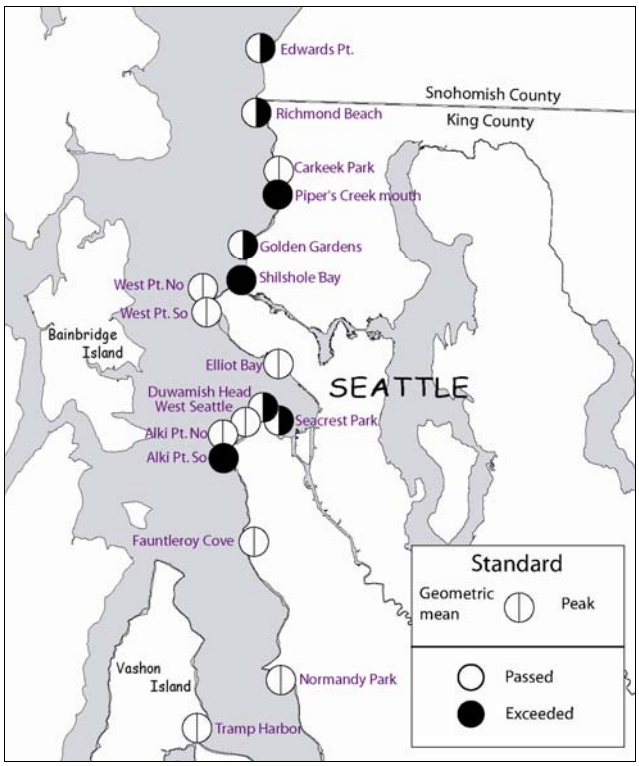


Figure D-3. Pass-Fail Status of Puget Sound Beach Monitoring Sites for Fecal Coliform Bacteria Standards, 2005

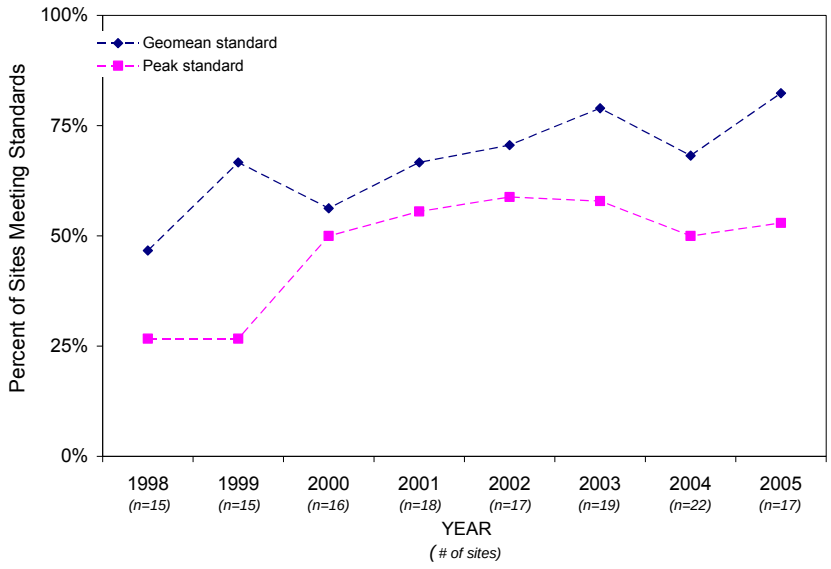


Figure D-4. Percentage of Puget Sound Beach Monitoring Sites that Met Fecal Coliform Bacteria Standards, 1998-2005

Overall Quality—Marine Offshore Water Quality Index

King County uses a modified version of the water quality index developed by the Washington State Department of Ecology to assess overall quality of offshore marine water. The determination is based on four indicators: dissolved oxygen (DO), dissolved inorganic nitrogen (DIN), ammonia, and stratification strength and persistence. Each location is categorized as low, moderate, or high concern.

The 2005 findings indicate that the water quality at all of the ambient and outfall offshore stations is at a level of low concern. Although the ambient station in Elliott Bay experienced strong-intermittent stratification, low DO levels were not observed. Areas where strong or persistent stratification occurs, however, should be regarded as areas where significant nutrient loading could lower DO concentrations. DO concentrations below the threshold (5 mg/L for two consecutive months) were observed at the ambient station located in the East Passage of Puget Sound. These concentrations occurred in the fall as a result of the natural seasonal influx of low oxygenated Pacific Ocean water into the deep main basin of Puget Sound.

Figure D-4 shows the percentage of the 8 to 11 offshore stations categorized as moderate or high concern in 1999 through 2005. The percentage of stations of moderate or high concern reached a maximum in 2000 (22 percent) and has declined to zero percent for the past two years.

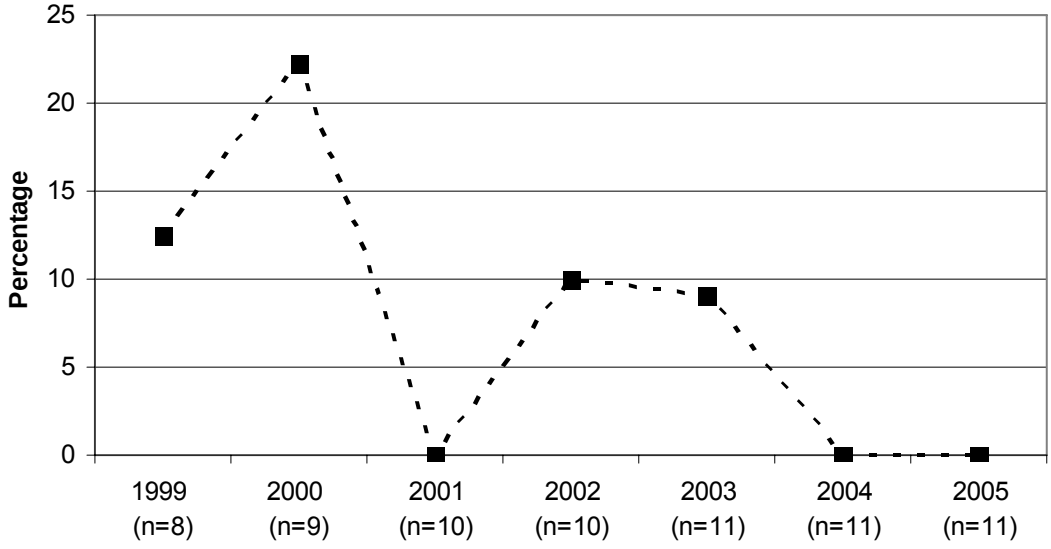


Figure D-4. Percentage of King County Offshore Stations with Moderate or High Concern Rankings Based on Water Quality Index, 1999-2005

Shoreline Armoring

Shoreline armoring is a general indicator of the condition of marine shorelines. Data on shoreline armoring along Puget Sound in King County were collected in 2004. This is the first time that comprehensive armoring data have been available for the area. The study characterized marine shorelines by whether they were armored and by their historical and current role in the sediment transport process.

What is shoreline armoring?

Shoreline armoring can be hard protective structures such as vertical seawalls, revetments (facings of stone placed on a bank or bluff to protect a slope), riprap (permanent cover of rock used to stabilize streambanks), and bulkheads.

Table D-2. Percentages of Unarmored Shoreline in King County

Jurisdiction	% Unarmored
City of Federal Way	51.81%
Unincorporated KC (Vashon)	51.25%
City of Normandy Park	43.55%
City of Shoreline	19.56%
City of Des Moines	15.87%
City of Burien	13.53%
City of Seattle	12.03%

The spatial distribution of shoreline armoring reveals a striking contrast between the mainland shoreline and the Vashon and Maury Island shorelines (Table D-2). The islands have less modified shoreline and more natural habitat than along most of the mainland. As expected, the City of Seattle was the most armored. Somewhat unexpected was the trend toward decreasing amounts of armoring moving south along the mainland shoreline, particularly given Federal Way's proximity to the City of Tacoma.

The data show that many of the beach-feeding sediment sources are trapped behind armoring.

Major Lakes

This section describes the results of fecal coliform bacteria sampling in ambient and swimming beach locations in the major lakes in King County. It also describes overall water quality in these lakes based on calculation of their Trophic State Index.

Monitoring Locations

Figure D-5 shows the 25 ambient sampling locations in Lakes Washington, Sammamish, and Union and in the Ship Canal. Figure D-6 shows the 21 swimming beach sampling locations in Lake Washington, Lake Sammamish, and Green Lake.

Figure D-5. Ambient Monitoring Locations in Lakes Washington, Sammamish, and Union (including the Ship Canal)

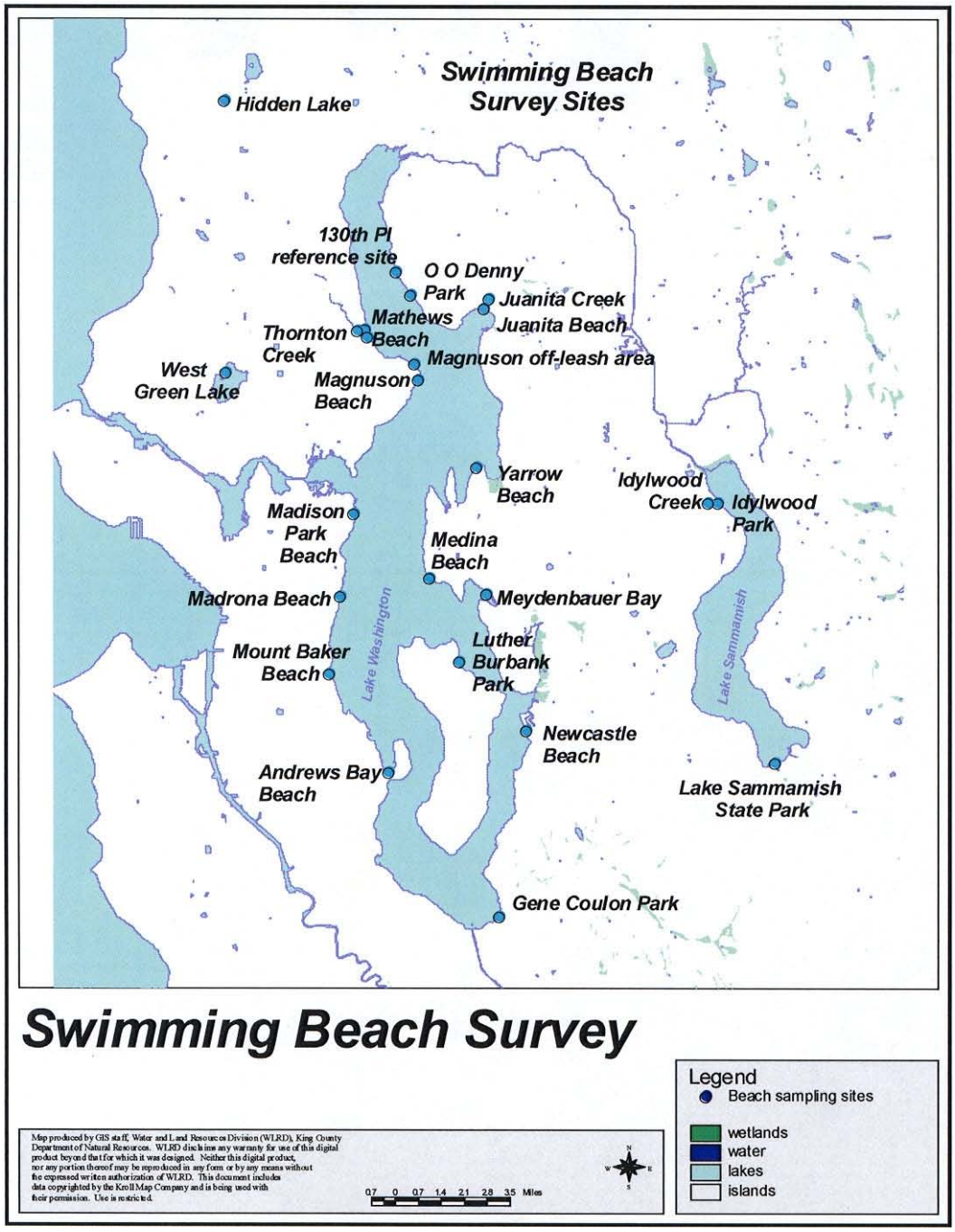


Figure D-6. Swimming Beach Monitoring Locations in Lake Washington, Lake Sammamish, and Green Lake

Fecal Coliform Bacteria—Ambient Mid-Lake (Open-Water) and Nearshore

The lake standard for fecal coliform bacteria addresses human risk resulting from direct contact with the water during activities such as swimming and wading. The standard is a geometric mean value of less than 50 colonies/100 mL with no more than 10 percent of all samples obtained for calculating the geometric mean value exceeding 100 colonies/100 mL (WAC 173-201A). Sites used for this indicator are located in both mid-lake (open water) and nearshore locations.

Even though this measure uses an exceptionally high standard, 100 percent of the Lake Sammamish samples and 97 percent of the Lake Washington samples achieved this standard in 2005 (Figure D-7). Fewer samples in Lake Union met this standard (86 percent), most likely resulting from the influence of numerous CSO and stormwater outfalls in the lake. Two major projects to reduce flows from CSOs were completed after the unusually high precipitation that occurred during the spring of 2005. These projects are expected to reduce fecal coliform levels in Lake Washington and Lake Union, as well as in Elliott Bay.

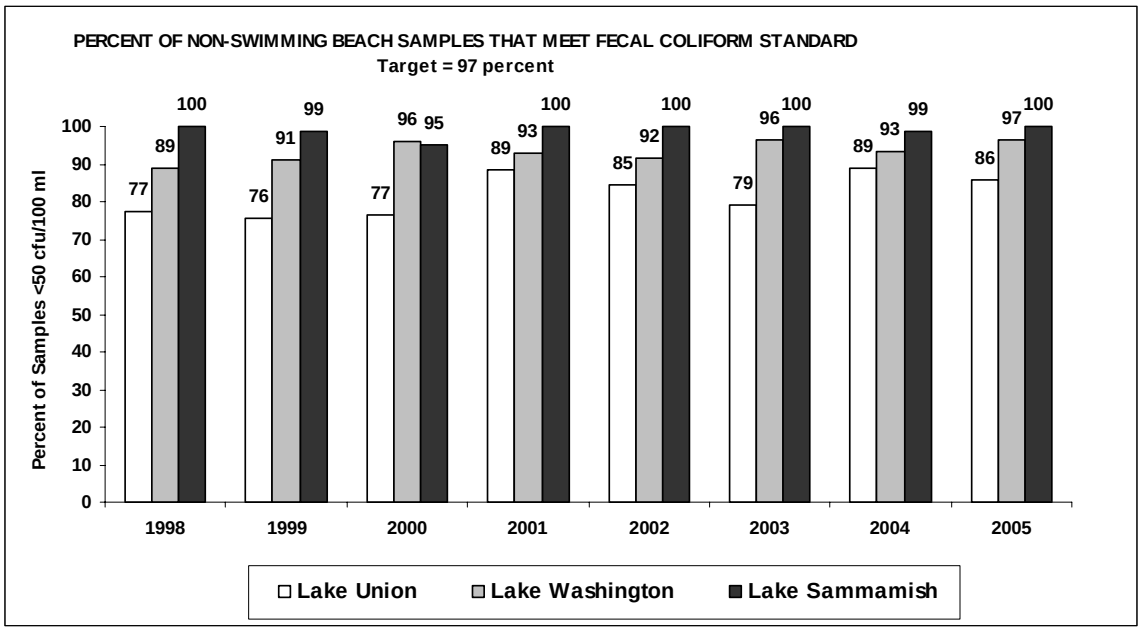


Figure D-7. Percentage of Ambient Samples in Lakes Washington, Sammamish, and Union that Met the Fecal Coliform Bacteria Standard, 1998–2005

Fecal Coliform Bacteria—Swimming Beaches

King County's standard for acceptable fecal coliform bacteria levels in swimming beaches is less than 200 colonies/100 mL in any sample. Public Health-Seattle & King County and the Washington State Department of Health currently use this standard, which is called the Ten State Standard.

All samples collected at Green Lake met the fecal coliform standard for the second year in a row (Figure D-8).

Levels at swimming beaches in Lakes Sammamish and Washington remained fairly consistent with slight variability from year to year (Figures D-9 and D-10). In Lake Sammamish, 89 percent of the samples collected in 2005 met the standards, down slightly from 2004 (91 percent). In Lake Washington, 85 percent of the samples met the standards, up from 79 percent in 2004. A greater number of bacterial exceedances occurred at the swimming beaches than at the ambient monitoring sites in these two lakes.

Bacterial counts for all beaches monitored in Lake Sammamish were within acceptable ranges and did not warrant swimming beach closures. Four Lake Washington swimming beaches were closed in July 2005: Matthews, Newcastle, Juanita, and Gene Coulton Beaches. Matthews Beach was closed because of high-bacteria stormwater inflow from Thornton Creek and was reopened after the streamflow diminished. Waterfowl were suspected as sources of bacteria in the Newcastle and Juanita Beach closures. The most likely source of the bacteria at Gene Coulon Beach was waterfowl. There were no sewer line breaks, spills, or leaks; nor is there an adjacent stream that contributes high counts of bacteria into the swimming area.

Overall Quality in Major Lakes—Trophic State Index

Overall water quality in Lakes Washington, Sammamish, and Union is determined by measuring the summer total phosphorus concentrations and converting them to the Trophic State Index (TSI-TP). The Trophic State Index relates phosphorus to the amount of algae that the lake can support. The potential for nuisance algal blooms is considered low if the TSI-TP is less than 40, moderate if less than 50, and high if greater than 50.

Water quality in these lakes varies annually, depending on watershed inputs, weather, and biological interactions. The 1994–2005 results for these three lakes show the values fluctuating across the low-to-moderate threshold, indicating that the water quality varies from good to moderate (Figure D-11). In the past five years, Lake Union typically has fallen in the moderate range, Lake Washington in the low range, and Sammamish in both ranges.

High algae productivity often relates to poor water quality. Although such high productivity may not reduce beneficial uses in all cases, depending on the natural condition of the lake, a trend toward increased TSI-TP could indicate changes in the watershed.

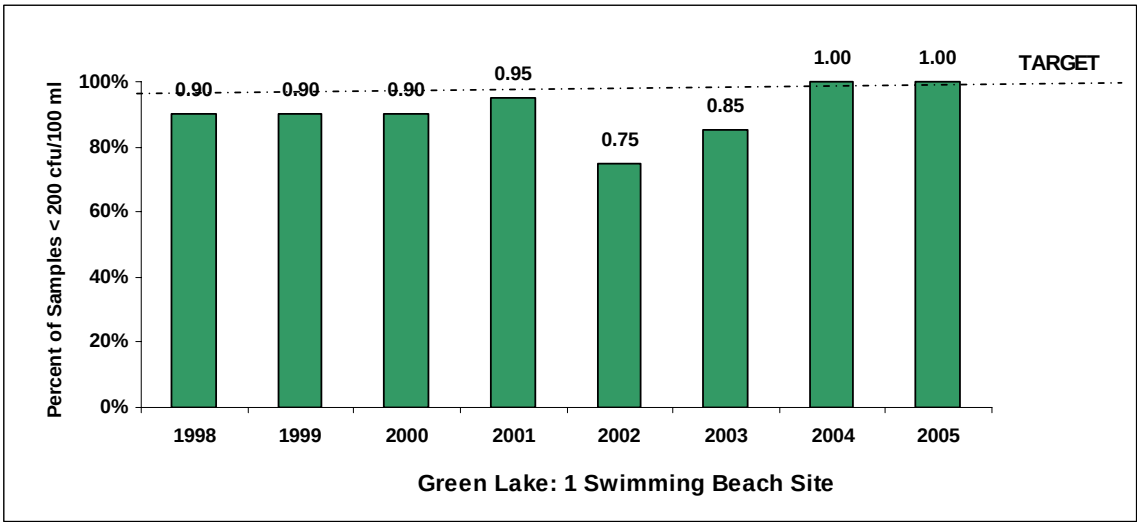


Figure D-8. Percentage of Samples that Met the Fecal Coliform Bacteria Standard at Green Lake Swimming Beaches, 1998–2005

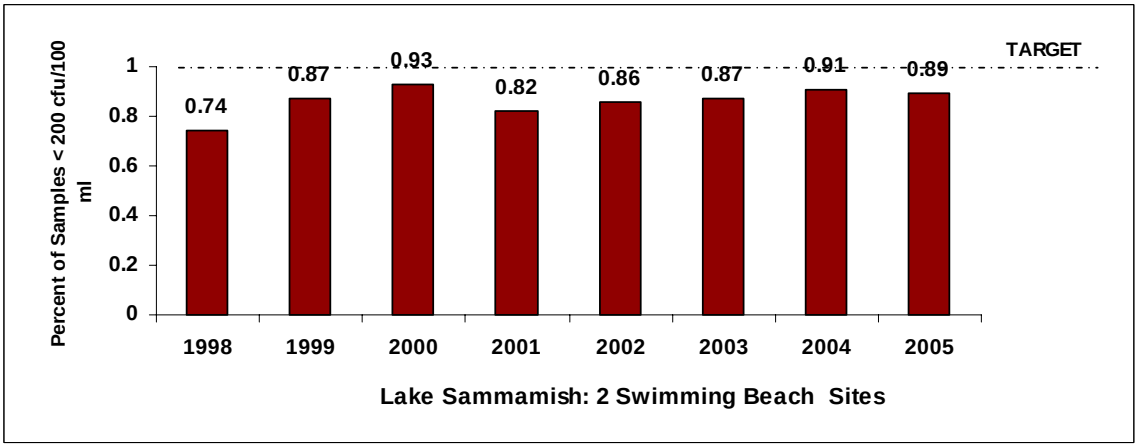


Figure D-9. Percentage of Samples that Met the Fecal Coliform Bacteria Standard at Lake Sammamish Swimming Beaches, 1998–2005

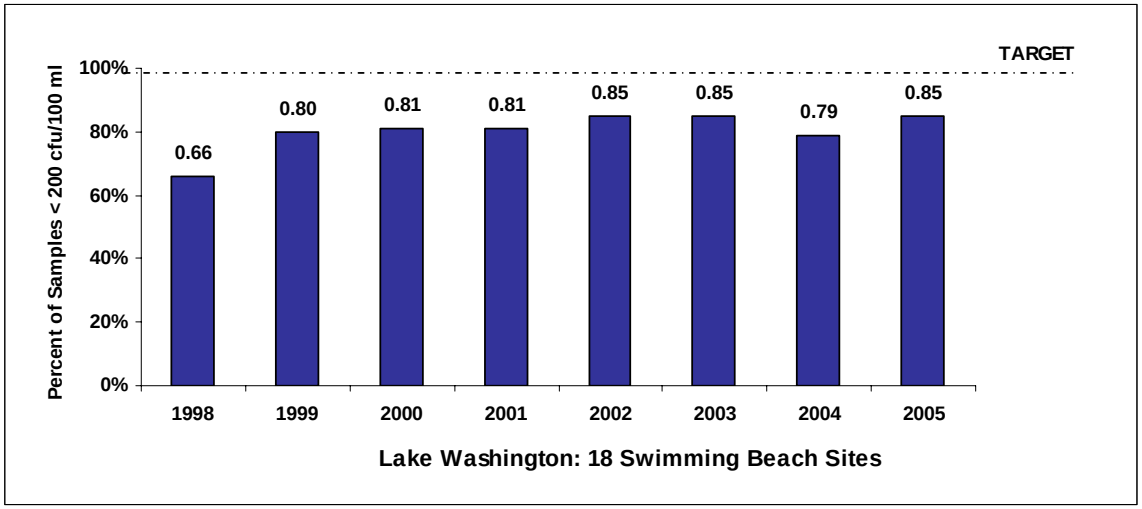


Figure D-10. Percentage of Samples that Met the Fecal Coliform Bacteria Standard at Lake Washington Swimming Beaches, 1998–2005

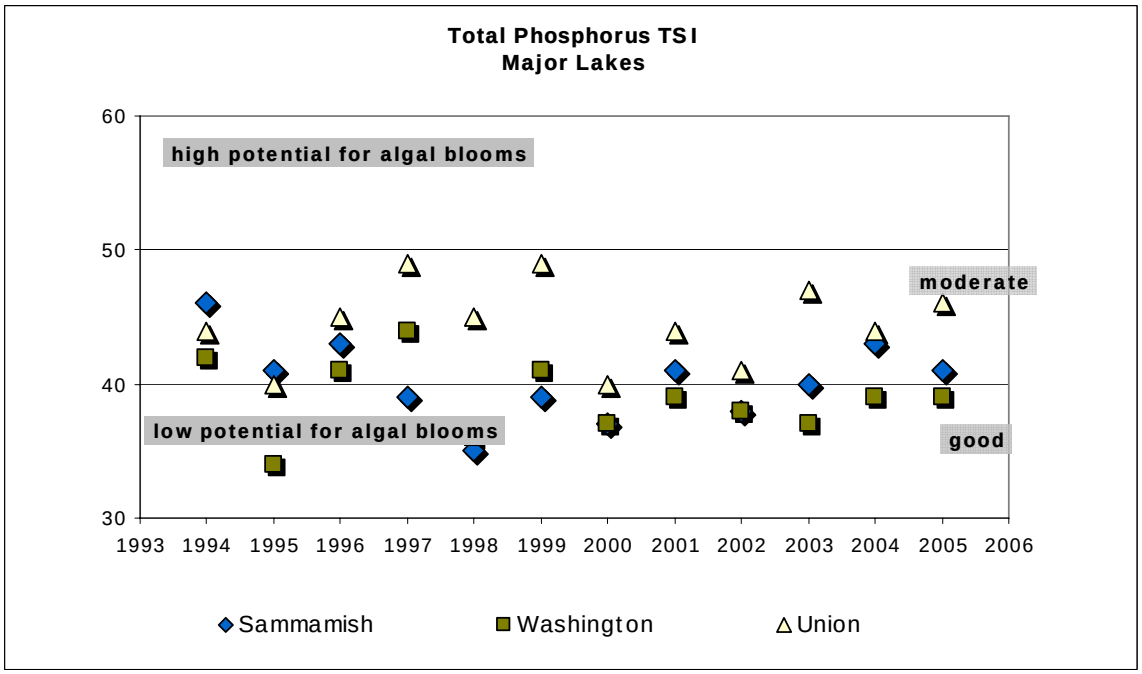


Figure D-11. Overall Water Quality in Lakes Washington, Sammamish, and Union Based on Trophic State Index, 1994–2005

Water Temperature—Effects of Climate Change

Global climate change is having an impact on our local weather patterns and subsequently on county aquatic resources. On average, ambient air temperatures in the Pacific Northwest have increased over the twentieth century by roughly 1.5ºF.[2] Air temperatures in the region are expected to continue to increase by another 2 to 9ºF over the next 80 years.

Warmer temperatures have reduced the snow pack levels in Washington and, thus, the timing and quantity of flows in regional rivers and streams. Higher air temperatures and changes in wind patterns also increase lake temperatures through surface heat exchange processes. January water temperatures are taken at a 1-meter depth from the mid-lake monitoring stations in Lakes Washington, Sammamish, and Union (Figure D-12). Because the lakes are well mixed during January, temperatures at the surface reflect the temperatures throughout the water column.

The University of Washington has measured temperatures in Lake Washington since 1960. King County (then Metro) began monitoring temperatures in Lakes Washington, Sammamish, and Union in 1979. Additional Lake Washington data were collected in 1913 and 1933. Lake temperatures vary annually, depending on seasonal weather conditions (wind, precipitation, cloudiness, ambient air temperatures). Overall, winter water temperatures have increased about 0.25°C (0.45°F) per decade since 1960 in Lake Washington and about 1°C (1.8 °F) per decade since 1979 in Lakes Sammamish and Union. The smaller increase in Lake Washington is likely due to its larger volume, which is roughly 8 times greater than Lake Sammamish and 118 times greater than Lake Union.

[2] http://www.cses.washington.edu/cig/pnwc/pnwc.shtml

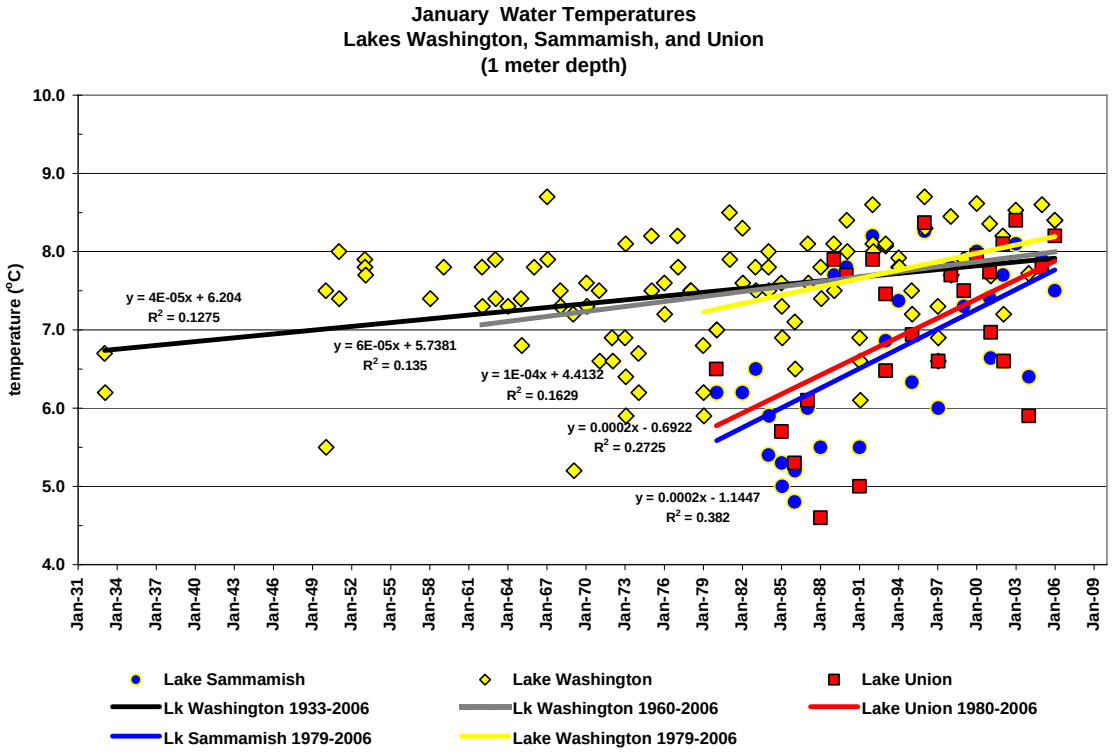


Figure D-12. January Water Temperatures in Lakes Washington, Sammamish, and Union, 1931–2006

Rivers and Streams

This section describes the quality of water in King County rivers and streams in terms of overall water quality (Water Quality Index) and normative streamflows.

Monitoring Locations

Fifty-six sites in rivers and streams in the Lake Washington and Green-Duwamish drainage basins were sampled monthly from 2001 through 2005 for numerous water quality parameters, including those used to determine the Water Quality Index (Figure D-13).

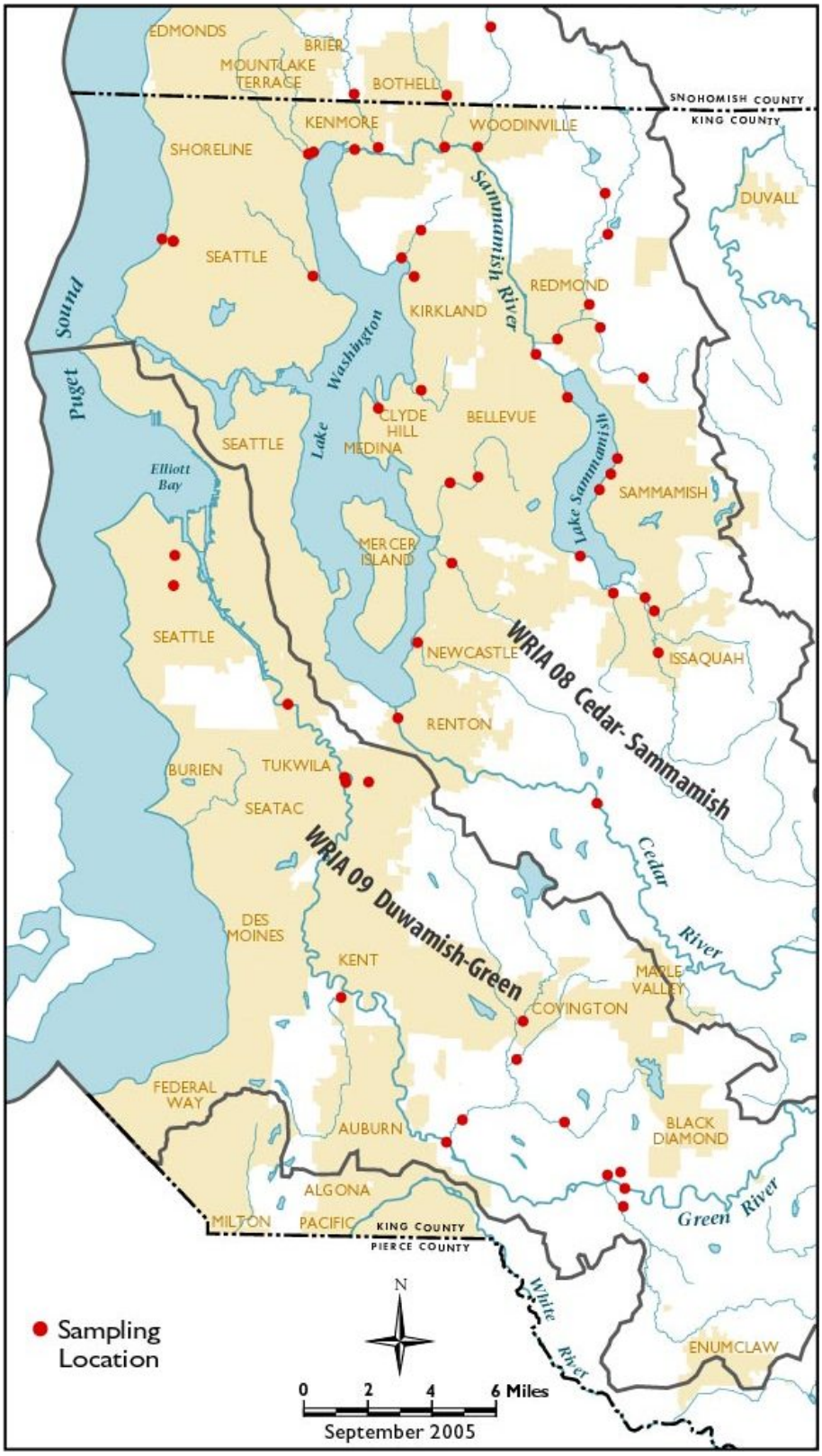


Figure D-13. River and Stream Monitoring Locations

Overall Quality—Water Quality Index

The Water Quality Index (WQI) for rivers and streams attempts to integrate a series of key water quality indicators into a single number that can be used for comparison over time and among locations. The WQI is based on a version proposed by the Washington State Department of Ecology and originally derived from the Oregon Water Quality Index. The WQI is a number ranging from 10 to 100—the higher the number, the better the water quality. For temperature, pH, fecal coliform bacteria, and dissolved oxygen (DO), the index expresses results relative to state standards required to maintain beneficial uses. For nutrient and sediment measures, where the state standards are not specific, results are expressed relative to expected conditions in a given eco-region. Multiple constituents are combined and results aggregated over time to produce a single score for each sampling station.

Given a population of almost two million residents and the intense urbanization of the area, overall stream water quality in King County is fairly good. Water quality at 36 of the 56 sites, or 64 percent, was considered either low or moderate concern, while 20 sites (or 36 percent) were rated high concern. In Water Resource Inventory Area (WRIA) 9—the Green-Duwamish basin, 6 of the 16 sites were rated as low concern, 8 sites as moderate concern, and 2 sites as high concern (Figures D-14 and D-15). Of the 40 sites in WRIA 8 (Lake Washington basin), no sites were rated as low concern, 22 sites as moderate concern, and 18 as high concern (Figures D-16 and D17). High concern ratings were caused at least in part by excessive nutrients (phosphorus) at all 20 sites, high bacteria levels at 17 sites, low DO concentrations at 12 sites, and high temperatures at 5 sites.

Because high phosphorus concentrations are found in fecal material, elevated phosphorus concentrations are often linked to the same sources that cause higher bacteria levels. Phosphorus is also released from the sediment when DO concentrations are low. In addition, elevated phosphorus concentrations are linked to areas with high volumes of stormwater runoff and areas undergoing development.

Pets and failing septic systems are the most likely sources of bacteria in the urban areas. Poor livestock management practices can be a potential source of bacteria in agricultural areas. In wetland areas, wildlife and stagnant water conditions can lead to elevated bacteria counts.

Low DO concentrations can be associated with low flows, high temperatures, and high levels of organic matter. Low flows and high temperatures were a particular problem during late summer 2005. There were extended dry periods, and the cumulative rainfall was relatively low compared to historical values. Finally, lower instream flows exacerbate every measurement in the WQI.

Normative Streamflows

In urban areas, streams respond more quickly to rainfall with higher peak flows rising and falling more rapidly than under forested conditions. Because less rainfall is being absorbed by the vegetation and soil, there is more surface runoff. Higher, more rapid and frequent pulses of runoff (“flashiness”) lead to flooding and channel erosion. From a biological perspective, streams with more frequent peak flows are disturbed more often. Organisms that survive in these conditions are those that have adapted to more frequent and severe disturbances.

Flows from 16 stream sites were measured and their flashiness calculated during the 2005 water year (October 2004–September 2005). For 10 streams, flashiness was compared between actual data and a watershed model simulation under fully forested conditions over a period of 50 years.[3] Seven of the ten streams were flashier (higher peak flows and less annual flow) than if they had existed in forested conditions (Figure D-18). Over the past 36 years, average stream flashiness has been higher than would be expected under fully forested conditions, indicating an overall increase in flashiness at several monitoring locations in the county (Figure D-19).

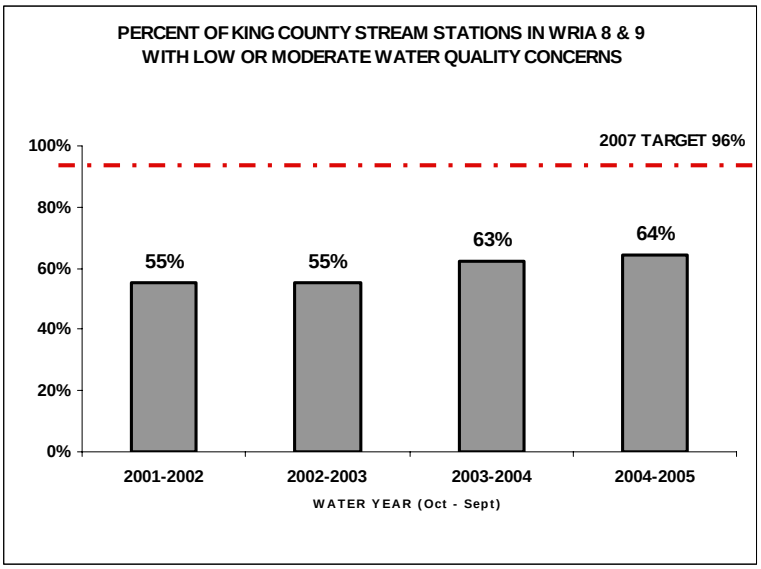


Figure D-14. Percentage of Streams in WRIAs 8 and 9 with Low or Moderate Water Quality Concerns Based on Water Quality Index, 2001–2005

[3] Flashiness is defined as the fraction of days during the year that flow rises above the annual mean daily flow.

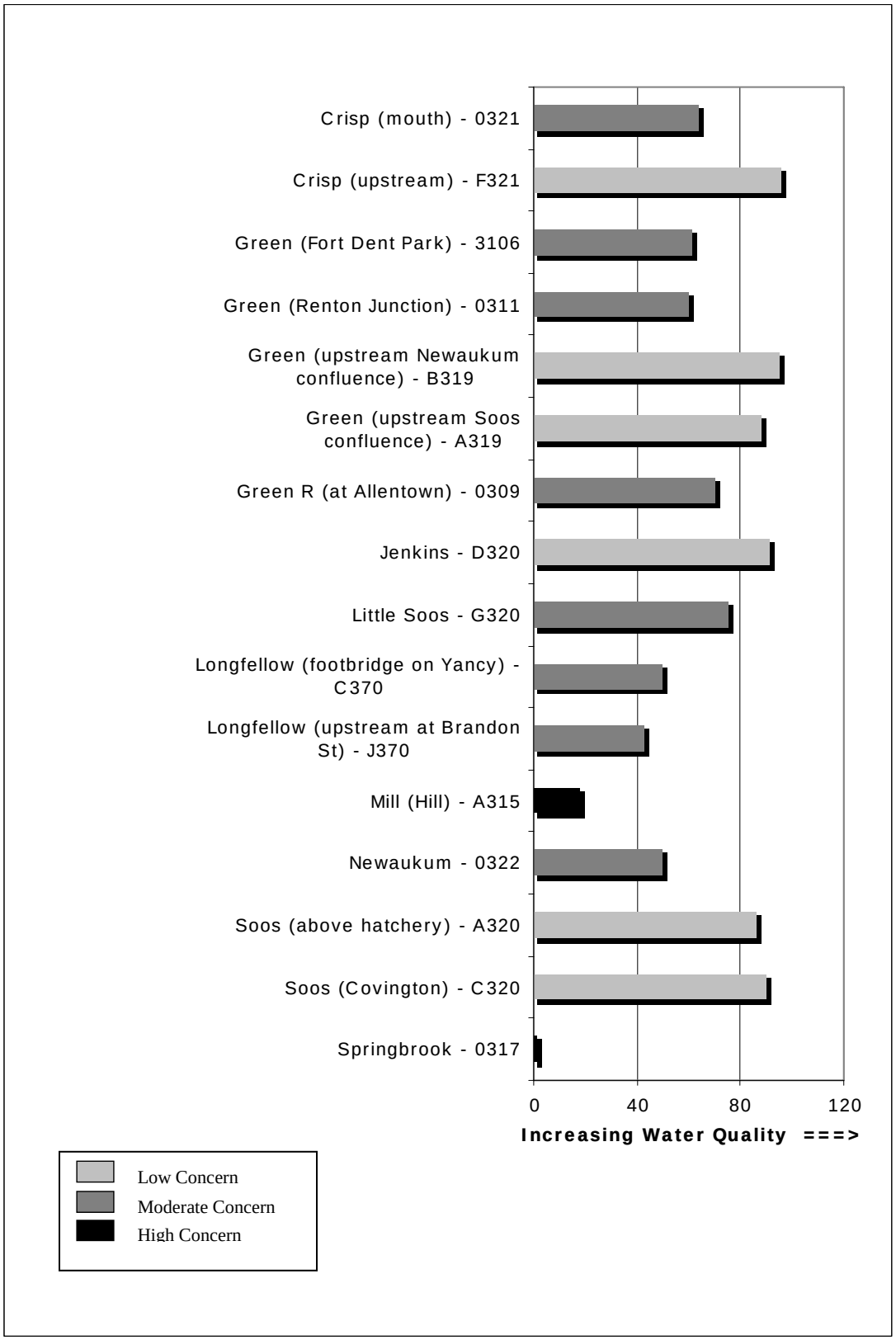


Figure D-15. Water Quality Index Rankings for Rivers and Streams in WRIA 9, 2004–2005

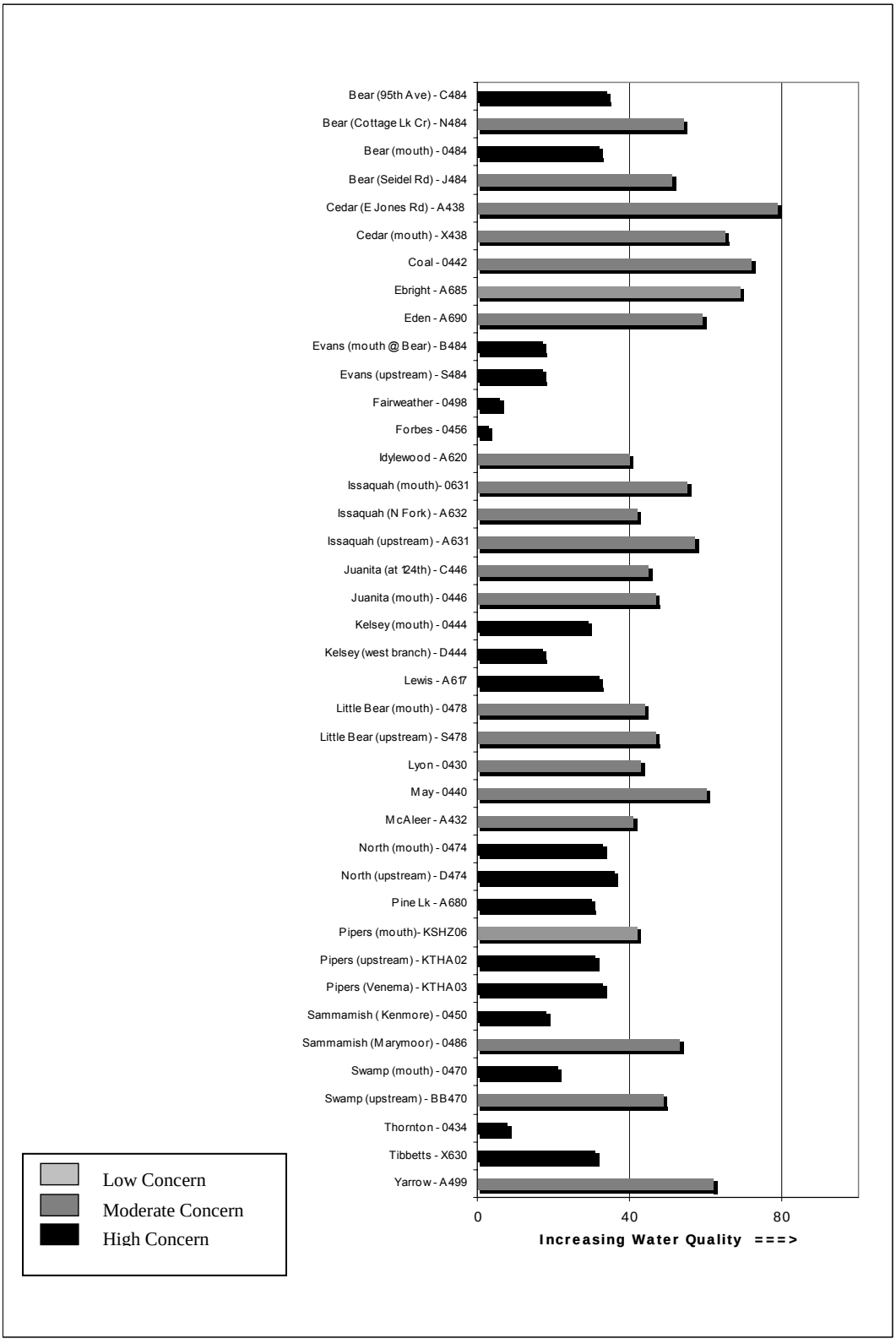


Figure D-16. Water Quality Index Rankings for Rivers and Streams in WRIA 8, 2004–2005

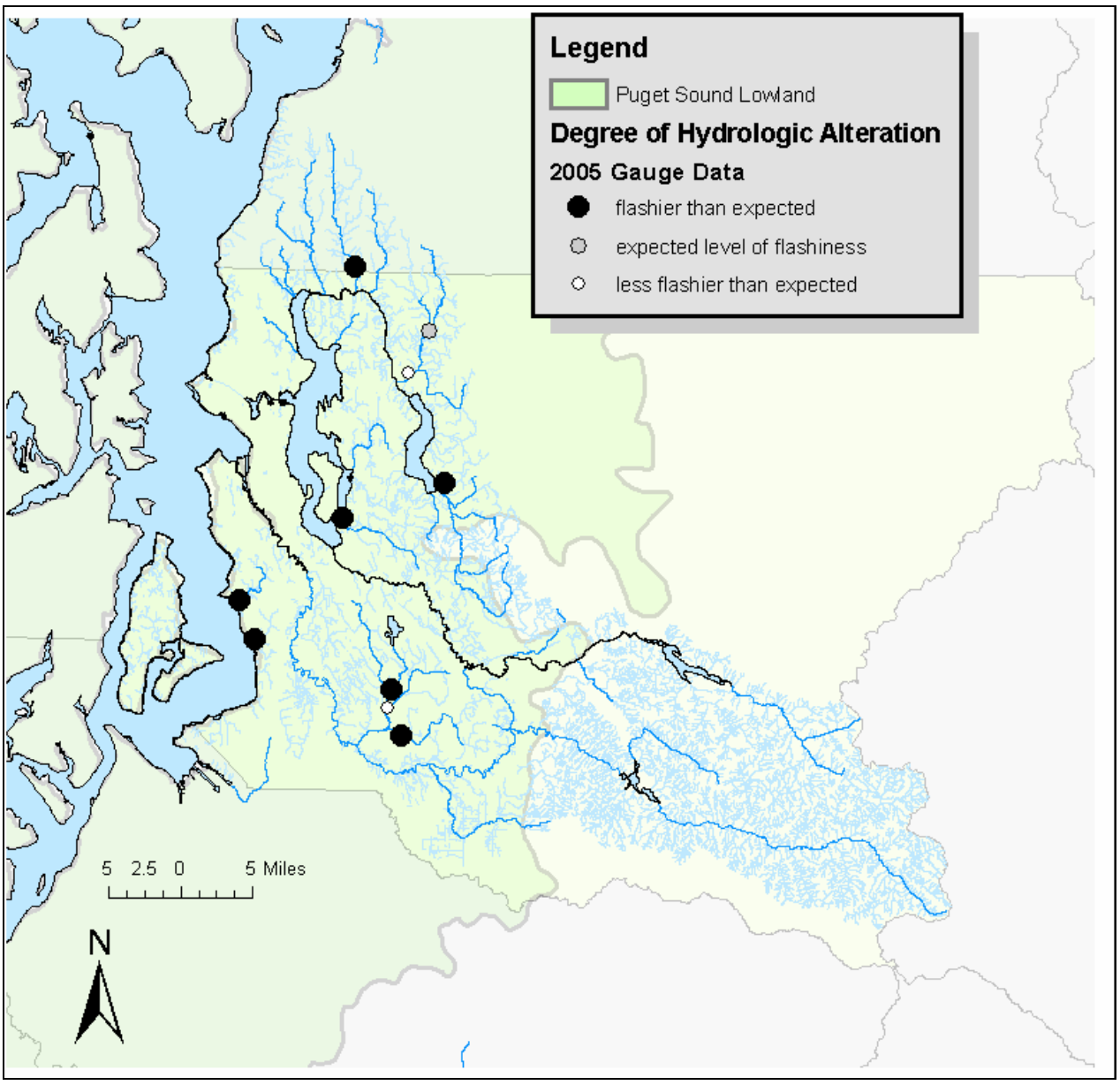


Figure D-17. Comparison of 2005 Stream Flashiness to Modeled Simulation of Flashiness in a Fully Forested Watershed

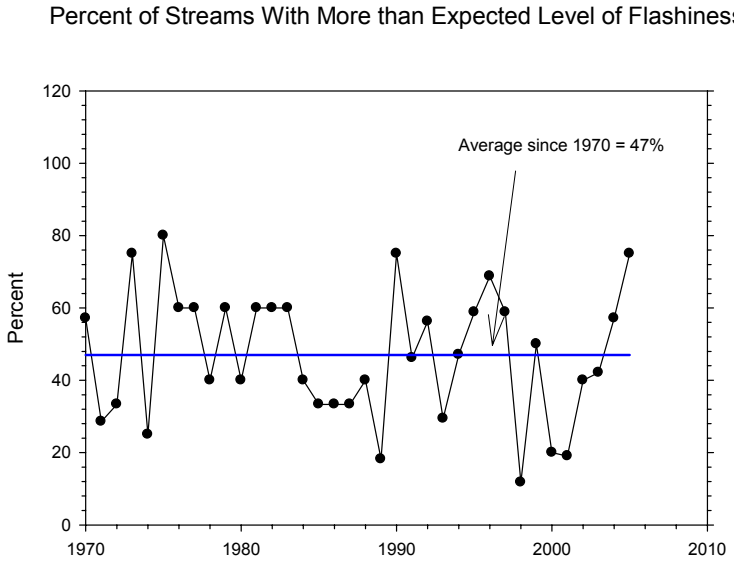


Figure D-18. Percentage of Times Stream Flashiness Was Greater Than Flashiness in Fully Forested Model Simulation, 1970–2005