

Regional Wastewater Services Plan

2010 Annual Report

September 2011



King County

Department of Natural Resources and Parks
Wastewater Treatment Division

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Executive Summary

The Regional Wastewater Services Plan (RWSP) 2010 Annual Report summarizes the progress made during 2010 in implementing the plan's major programs and projects. The report is presented in accordance with the RWSP reporting policies outlined in Ordinance 15384 and King County Code 28.86.165 and is the 11th RWSP annual report that the Wastewater Treatment Division (WTD) has prepared.¹

Highlights of RWSP implementation in 2010 include the following:

- Significant progress was made on the Brightwater Treatment System, including starting equipment and system testing at the treatment plant and completing the conveyance system's West Tunnel.
- National Pollutant Discharge Elimination System (NPDES) permit applications for the Brightwater Treatment Plant and Brightwater Reclaimed Water were submitted to the Washington State Department of Ecology (Ecology).
- Progress was made on six RWSP conveyance system improvement projects in various stages of project development, design, or construction.
- The King County Department of Natural Resources and Parks recommended four projects to control combined sewer overflows in Puget Sound.
- The Lower Duwamish Waterway Group, which consists of King County, the City of Seattle, the Port of Seattle, and the Boeing Company, completed and issued the Lower Duwamish Waterway Draft Final Feasibility Study for public comment.
- Approximately 119,000 wet tons of biosolids were produced at South and West Point treatment plants, all of which was recycled and used beneficially as a fertilizer and soil amendment for forestry and agricultural applications or used to make compost.
- Over 300 million gallons of reclaimed water was produced at the South, West Point, and Carnation treatment plants and used for landscape irrigation, wetland enhancement, and industrial processes.

Background

King County adopted the RWSP in 1999 to ensure that the regional wastewater system keeps pace with growth and protects public health, the environment, and the economy. The RWSP outlines programs and projects through 2030, such as building the Brightwater Treatment System to accommodate growth in the northern portion of the wastewater service area; making improvements to the County's regional conveyance system to meet the 20-year peak storm design standard and accommodate increased wastewater flows; and controlling combined sewer overflows (CSOs) so that an average of no more than one untreated discharge occurs per year at each CSO site by 2030. The RWSP provides guidance on recovering and recycling beneficial resources from the wastewater treatment process, such as reclaimed water, biosolids, and

¹ Previous RWSP annual reports are available at <http://www.kingcounty.gov/environment/wtd/Construction/planning/rwsp/Library.aspx>.

digester gas, and also provides direction on protecting and monitoring water quality and meeting permit standards. The adopted policies that guide RWSP implementation are in King County Code 28.86.010 through 28.86.180.

More information on the RWSP is available at <http://www.kingcounty.gov/environment/wtd/Construction/planning/rwsp.aspx>.

Brightwater Treatment System

The Brightwater Treatment System is the largest expansion of the County's regional wastewater system in nearly 50 years. The Brightwater system includes a treatment plant, an influent pumping station, a 13-mile conveyance pipeline, and a mile-long marine outfall in Puget Sound.

Significant progress was made on this project in 2010 and includes the following:

- Completed construction of the treatment plant's liquids and solids facilities' structures
- Began treatment plant equipment and system testing
- Completed mining of the West Tunnel
- Completed all contract work for the conveyance system's East Tunnel
- Completed startup planning and began staff training
- Continued construction on the Environmental Education Community Center and began landscape installation along the perimeter of the treatment plant.

Brightwater monthly reports were submitted to the King County Council in accordance with RWSP reporting policies. These reports describe the scope, schedule, status, and budget performance of the Brightwater project.

The January 2011 Brightwater Cost Update forecasts that the lifetime cost estimate for the Brightwater project is \$1.849 billion, which represents a 1.8 percent increase over the January 2010 cost update (see information on Brightwater Cost Update later in this report).

More information on the Brightwater Treatment System is available at <http://www.kingcounty.gov/environment/wtd/Construction/North/Brightwater.aspx>

Conveyance System Improvements

In 2010, six RWSP conveyance system improvement (CSI) projects were in various stages of project development, design, or construction. In addition, WTD acquired the Central Plateau Interceptor from the City of Renton.²

A summary of activities and project descriptions of the CSI capital projects that were active in 2010 follows.

Bellevue Pump Station Upgrade and Force Main Installation

This project includes construction of a new force main and replacement of a pump station. The refurbished pump station's capacity was increased by 60 percent and is able to convey more than 13 million gallons of wastewater daily from west and central Bellevue to the South Treatment Plant. The project was substantially complete in December. Therefore, this is the last year it will be included in the RWSP annual report.

As of Dec. 31, 2010, the lifetime project cost was \$34.5 million, which is consistent with what was reported in the RWSP 2009 Annual Report.

More information on the Bellevue Pump Station Upgrade and Force Main Installation project is available at

<http://www.kingcounty.gov/environment/wtd/Construction/Completed/Bellevue.aspx>.

Kent-Auburn Conveyance System Improvements

This project will construct approximately three miles of new sewer in Auburn, Kent, Algona, and Pacific. The project consists of four individual pipelines that will be built in two phases. Phase A includes construction of Stuck River Trunk and Kent East Diversion Hill pipelines, and Phase B includes construction of Pacific Pump Station Discharge and Auburn West Interceptor Parallel pipelines.

Efforts in 2010 focused on acquiring easements for Phase B pipelines. Construction on Phase A pipelines is expected to begin in 2013; construction on Phase B pipelines is expected to begin after 2014.

As of Dec. 31, 2010, the lifetime project cost estimate for the work associated with completing Phase A pipelines and through 50 percent of design and easement acquisition of Phase B pipelines was \$21 million, which is consistent with the project's baseline budget and what was reported in the RWSP 2009 Annual Report.

More information on the Kent-Auburn Conveyance System Improvements project is available at <http://www.kingcounty.gov/environment/wtd/Construction/South/KentAuburn.aspx>.

² The purchase conformed with RWSP Conveyance Policy-5, which calls for applying uniform criteria throughout its service area for the financing, development, ownership, operation, maintenance, repair, and replacement of all conveyance facilities; the criteria are provided in King County Code 28.86.060.

Sunset and Heathfield Pump Stations Upgrades

This project will increase capacity at the Sunset and Heathfield pump stations to ensure adequate capacity to continue to safely and reliably convey wastewater flows from Sammamish, Issaquah, and Bellevue to the South Treatment Plant.

Efforts in 2010 focused on finalizing the scope of work with the design consultant, conducting technical analyses of existing equipment, and beginning to develop preliminary alternatives.

As of Dec. 31, 2010, the planning-level cost estimate for the project is \$81 million. The cost estimate increased by about \$10 million from what was reported in the RWSP 2009 Annual Report; the increase is attributed to a more developed scope of work. The baseline budget for the project will be developed at the end of predesign.

More information on the Sunset and Heathfield Pump Stations Upgrades project is available at <http://www.kingcounty.gov/environment/wtd/Construction/East/SunsetHeathfield.aspx>.

Bellevue Influent Trunk Improvement

This project will construct a parallel Bellevue Influent Trunk (BIT) with expanded capacity to serve the rapidly growing downtown Bellevue area and meet the RWSP's design standard for the separated conveyance system. The BIT will convey flows to the newly upgraded Bellevue Pump Station. The project also includes design and construction of a new portion of the City of Bellevue's West Central Business District (CBD) Trunk. Under a cost share agreement, the City of Bellevue will cover the costs associated with the improvements to the West CBD Trunk and also share a portion of the design, construction, and staff labor costs of the BIT.

Work in 2010 included holding meetings with affected residents and businesses, obtaining necessary permits, completing final design, and advertising the construction contract. Construction is scheduled to begin in 2011.

As of Dec. 31, 2010, the project's baseline budget is \$6.5 million, which is about \$2.3 million more than the planning-level estimate that was reported in the RWSP 2009 Annual Report. This change is largely attributed to a different project alternative and construction methods than used in the planning-level scope.

More information on the Bellevue Influent Improvement project is available at <http://www.kingcounty.gov/environment/wtd/Construction/East/BellevueInfluentTrunk.aspx>.

North Creek Pipeline

This project will replace a 14,275-foot segment of pipeline that carries wastewater from a large portion of south Snohomish County to King County's regional system. As reported in the RWSP 2009 Annual Report, the County will assume responsibility for managing design and construction of the project from the Alderwood Water and Wastewater District (AWWD).

Activities in 2010 focused on continuing to work with AWWD to transfer the consultant design contract to King County.

As of Dec. 31, 2010, the lifetime project cost estimate was \$49 million, which is consistent with what was reported in the RWSP 2009 Annual Report. The project's lifetime budget will be updated in 2011.

Decennial Flow Monitoring

RWSP conveyance policies call for WTD to conduct systemwide flow monitoring in the separated conveyance system every 10 years to correspond with the Federal Census. The Decennial Flow Monitoring project began in 2009 to collect accurate flow data over two wet seasons coincident with the 2010 census. Data from the Decennial Flow Monitoring project will be used to update the prioritization, timing, and sizing of future CSI projects and will also be available to the local agencies for their use in planning and design within their systems.

In 2010, WTD staff continued to monitor the 235 flow meter locations, developed a website with information on the monitoring locations in each local agency, and conducted preliminary analysis of initial flow data. Monitoring will conclude in mid-2011.

As of Dec. 31, 2010, the lifetime project cost estimate was \$5.5 million, which is consistent with what was reported in the RWSP 2009 Annual Report.

More information on the Decennial Flow Monitoring project is available at <http://www.kingcounty.gov/environment/wastewater/CSI/FlowMonitoring/DecennialFM.aspx>.

Infiltration and Inflow Control Program

WTD continues to implement the Executive's Recommended Infiltration and Inflow (I/I) Control Program that was approved by the King County Council through Motion 12292 in May 2006. Efforts in 2010 focused on implementation of an initial I/I reduction project in the Skyway Water and Sewer District. The purpose of the project is to test the effectiveness of I/I reduction on a large scale to determine whether and under what conditions it is possible to cost-effectively remove enough I/I from the collection system to delay, reduce, or eliminate a planned regional CSI project.

The Skyway project includes replacing side sewers serving approximately 334 residential properties; repairing or replacing public sewer mains and manholes; and disconnecting improper storm drainage connections to the sanitary sewer. The project is anticipated to remove enough flow from the local sewer system to eliminate the need to build a regional wastewater storage facility in the area. Construction costs are being shared by King County and the Skyway Water and Sewer District.

Project activities in 2010 included holding public meetings to provide information about the project, obtaining right-of-entry agreements from individual homeowners in the project area, and completing final design. Construction is scheduled to begin in spring 2011 and continue through early 2012.

As of December 31, 2010, the project's baseline budget is \$11 million. The budget reflects a

decrease of approximately \$5 million from what was reported in the RWSP 2009 Annual Report. This decrease results from reduced scope because of budget limitations.

More information on the Skyway initial I/I reduction project is available at <http://www.kingcounty.gov/environment/wastewater/II/InitialProjects/Skyway.aspx>.

Combined Sewer Overflow Control Program

Activities continued in 2010 to implement the County's combined sewer overflow control (CSO) program. The RWSP calls for continued CSO control improvements to meet the Washington State standard of no more than an average of one untreated discharge per year at each CSO location by 2030. Over one-half of the County's 38 CSOs are controlled, and projects to control five additional CSO locations are under way.

This section provides information on progress made to implement the Puget Sound Beach CSO control projects, to complete the 2012 CSO Control Program review and plan update, and to clean up contaminated sediments near CSO sites under the County's sediment management program and the Lower Duwamish Waterway Superfund project.

More information on the County's CSO Control Program is available at <http://www.kingcounty.gov/environment/wastewater/cso.aspx>.

Puget Sound Beach CSO Control Projects

Efforts in 2010 focused on recommending four projects to control combined sewer overflows along Puget Sound. A series of meetings was held with community members in each project area to solicit input on the projects under consideration. The County continues to coordinate closely with the City of Seattle, and residents and businesses in the project areas.

The proposed projects are described below. Baseline budgets for each project will be established at the end of predesign, which is anticipated by the end of 2011.

North Beach CSO Control Project

This project will design and build an underground storage pipeline in the rights-of-way in Northwest Blue Ridge Drive and Triton Drive Northwest in Seattle. The facility will store about 230,000 gallons of peak flows when the North Beach Pump Station reaches maximum capacity. After storms have passed, stored flows will be transferred to the pump station for conveyance to King County's Carkeek Wet Weather Treatment Facility for on-site treatment or transfer to the West Point Treatment Plant for treatment.

More information on the North Beach CSO Control Project is available at <http://www.kingcounty.gov/environment/wtd/Construction/Seattle/NBeachCSOStorage.aspx>.

South Magnolia CSO Control Project

This project will design and build an underground storage tank in the Smith Cove Park/West Yard area south of the Magnolia Bridge in Seattle. The facility will store about 1.8 million gallons of peak flows when the South Magnolia Trunk Line reaches maximum capacity. After

storms have passed, stored flows will be transferred to the Interbay Pump Station for conveyance to the West Point Treatment Plant.

More information on the South Magnolia CSO Control Project is available at <http://www.kingcounty.gov/environment/wtd/Construction/Seattle/SMagnoliaCSOStorage.aspx>.

Murray CSO Control Project

This project will design and build an underground storage tank beneath property across the street from West Seattle's Lowman Beach Park. The facility will store approximately 1 million gallons of peak flows when the Murray Pump Station reaches maximum capacity. After storms have passed, stored flows will be transferred to the Murray Pump Station for conveyance to the West Point Treatment Plant.

More information on the Murray CSO Control Project is available at <http://www.kingcounty.gov/environment/wtd/Construction/Seattle/MurrayCSOStorage.aspx>.

Barton CSO Control Project

This project will design and build green stormwater infrastructure (GSI) to control CSOs in the Barton basin.³ The recommended proposal involves use of planting strips in the city-owned right-of-way in the Sunrise Heights and Westwood neighborhoods in West Seattle. This is the first "green" project that WTD will implement to control CSOs. Bioswales (soils, vegetation, and street trees) will be designed to capture and reduce the amount of peak stormwater flows that enter the combined sewer system.

More information on the Barton CSO Control Project is available at <http://www.kingcounty.gov/environment/wtd/Construction/Seattle/BartonCSO-GSI/Design.aspx>.

CSO Control Program Review and Plan Update

Progress was made in 2010 on the work to complete the 2012 CSO Control Program review and plan update. The RWSP calls for conducting a program review prior to submitting a CSO control plan update to Ecology; the update is required with each NPDES permit renewal application (about every five years) for the West Point Treatment Plant.

Activities focused on developing conceptual alternatives to control the County's remaining 14 uncontrolled CSOs. Seattle Public Utilities (SPU) is also updating its CSO control plan, and WTD and SPU are working to identify potential joint projects. Workshops with interested parties were held on CSO treatment technologies and new science that are being considered in the program review. Informational meetings were also held with neighborhood, environmental, and business groups. The program review and plan update is expected to be transmitted to Council in spring 2012.

More information on the CSO Control Program Review and Plan Update is available at <http://www.kingcounty.gov/environment/wastewater/CSO/ProgramReview.aspx>.

³ Green stormwater infrastructure refers to engineered infrastructure at a smaller scale, such as rain gardens and green roofs. These practices make use of soils and vegetation, in combination with other approaches such as rain barrels and permeable pavement, to infiltrate, evaporate, capture, and reuse stormwater.

Sediment Management Program

As a part of RWSP implementation, WTD is carrying out a Sediment Management Program (SMP) to remediate contaminated sediments near CSO outfalls. Most of the contamination occurred in the early to mid-1900s. The SMP addresses sediment contamination cleanups that are required under the federal Comprehensive Environmental Response, Compensation, and Liability Act (Superfund) and state Model Toxic Control Act regulations. The SMP's 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.

Activities in 2010 included the following:

- Completed five years of post-construction monitoring at the Diagonal/Duwamish cleanup site
- Completed sampling of East Waterway Superfund site sediments to fill in data gaps
- Continued pollution source control efforts along the East Waterway
- Began sediment transport modeling and risk assessment efforts.

More information on the County's Sediment Management Program is available at <http://www.kingcounty.gov/environment/wastewater/SedimentManagement.aspx>.

Lower Duwamish Waterway Superfund Site

The 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. The County is partnering 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.

Efforts in 2010 focused on completion and issuance of the Lower Duwamish Waterway Draft Final Feasibility Study, which describes the 11 cleanup alternatives being considered for the Lower Duwamish. The EPA will propose a cleanup plan in early 2012 based on the alternatives analyzed in the feasibility study.

In 2010, the County added three years of expanded source control work to the project's budget. King County's Industrial Waste Program will coordinate this work to identify and control the sources of pollution that may pose health or environmental problems if they accumulate in Duwamish Waterway sediments or recontaminate cleanup areas.

More information on the Lower Duwamish Waterway cleanup efforts is available at <http://www.kingcounty.gov/environment/wastewater/Duwamish-waterway.aspx>.

Odor Prevention and Control Program

RWSP policies guide King County in achieving its goal of preventing and controlling odor occurrences at all wastewater treatment plants and associated conveyance facilities. To achieve this goal, the policies provide direction on implementing an odor prevention program that goes beyond traditional odor control. RWSP policies also call for including in annual reports a summary of odor complaints.

Efforts in 2010 focused on continuing to monitor and make adjustments to odor control improvements made at the West Point and South treatment plants in 2007 and 2008.

WTD received and investigated 33 odor complaints in 2010. Of these complaints, only 18 were determined to be attributable to WTD facilities. All but one of these was identified and resolved promptly. There were no complaints associated with the West Point, Vashon, or Carnation treatment plants.

More information on WTD's Odor Prevention and Control Program is available at <http://www.kingcounty.gov/environment/wtd/Response/OdorControl/GoodNeighbor.aspx>.

Biosolids Recycling Program

Biosolids are the nutrient-rich organic material produced by treating wastewater solids. After being processed and treated, biosolids are used beneficially as a fertilizer and soil amendment. RWSP biosolids policies encourage 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.^{4,5}

In 2010, approximately 119,000 wet tons of biosolids were produced at the South and West Point treatment plants, all of which was recycled and used beneficially as a fertilizer and soil amendment for forestry and agricultural applications or used to make compost. The sale of biosolids generated more than \$150,000 in fertilizer revenue from customers.

The biosolids were used as a fertilizer or soil amendment for a variety of applications:

- 5,314 acres of dryland wheat in Douglas County as part of the Boulder Park Soil Improvement Project
- 3,230 acres of hops, orchards, and wheat at Natural Selection Farms located in the Yakima Valley
- 357 acres of state forestlands in King and Snohomish counties and 1,072 acres of Douglas-fir plantations in Hancock's Snoqualmie Forest as part of the Mountains to

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 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.

Sound Greenway Biosolids Forestry Program.

Other accomplishments in 2010 include the following:

- Developing an inventory of organic residuals and degraded lands managed by the County, with the objective of partnering with other county agencies to improve soils, sequester carbon, and reduce costs of managing residuals.
- Selecting new biosolids trucks and trailers through a competitive process to replace the aging fleet. The trucks will meet new standards set by the EPA for mono-nitrogen oxides (NO_x, atmospheric pollutants). The NO_x emissions from the new fleet will be about 95 percent less than the emissions from the existing fleet.
- Designing a project at the West Point Treatment Plant to meet amendments made to the state's biosolids management rule (WAC 173-308-205). The project will upgrade and replace the screening equipment that filters out trash and other debris to remove manufactured items that remain relatively unchanged during wastewater or solids treatment processes, such as plastic, metals, and ceramics. The project will protect the quality of WTD's biosolids as well as other process equipment. Construction is expected to be complete in 2014.
- Completing final design on the West Point Treatment Plant Digestion System Improvements project. The project will enhance the reliability of the West Point plant's solids digestion system and reduce the risk of digester upsets under current and future solids loading conditions. The project is expected to be complete by the end of 2012.

More information on WTD's Biosolids Recycling Program is available at <http://www.kingcounty.gov/environment/wastewater/Biosolids.aspx>.

Energy Recovery and Efficiency Program

RWSP policies call for the County to use digester gas, an energy-rich methane gas naturally produced as a byproduct of solids treatment, for energy and other purposes where cost-effective. The South and West Point treatment plants continue to use digester gas to generate heat, electricity, and natural gas. Energy audits of WTD facilities that are high energy users are under way. The goal of the audits is to identify opportunities to increase energy efficiencies.

At South plant, digester gas is also used in conjunction with natural gas to generate electricity using an on-site cogeneration facility. If the cogeneration facility is not in use, the excess gas produced is "scrubbed" to the quality required for pipeline natural gas and then sold to Puget Sound Energy (PSE). The scrubbing system was out of service during the last quarter of 2010. WTD sold 1.91 million therms of natural gas to PSE the first three quarters of the year, which is enough to serve more than 2,300 typical Seattle homes.

In 2010, work continued on the West Point plant's Waste-to-Energy project, which will install a new cogeneration facility that uses digester gas to generate electricity. The project's two internal combustion engines have the ability to produce up to 4.6 megawatts of electricity. The amount of digester gas used at the plant will increase significantly once the engines start producing

electricity and heat in early 2012.

Other activities in 2010 include the following:

- Began replacement of preaeration blowers at the West Point plant with more efficient blowers. This effort is being funded by a combination of an Energy Efficiency and Conservation Block Grant (EECBG) award and a conservation-based incentive payment from Seattle City Light.
- Began work, with the help of incentive funding from PSE, to replace up to three secondary aeration blowers at South plant with more efficient models.
- Started the West Point plant's Investment Grade Audit (IGA) that will lead to a guaranteed cost and energy savings project for replacing the solids dewatering and conveyance systems. The IGA is partially funded through an EECBG Grant.
- Reviewed findings of a consultant's energy audit of South plant, and evaluated equipment added since the audit to identify further opportunities for energy efficiency.

More information on WTD's energy recovery efforts is available at <http://www.kingcounty.gov/environment/wastewater/EnergyRecovery.aspx>.

Reclaimed Water Program

The RWSP encourages the County to explore ways to increase the use of reclaimed water at its existing and future wastewater treatment facilities. Information on the County's Reclaimed Water Program is available at

<http://www.kingcounty.gov/environment/wastewater/ResourceRecovery/ReWater.aspx>.

Reclaimed Water from Existing and Future Treatment Plants

South Treatment Plant

The South Treatment Plant produced approximately 87 million gallons of reclaimed water in 2010. The majority of the water was used at the plant for process water and irrigation, typically saving an estimated \$80,000–\$90,000 (depending on annual water usage at the plant) per year in potable water costs. Approximately 3 million gallons was sold to the City of Tukwila for irrigation of the Starfire Sports Complex and for city public works uses such as street sweeping and sewer flushing. WTD charged Tukwila \$0.92 (non-peak season) and \$1.42 (peak season) per 100 cubic feet of reclaimed water.

West Point Treatment Plant

The West Point Treatment Plant produced approximately 190 million gallons of reclaimed water in 2010. All of the reclaimed water produced is used at the plant site for process water and irrigation, typically saving an estimated \$440,000–\$575,000 (depending on annual water usage at the plant) in potable water costs per year.

Carnation Treatment Plant

In 2010, the Carnation Treatment Plant discharged approximately 30.6 million gallons of

reclaimed water to a wetland in the County's Chinook Bend Natural Area.

Brightwater Treatment Plant

By summer 2013, the Brightwater Treatment Plant will be producing reclaimed water that could be used in select locations in the Sammamish Valley and Bothell for irrigating golf courses, soccer fields, nurseries, farms and for commercial and industrial uses.

Reclaimed Water Comprehensive Plan

Efforts continued in 2010 to determine whether the County's existing reclaimed water system should expand. Activities focused on developing conceptual reclaimed water strategies to serve potential uses for reclaimed water that were identified in 2009. In late 2010, WTD proposed planning-level engineering, economic, and environmental analyses be conducted on three of the conceptual strategies.

More information on the Reclaimed Water Comprehensive Plan can be found at <http://www.kingcounty.gov/environment/wastewater/ReclaimedWater/CompPlan.aspx>.

RWSP Cost Estimates

This section presents an update of the RWSP cost estimates through the year 2030. The cost estimates range in level of accuracy from planning level to final construction because they are for projects in various stages of development, including planning, predesign, final design, and construction, and for completed RWSP projects.

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 significantly as more detailed information becomes available.⁶

Table 1 compares 2010 and 2009 RWSP cost estimates. A challenge to providing a useful comparison of costs is that the RWSP is an ongoing plan that includes expenditures incurred in the past plus expenditures planned for the future. In presenting the comparison shown in Table 1, expenditures that have occurred through 2010 are included at their original value and future expenditures, planned for 2011 to 2030, are adjusted for inflation to a base year of 2010.

Tables 2 through 5 present cost estimates by four categories: (1) completed RWSP projects; (2) Brightwater cost update; (3) RWSP projects in design or construction; and (4) RWSP projects planned for the future. Presenting costs this way provides a means to track incurred, current, and future costs separately. Because some categories present costs in nominal dollars and others in base-year or constant dollars, the sum of these categories will not yield a meaningful total cost comparison as is done with the estimates in Table 1.

Comparing 2010 and 2009 Cost Estimates

Table 1 summarizes the 2010 RWSP cost estimates and compares them to the 2009 cost

⁶ Costs for projects in planning can have a "ball park" estimate in the range of -50 to +100 percent.

estimates. The 2010 estimate for implementing the projects and programs associated with the RWSP through 2030 is approximately \$3.54 billion in 2010 dollars, an increase of about \$51 million, or 1.46 percent, from the 2009 RWSP cost estimate of \$3.49 billion in 2010 dollars. The change is largely attributed to (1) an increase in Brightwater costs, primarily due to changes in state legislation that require recalculation of the Manufacturing & Equipment sales tax exemption on equipment that will be used at Brightwater to create reclaimed water and biosolids, and (2) more developed scopes of work for projects that were in the planning or project development phase in 2009.

Table 1. Comparison of 2010 and 2009 RWSP Cost Estimates, 1999–2030 (million dollars)

RWSP Element	2009 RWSP Estimates (2009\$)	2009 RWSP Estimates (2010\$)	2010 RWSP Estimates (2010\$)	Cost Change (2010\$)
Total RWSP	\$3,443	\$3,490	\$3,541	\$51
Total Brightwater Treatment System^a	\$1,799	\$1,812	\$1,849	\$37
Brightwater Treatment Plant	\$662	\$667	\$667	--
Brightwater Conveyance	\$886	\$892	\$929	\$37
Land and Right-of-Way	\$104	\$104	\$104	--
Mitigation	\$148	\$148	\$148	--
Total Treatment & Odor Control Improvements	\$190	\$194	\$193	(\$1)
Phase I & II Odor Control at South Plant (completed)	\$8	\$8	\$8	--
West Point Odor Control (completed)	\$1	\$1	\$1	--
West Point Digestion Improvements	\$11	\$11	\$10	(\$1)
King Street Regulator Odor Control (completed)	\$7	\$7	\$7	--
South Plant Expansion	\$116	\$119	\$119	--
Vashon Treatment Plant Upgrade (completed)	\$23	\$23	\$23	--
Carnation Treatment Plant (completed)	\$21	\$21	\$21	--
Chinook Wetlands Enhancement (completed)	\$3	\$3	\$3	--
Total Conveyance System Improvements (CSI)	\$856	\$872	\$883	\$11
Completed CSI projects, acquisitions, and planning	\$249	\$249	\$249	--
CSI projects in design or construction	\$213	\$218	\$216	(\$2)
Planned CSI projects, acquisitions, and planning	\$394	\$406	\$418	\$12
Total Infiltration/Inflow (I/I) Reduction^b	\$42	\$42	\$42	--
Total Combined Sewer Overflow (CSO) Control	\$488	\$502	\$509	\$7
CSO Control Projects ^c	\$425	\$438	\$438	--
CSO Planning and Updates	\$11	\$11	\$14	\$3
Sediment Management/Lower Duwamish Superfund	\$52	\$53	\$57	\$4
Total Reclaimed Water	\$41	\$42	\$41	(\$1)
Technology Demonstration (completed)	\$1	\$1	\$1	--
Existing Reclaimed Water Program	\$5	\$5	\$4	--
Water Reuse Satellite Facility (canceled)	\$5	\$5	\$5	--
Reclaimed Water Backbone	\$26	\$27	\$26	(\$1)
RWSP Water/Wastewater Conservation (completed)	\$1	\$1	\$1	--
Reclaimed Water Comprehensive Plan	\$3	\$3	\$3	--
Water Quality Protection (completed)	\$16	\$16	\$16	--
Habitat Conservation Plan (HCP)/ Programmatic Biological Assessment	\$8	\$8	\$8	--
RWSP Planning and Reporting	\$3	\$3	\$2	--

Notes: Projects shown are not exhaustive, but are listed to illustrate changes. Totals may not add due to rounding to the nearest million.

^a The Brightwater cost estimates are shown in constant dollars to be consistent with other components of total RWSP costs. Table 3 presents Brightwater costs in nominal dollars, consistent with the Brightwater Cost Update: Current Conditions and Trends, January 2011.

^b Costs for the initial I/I reduction projects are funded by the CSI program in accordance with the recommended I/I program approved by the King County Council in 2006; therefore, costs associated with these projects are not shown in this line item.

^c The 2009 and 2010 cost estimates for the CSO control projects are the 1998 planning-level estimates adjusted for inflation. Baseline budgets for the Puget Sound Beach CSO control projects will be established at the end of pre-design, which is anticipated by the end of 2011. Cost estimates for the remainder of the CSO control projects are expected to be updated as part of the 2012 CSO Control Program review and plan update.

Completed RWSP Projects

Table 2 summarizes the expenditures associated with completed projects as of Dec. 31, 2010. Only one project was completed in 2010, the acquisition of the Central Plateau Interceptor.

Table 2. Expenditures for Completed RWSP Projects (million dollars)

	Expenditures as of December 31, 2010
Total completed projects	\$376
Completed CSI projects, acquisitions, planning	\$249
Completed treatment and odor control projects	\$64
Completed reclaimed water projects	\$7
Completed I/I pilot study projects/program	\$40
Completed water quality protection	\$16

Note: Expenditures are shown at their original value. Totals may not add because of rounding to the nearest million.

Brightwater Cost Update

The January 2011 Brightwater Cost Update marks the 10th cost update prepared for the Brightwater project. It describes construction trends through January 2011, identifies the costs associated with these trends, and compares costs to those presented in the January 2010 Brightwater Cost Update. Compared to the January 2010 update, the current cost estimate represents an increase of \$0.9 million in treatment plant costs and an increase of \$32.5 million in conveyance costs, for a net increase of \$33.4 million or 1.8 percent (Table 3).

Table 3. Comparison of Brightwater Cost Estimates Since January 2010 (million dollars)^a

Brightwater Component	January 2010	January 2011	Dollar Change	Percent Change	December 2010 OMC ^b Estimate
Treatment	\$884.2	\$885.1	\$0.9	0.1%	\$895–\$904
Conveyance	\$931.6	\$964.1	\$32.5	3.5%	\$919–\$951
Total	\$1,815.8	\$1,849.2	\$33.4	1.8%	\$1,814–\$1,856

^a Totals may not add due to rounding.

^b Oversight monitoring consultant.

When analyzing the \$33.4 million net cost increase, it is important to note that \$31.2 million of this increase is attributed to changes in state legislation that require recalculation of the Manufacturing & Equipment sales tax exemption on equipment that will be used at Brightwater to create reclaimed water and biosolids.

More information on the January 2011 Brightwater Cost Update is available at <http://www.kingcounty.gov/environment/wtd/Construction/North/Brightwater/Description/BW-2011-trend.aspx>.

RWSP Projects in Design or Construction

Table 4 shows RWSP cost estimates of projects in design or construction as of Dec. 31, 2009, and as of Dec. 31, 2010. These projects were included as part of the 2010 and 2011 King County

adopted budgets, respectively. The cost estimates are shown in inflated dollars for both actual expenditures and projected costs. The expenditures are included at their original value.

The cost estimate for all projects in design or construction in 2010 is \$363 million, an increase of \$8 million from the 2009 estimate of \$355 million. This change is the net result of increases and decreases in costs of some of the projects in design and of placing the Black Diamond Storage project on hold. This project is on hold until the City of Black Diamond releases a schedule detailing when development permits will be issued and construction will occur for the master-planned areas of the city. At that time, WTD will work with the city to determine when the project is needed to meet the city's wastewater capacity needs. The 2010 cost estimate for the project is included in Table 5, RWSP Projects Planned for the Future.

Table 4. RWSP Projects in Design or Construction (million dollars, inflated)

	2009 Cost Estimates ^a	2010 Cost Estimates ^b	Cost Change
Total Costs for RWSP Projects in Design/Construction	\$355	\$363	\$8
Total Conveyance Projects	\$228	\$231	\$3
Bellevue Pump Station Upgrade and Force Main Installation	\$34	\$37	\$2
Kent-Auburn Conveyance System Improvements (Phase A and Phase B pipelines) ^c	\$51	\$52	\$1
Black Diamond Storage	\$14	--	(\$14)
North Creek Pipeline	\$48	\$49	\$1
Bellevue Influent Trunk Parallel	\$4	\$7	\$3
Sunset/Heathfield Pump Station Replacement and Force Main Replacement	\$71	\$81	\$10
Decennial Flow Monitoring	\$5	\$5	--
Total Treatment and Odor Control	\$11	\$10	(\$1)
West Point Digestion Improvements	\$11	\$10	(\$1)
Total I/I^d	\$2	\$2	--
Total CSO Control Program^e	\$69	\$76	\$7
Sediment Management/Lower Duwamish Superfund	\$57	\$61	\$6
CSO Planning and Updates ^f	\$12	\$15	\$3
Habitat Conservation Plan (HCP)/Programmatic Biological Assessment	\$8	\$8	--
Reclaimed Water	\$34	\$33	(\$1)
Brightwater Reclaimed Water Backbone	\$27	\$26	--
Future Water Reuse	\$5	\$4	(\$1)
Reclaimed Water Comprehensive Plan	\$3	\$3	--
RWSP Planning and Reporting	\$3	\$3	--

Note: Totals are rounded to the nearest million.

^a Project costs in this column reflect costs reported in the 2010–2015 WTD Capital Improvement Plan (CIP) budget submittal (September 2009).

^b Project costs in this column reflect costs reported in the 2011–2016 WTD CIP budget submittal (September 2010).

^c The cost estimate to complete Phase A pipelines and 50 percent design and easement acquisition of Phase B pipelines is approximately \$20 million; the cost estimate to complete Phase B pipelines is approximately \$32 million.

^d These costs reflect projected costs related to flow monitoring for the initial I/I reduction projects; ongoing modeling, cost-benefit analysis, planning, and reporting; public education; and regional I/I clearinghouse and other program related costs. The expenditures associated with the I/I pilot programs are reflected in Table 2, Completed RWSP Projects.

^e Although the Puget Sound Beach CSO control projects were included in the 2010–2015 and 2011–2016 WTD CIP budget submittal, they are not reflected in this table. The baseline budgets for these projects will be established at the completion of pre-design. Because their existing cost estimates reflect planning-level costs developed in 1998 and adjusted for inflation, these project costs are included in Table 5, RWSP Projects Planned for the Future.

^f The change in costs for CSO Planning and Updates is attributed to additional modeling and calibration needs as part of the CSO Program Review and development of system model with SPU, additional staffing needs to respond to the EPA compliance review, amendments to the CSO Program Review consultant contract, inclusion of project contingency, and adding budget for an additional year of the CSO Control Program as part of the six-year CIP budget process.

RWSP Projects Planned for the Future

Table 5 shows 2009 and 2010 planning-level cost estimates for projects planned in the future. The costs are presented in constant dollars.

Table 5. RWSP Projects Planned for the Future (million dollars)

	2009 Cost Estimate (2009\$)	2009 Cost Estimate (2010\$)	2010 Cost Estimate (2010\$)	Cost Change (2010\$)
Total Planned Projects	\$935	\$963	\$975	\$12
Planned conveyance projects ^a	\$394	\$406	\$418	\$12
Planned CSO control projects ^b	\$425	\$438	\$438	--
Planned South Plant expansion ^c	\$116	\$119	\$119	--

^a Conveyance project costs reflect the planning-level cost estimates that were developed as part of the 2007 Conveyance System Improvement Program Update and adjusted for inflation, using the 3 percent per year assumption, to 2010 dollars. The change in costs reflects placing the Black Diamond Storage Facility on hold and including the project's cost estimates in the category of projects planned for the future.

^b CSO control project cost estimates for the planned CSO control projects reflect the 1998 planning-level estimates adjusted for inflation, using the 3 percent per year assumption, to 2010 dollars.

^c South Plant expansion cost estimates reflect the 1998 planning-level estimate adjusted for inflation, using the 3 percent per year assumption, to 2010 dollars.

Productivity Initiative Pilot Program

WTD's Productivity Initiative Pilot Program was developed to identify and implement ways to increase efficiency. This 10-year incentive program applies certain private-sector business practices, including the establishment of an incentive-based cash payment to employees in the wastewater program, to reduce operating costs, increase productivity, and continue a high level of service and environmental protection for WTD's customers.

Positive productivity results were generated during 2010, the 10th and final year of the program. The results marked the eighth time in the past 10 years that employees achieved an established productivity target for the operating program and earned a financial incentive for their work. Since 2001, a savings of \$83.9 million for ratepayers has been achieved.

More information on WTD's Productivity Initiative, including the Productivity Initiative 2010 Annual Report and a comprehensive review report of the program, is available at <http://www.kingcounty.gov/environment/wtd/About/Finances/PI.aspx>.

Permit Compliance

On average, the County's four secondary treatment plants processed about 175 million gallons of wastewater each day in 2010. The West Point, South, and Carnation treatment plants operated without a single violation of their NPDES effluent limits. The Vashon Treatment Plant had one effluent limit violation because of a pH exceedance that occurred on December 12.⁷

⁷ The term "pH" refers to a measure of the acidity of water on a scale of 0 to 14, with 7 representing neutral water. A pH of less than 7 is considered acidic and above 7 is basic, also sometimes called alkaline.

Both the South and West Point treatment plants received the National Association of Clean Water Agencies' (NACWA) Platinum Peak Performance award for attaining 100 percent compliance with the effluent limits established by their respective NPDES permits under the federal Clean Water Act and the state's Water Pollution Control Law. Platinum level awards indicate multiple consecutive years of compliance. To date, the South Treatment Plant has attained 13 years of 100 percent permit compliance, and the West Point Treatment Plant has attained 9. The Carnation Treatment Plant received NACWA's Gold Peak Performance Award for achieving 100 percent compliance with its NPDES permit for the year, and the Vashon Treatment Plant received NACWA's Silver Peak Performance Award for receiving less than five permit violations.

In late 2010, WTD submitted the Brightwater Treatment Plant and Brightwater Reclaimed Water NPDES permit applications to Ecology.

More information on WTD's NPDES permits is available at <http://www.kingcounty.gov/environment/wtd/About/System/NPDES.aspx>.

Sanitary Sewer Overflows and Permit Deviations

Sanitary sewer overflows (SSOs) are discharges of wastewater from separated sewer systems and from combined systems when no rain is occurring or when the overflow is exacerbated by other factors. Permit deviations are occurrences that are not allowed by the NPDES permit, such as lack of disinfection of treated wastewater, but that do not result in a violation of effluent permit limits or overflows of untreated wastewater.

Nineteen SSOs and four permit deviations occurred in 2010. All of the SSOs occurred in the conveyance system at pipes and pump stations.

Causes of the SSOs are as follows:

- Rags, wipes, trash, or other debris, such as grit, rocks, and roots (6 overflows)
- The "Pineapple Express" storm in December (6 overflows)
- Mechanical failures or equipment problems (5 overflows)
- Tide surge (1 overflow)
- Power outage (1 overflow)

The permit deviations occurred at four separate facilities. Operator error contributed to one deviation. Mechanical failure caused two deviations, and the other deviation occurred when control systems diverted a small amount of primary treated flow in response to rapidly increasing flows.

For all SSOs, WTD implemented prompt overflow response procedures, which 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 returned to levels consistent with state Water Quality Standards. WTD reported all SSOs and permit deviations in 2010 to Ecology.

In an effort to eliminate debris from entering the regional wastewater system, WTD provides information on proper trash disposal and what should not be put in the toilet at <http://www.kingcounty.gov/environment/wtd/Education/ThingsYouCanDo/TalkTrash.aspx>.

Combined Sewer Overflow Events

King County's CSOs are regulated through West Point's NPDES permit. WTD submits a report to Ecology each year on annual CSO volumes and frequencies and on progress made to control its CSOs.

In 2010, there were 254 untreated CSO events with a total discharge of 1,317 million gallons (MG), representing a 56 percent reduction from the 1981–1983 baseline volume of 2,339 MG. The major "Pineapple Express" storm that occurred in December resulted in a total discharge of 804.40 MG, or 61 percent of the annual total.

In June 2010, Ecology issued a Notice of Penalty to King County for permit violations that occurred between Sept. 1, 2009, and April 30, 2010, at the County's four CSO treatment plants. Most of the causes of the violations were addressed and corrected immediately; corrections for others are under way.

More information on CSO events in 2010 is provided in the CSO Control Program 2010 Annual Report, which is available at <http://www.kingcounty.gov/environment/wastewater/CSO/Library/AnnualReports.aspx>.

Pollution Source Control Programs

Two source control programs in King County—the King County Industrial Waste Program (KCIW) and the Local Hazardous Waste Management Program (LHWMP)—work to control pollutants at their source, keeping them out of the wastewater system and, in turn, out of surface waters and the environment. KCIW is operated by WTD. LHWMP is a regional partnership under a state-mandated program that complements WTD's efforts to protect water quality.

King County Industrial Waste Program

KCIW regulates industrial wastewater discharged into the King County wastewater system. The program protects surface water and biosolids quality, the environment, public health, and the wastewater system. The program ensures that industries treat wastewater for harmful substances before discharging the wastewater to sewers. To do this, the program issues three main kinds of discharge approvals: letters of authorization, discharge authorizations, and permits.

During 2010, KCIW conducted 448 business and facility inspections and collected more than 2,347 discrete compliance samples. In addition, 126 permits and 292 discharge authorizations were in effect. Notices of Violation were issued to 46 companies and facilities for 93 violations; none of the violations caused NPDES permit exceptions at King County treatment plants.

More information on KCIW can be found at <http://www.kingcounty.gov/environment/wastewater/IndustrialWaste.aspx>.

Local Hazardous Waste Management Program

LHWMP brings together resources from local governments to protect and enhance public health and environmental quality by helping citizens, businesses, and governments reduce the threat posed by hazardous materials. The program is a regional partnership comprising the King County Water and Land Resources and Solid Waste Divisions, Seattle Public Utilities, Public Health–Seattle & King County, and the Suburban Cities Association.

In 2010, the program collected 1,363 tons of household hazardous waste from more than 44,577 customers, and LHWMP continued to run a pilot project targeted at businesses; this program resulted in the collection of over 38 tons of waste from 487 businesses.

More information on LHWMP can be found at <http://www.lhwmp.org/home/>.

Water and Sediment Monitoring

To protect public health and King County’s significant investment in water quality improvements, the County regularly monitors wastewater treatment plant effluent, marine water, fresh water, and sediments. The parameters used to assess a water body’s health under Washington State Water Quality Standards are fecal coliform bacteria, dissolved oxygen, temperature, pH, nutrients, turbidity, and a variety of chemical compounds. Monitoring` results for the previous year are presented as environmental indicators on the Department of Natural Resources and Parks KingStat website at <http://your.kingcounty.gov/dnrp/measures/indicators/default.aspx>.

Overall, water and sediment quality conditions observed in 2010 were largely consistent with those observed in 2009 and in previous years. Key findings in 2010 include the following:

- Wastewater treatment plant effluent met permit requirements.
- Waters in urban streams frequently are warmer than Washington State temperature standards allow, have more bacteria than the standards allow, and occasionally do not have as much oxygen as required by state standards.
- The health of streams, as measured by the diversity and abundance of the community of organisms that live on the stream bottom, is generally worse in streams in areas on the urban side of the urban growth boundary than streams on the rural side of the urban growth boundary.
- Freshwater and Puget Sound swimming beaches occasionally exceeded bacteria guidelines.
- The surface layers of lakes Sammamish, Washington, and Union are warmer during the summer months than Washington State temperature standards allow, and the bottom layers have less oxygen during the summer months than state standards require.
- There were no substantial changes or trends observed for 12 small lakes that were monitored for water quality under interlocal agreement contracts with cities in King County.

In addition, investigations continued to identify the sources of bacteria in Juanita Creek, and new investigations were initiated to identify the sources of bacteria in Issaquah and Idylwood creeks. An investigation was also initiated to identify the sources of excess nutrients in Mileta Creek.

More complete monitoring and data sets and reports are available from the Water and Land Resource Division's Science Section website at <http://www.kingcounty.gov/environment/wlr/sections-programs/science-section/doing-science.aspx>.