

Regional Wastewater Services Plan

2011 Annual Report

September 2012



King County

Department of Natural Resources and Parks
Wastewater Treatment Division

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Executive Summary

The Regional Wastewater Services Plan (RWSP) 2011 Annual Report summarizes the progress made during 2011 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 in King County Code 28.86.165. This is the 12th RWSP annual report that the Wastewater Treatment Division (WTD) has prepared.¹

Highlights of RWSP implementation in 2011 are as follows:

- The Brightwater Treatment Plant began operating on Sept. 6, 2011, and a grand opening was held on Sept. 24, 2011.
- Progress was made on five RWSP conveyance system improvement (CSI) projects in various stages of project development, design, or construction.
- Construction began in April 2011 on the initial infiltration and inflow (I/I) project in the Skyway Water and Sewer District.
- Preliminary design began on four combined sewer overflow (CSO) control projects.
- WTD's recommended plan to control the County's remaining 14 uncontrolled CSOs was issued in October 2011 for public comment.
- Approximately 114,000 wet tons of biosolids were produced at the West Point, South, and Brightwater 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.
- Construction was completed on the West Point Treatment Plant's Waste-to-Energy project. Startup activities will take place in 2012, and the facility is expected to be operating in 2013.
- WTD used over 260,000 therms of digester gas for plant processes and sold approximately 370,000 therms of natural gas to Puget Sound Energy (PSE).²
- Over 320 million gallons (MG) of reclaimed water was produced at the South, West Point, Brightwater, and Carnation treatment plants and used for landscape irrigation, wetland enhancement, and industrial processes.
- 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 National Pollutant Discharge Elimination System (NPDES) permits under the federal Clean Water Act and the state's Water Pollution Control Law.

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

² A therm is a unit of heat energy equal to 100,000 British thermal units. It is approximately the energy equivalent of burning 100 cubic feet of natural gas.

Background

King County adopted the RWSP in 1999 by Ordinance 13860 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 to increase system capacity and function and improve water quality; gives guidance on recovering and recycling beneficial resources from the wastewater treatment process; and provides direction on protecting and monitoring water quality and meeting permit conditions.

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 pump station, a 13-mile-long conveyance pipeline, and a mile-long marine outfall in Puget Sound.

Significant progress was made on this project in 2011, including the following:

- Mining of the Brightwater conveyance tunnels was completed Aug. 16, 2011.
- The Brightwater Treatment Plant began operating on Sept. 6, 2011. Treated effluent is being routed to the South Treatment Plant for discharge into Puget Sound until the Brightwater conveyance system is completed. Effluent quality goals and stringent odor requirements were met in 2011.
- The grand opening of the Brightwater Treatment Plant and the Environmental Education and Community Center was held on Sept. 24, 2011.
- In November 2011, the plant produced its first truckload of biosolids, which was sent to eastern Washington for reuse.

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 2012 Brightwater Cost Update estimates that the lifetime cost estimate for the Brightwater project will be \$1.86 billion, which represents a \$10.7 million or 0.6 percent increase over the January 2011 cost update. (See information on the 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

The purpose of conveyance system improvement (CSI) projects is to increase capacity in areas of the separated conveyance system to meet projected demands and the RWSP 20-year peak flow design standard. In 2011, five RWSP CSI projects were in various stages of project development, design, or construction. The following sections describe these projects and summarize project activities in 2011.

Kent-Auburn Conveyance System Improvements

The Kent-Auburn Conveyance System Improvements 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. Design of Phase A was completed in 2009. Construction of Phase A pipelines is expected to begin in 2013.
- Phase B consists of construction of the Pacific Pump Station Discharge and Auburn West Interceptor Parallel pipelines. This phase has been deferred to at least 2017 to accommodate other near-term capital projects.

Efforts in 2011 focused on acquiring easements for Phase B pipelines.

As of the end of 2011, the lifetime project cost estimate for the work associated with completing the Phase A pipelines and 50 percent of design and easement acquisition for the Phase B pipelines is \$21 million. This is consistent with the project's baseline budget.

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

Sunset and Heathfield Pump Stations Upgrade

The purpose of the Sunset and Heathfield Pump Stations Upgrade project is to address identified capacity needs in the Vasa Park force mains and Sunset and Heathfield pump stations, located in Bellevue. The project will ensure there is adequate capacity to continue to safely and reliably convey wastewater flows from Sammamish, Issaquah, and Bellevue to the South Treatment Plant.

Efforts in 2011 focused on conducting analyses of three project alternatives to upgrade one or both pump stations:

- Upgrading both Sunset and Heathfield pump stations
- Upgrading the Sunset Pump Station using a combination of high-head pumps and two-stage pumps to bypass the Heathfield Pump Station
- Upgrading the Sunset Pump Station with high-head pumps and constructing a new force main to bypass the Heathfield Pump Station.

During third quarter 2011, the project team began to evaluate a fourth alternative: a tunnel that could potentially eliminate the need for both pump stations. This alternative will be further evaluated in 2012. A final project alternative is expected to be selected in early 2013.

There have been no changes to the planning-level cost estimate of \$81 million for the project alternatives that involve upgrading one or both pump stations. The baseline budget for the project will be developed at the end of predesign.

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

Bellevue Influent Trunk Improvement

The purpose of the Bellevue Influent Trunk Improvement project is to construct a pipeline that parallels the Bellevue Influent Trunk (BIT) to serve the rapidly growing downtown Bellevue area and meet the RWSP's 20-year peak flow design standard. 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 CBD Trunk and also share a portion of the design, construction, and staff labor costs of the BIT.

Work in 2011 focused on relocating utilities, installing the new BIT pipe, and working closely with affected neighbors. By the end of the year, construction was over 50 percent complete. Construction is expected to be complete by mid-2012.

As of the end of 2011, the lifetime cost estimate for the project was \$6.3 million, which is slightly below the baseline budget of \$6.5 million.

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

North Creek Interceptor

The North Creek Interceptor project will replace about 12,000 linear feet of a pipeline that carries wastewater from a large portion of south Snohomish County to King County's regional wastewater system. In previous annual reports, this project was referred to as the North Creek Pipeline project. The North Creek Pipeline project was closed in 2011. Under the North Creek Pipeline project, the Alderwood Water and Wastewater District (AWWD) constructed approximately 2,600 feet of the new pipeline under a 2005 interlocal agreement with King County. In 2009, AWWD initiated a process to terminate the construction contracts, and the County assumed responsibility for necessary project redesign and construction. AWWD reached a settlement agreement with the contractor in 2011. In 2011, the county project team continued to work with AWWD to transfer permits, easements, and materials from AWWD to the County.

As part of the North Creek Interceptor project, in 2011, the project team eliminated 2,107 feet of new gravity pipe in the northern section of the existing pipeline from the project's scope of work

because modeling showed that this pipe section is not expected to reach capacity until 2028 or later.

As of the end of 2011, the lifetime project cost of the North Creek Pipeline project was \$29 million and the cost estimate for the North Creek Interceptor project is \$59 million. Construction of the North Creek Interceptor is expected to begin in 2015, and the project is expected to be complete by 2018.

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 flow data over two wet seasons coincident with the 2010 census. Data from the project is being 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.

Data collection from the 235 flow meter locations was completed in May 2011. Because this project was substantially complete in 2011, this is the last year it will be included in the RWSP annual report.

There were no changes in 2011 to the project's budget. As of the end of 2011, the lifetime project cost estimate was \$5.2 million.

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

Infiltration and Inflow Reduction 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. Construction began in April 2011 on the initial I/I 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 and to determine whether and under what conditions it is possible to cost-effectively remove enough I/I from the regional conveyance system to delay, reduce, or eliminate a planned CSI project to increase conveyance capacity.

The Skyway project includes replacing full or partial side sewers serving 298 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 270,000-gallon regional wastewater storage facility in the area. Construction costs are being shared by King County and the Skyway Water and Sewer District.

There were no changes in 2011 to the project's baseline budget of \$11 million. Construction is expected to be complete in 2012. Post-project flow monitoring to assess project results will occur during the 2012–2013 wet season, weather permitting.

Other agencies have expressed interest in learning more about the County's I/I reduction program. During 2011, representatives from agencies in Toronto, Milwaukee, Sacramento, and Bellingham visited the Skyway project.

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

Work continued in 2011 to implement the County's CSO Control 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. One-half of the County's 38 CSOs are controlled, and projects to control CSO locations near Puget Sound beaches 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 CSO Control Program is available at <http://www.kingcounty.gov/environment/wastewater/cso.aspx>.

Puget Sound Beach CSO Control Projects

The projects to control the County's CSOs near Puget Sound beaches are described below, along with highlights of activities that took place in 2011. The County continues to coordinate closely with the City of Seattle, other affected agencies, and residents and businesses in the project areas.

North Beach CSO Control Project

The North Beach CSO Control 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 pipeline will store 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 the Carkeek CSO Treatment Plant and then to the West Point Treatment Plant for treatment. During large storms when West Point is at capacity, flows will be treated at the Carkeek CSO Treatment Plant.

Efforts in 2011 included the following activities:

- Selected a design consultant and began work on preliminary design
- Completed geotechnical borings
- Completed environmental review
- Held public meetings and workshops

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- Completed the project facility plan and obtained approval of the Washington State Department of Ecology (Ecology).

As of the end of 2011, the project's preliminary lifetime budget estimate was \$13 million. The project's baseline budget will be established at the end of predesign in 2012. Construction is expected to begin in 2013.

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

The South Magnolia CSO Control 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 1.3 MG of peak flows when the South Magnolia Trunk 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.

Efforts in 2011 included the following activities:

- Selected a design consultant and began preliminary design
- Completed Phase 1 geotechnical borings
- Completed environmental review
- Held public meetings and workshops
- Completed the project facility plan and obtained Ecology's approval.

As of the end of 2011, the project's preliminary lifetime budget estimate was \$42 million. The project's baseline budget will be established at the end of predesign in 2012. Construction is expected to begin in 2013.

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

The Murray CSO Control 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 1 MG 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.

Efforts in 2011 included the following activities:

- Selected a design consultant and began preliminary design
- Conducted environmental review
- Held public meetings and workshops
- Completed the project facility plan and obtained Ecology's approval

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- Began work to acquire the six properties needed for the storage site; two properties were purchased by the end of the year.

As of the end of 2011, the project's preliminary lifetime budget estimate was \$49 million. The project's baseline budget will be established at the end of predesign in 2012. Construction is expected to begin in 2013.

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

The Barton CSO Control project will design and build green stormwater infrastructure (GSI) to control CSOs in the Barton basin. The project will construct bioretention swales (engineered rain gardens) between sidewalks and curbs in the Sunrise Heights and Westwood neighborhoods in West Seattle. Street runoff will flow into the bioretention swales during rainstorms. The water will then filter through soil to a perforated pipe, which will take the water deep underground and allow it to slowly infiltrate into the soils. The project will reduce the amount of stormwater entering the combined sewer system and help to achieve CSO control at the Barton Pump Station.

Work in 2011 included the following activities:

- Selected a design consultant and began preliminary design
- Held public meetings, workshops, and site visits
- Conducted studies through the use of groundwater monitoring wells and deep infiltration borings to understand soil types, soil layers, and how and where water flows underground
- Completed the project facility plan and obtained Ecology's approval
- Calibrated the stormwater management model that will be used in 2012 to estimate the number of blocks required to meet the CSO control target.

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 2011 on 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 National Pollutant Discharge Elimination System (NPDES) permit renewal application (about every five years) for the West Point Treatment Plant; the next permit renewal will occur in 2014.

WTD began the review of its CSO Control Program in 2009. The review looked at conditions that have changed since the last update to the CSO control plan—conditions such as population and flow, scientific developments, regulations, new technologies, and public priorities. Results of the review were used to produce WTD's recommended plan to control the County's remaining 14 uncontrolled CSOs. The recommended plan was issued for public comment in October 2011.

It includes nine capital projects—seven storage projects and two CSO treatment plant projects. Four of the storage projects would also include analysis of whether GSI could help reduce the required size of the storage structures. Three of the storage projects may be done jointly with the City of Seattle. The planning-level cost estimate to complete these projects by 2030 is \$711 million in 2010 dollars.

WTD solicited public comment through December 2011 on its recommended plan and received the following feedback:

- CSO control is important and protects our region's water quality and public health.
- Support was expressed for controlling CSOs in the Lower Duwamish Waterway sooner than originally planned.
- King County and the City of Seattle should collaborate on projects to save costs and lessen impacts to affected neighborhoods.
- Strong interest was expressed for incorporating GSI where possible.
- Concerns were raised about costs and rate impacts.
- Some people questioned whether CSO control is the best investment for improved water quality.
- Communities in project areas want to be engaged in siting decisions.

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

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 2011 included the following:

- Completed six years of post-construction monitoring at the Duwamish/Diagonal cleanup site on the east side of the Duwamish River, upstream of Harbor Island and immediately downstream of Kellogg Island in the lower portion of the Duwamish River. The cleanup site is stabilizing, as predicted, with the chemical concentrations similar to the surrounding areas. The influence of the ongoing discharges at the site has been far less than expected.
- Completed three years of post-construction monitoring at the Denny Way CSO site on Elliott Bay. The project moved the CSO outfall offshore of the cleanup site, and there has been no evidence of recontamination to date.

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- Completed drafts of the Human Health and Ecological Risk Assessments, Sediment Transport Evaluation Report, and remedial Alternative and Disposal Site Screening memorandum for the East (Duwamish) Waterway Superfund site and worked with the U.S. Environmental Protection Agency (EPA) to finalize the sediment transport evaluation
 - Continued pollution source control efforts along the East Duwamish Waterway
 - Began work on the East Duwamish Waterway remedial investigation report
 - Started work on an update to the Sediment Management Plan to address any cleanup needs at CSO outfalls not included in the 1999 plan; the update is expected to be complete in 2013.

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

Lower Duwamish Waterway Superfund Site

King County continues to work to improve water quality in the Lower Duwamish Waterway through actions such as controlling 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 EPA and Ecology to prepare a remedial investigation and feasibility study for the Lower Duwamish Waterway Superfund site.

Efforts in 2011 focused on completing the Lower Duwamish Waterway Final Feasibility Study, which describes the 11 cleanup alternatives being considered for the Lower Duwamish Waterway. EPA is expected to propose a cleanup plan in early 2013 based on the alternatives analyzed in the feasibility study.

In addition, in 2011, the County started the first of three years of expanded source control work. The Water and Land Resources Division and the King County Industrial Waste Program are working together 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 provide direction on implementing an odor prevention program at all wastewater treatment plants and associated conveyance facilities that goes beyond traditional odor control. RWSP policies also call for including in annual reports a summary of odor complaints.

A major achievement in the County's odor control program is the startup of the Brightwater Treatment Plant. The plant has been constructed with a state-of-the-art odor control system designed to ensure no odors are detected as a result of the plant's operation. As a component of the development agreement with Snohomish County, a Brightwater Air Quality Board was

formed to monitor the plant's performance and to recommend adjustments or improvements to the odor control system if necessary. The plant's stringent odor requirements were met in 2011.

WTD received and investigated 51 odor complaints in 2011. Of these complaints, 16 were determined to be attributable to WTD facilities: six were attributed to conveyance facilities that send wastewater to the South Treatment Plant; nine were attributed to conveyance facilities that send wastewater to the West Point Treatment Plant; and one was attributed to the Vashon Treatment Plant. Fifteen of the complaints were identified and resolved promptly. One complaint of odors near the Fauntleroy Ferry Terminal remains under investigation. No odor complaints were attributable to the Brightwater, South, West Point, or Carnation treatment plants.

The Puget Sound Clean Air Agency identified the use of chicken manure on fields rather than operations at WTD facilities as the source of more than 20 odor complaints that WTD received. The sources of the 14 remaining odor complaints that were not attributable to WTD's facilities were unknown. Some of them were located in areas where there are no WTD facilities.

More information on the 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 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.^{3,4}

In 2011, approximately 114,000 wet tons of biosolids were produced at the West Point, South, and Brightwater 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 \$150,900 in fertilizer revenue from customers.

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

- 5,894 acres of dryland wheat in Douglas County as part of the Boulder Park Soil Improvement Project
- 755 acres of hops, orchards, and wheat at Natural Selection Farms in the Yakima Valley
- 354 acres of state forestlands in King County and 795 acres of Douglas-fir plantations in Hancock's Snoqualmie Forest as part of the Mountains to Sound Greenway Biosolids Forestry Program.

³ 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.

⁴ 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.

Other accomplishments in 2011 include the following:

- WTD awarded Skagit Transportation a 10-year hauling contract for biosolids and treatment facility byproducts following a competitive procurement process.
- The Biosolids Recycling Program began replacing its fleet of haul trucks. Twenty new trucks were delivered to WTD, with five more to be delivered in 2012. The new trucks significantly reduce emissions of nitrogen oxides (NOx), a significant air pollutant.
- Staff worked with a consultant team to develop a brand for the County's biosolids, called Loop. Establishment of a brand provides a platform to communicate the benefits of the biosolids program and product to customers and the region. More information on Loop, the County's biosolids brand, is available at <http://www.loopforyoursoil.com/>.
- Researchers from the University of Washington and Washington State University published findings from a recent project that included the dryland wheat sites that use the County's biosolids. The level of carbon storage in cultivated fields fertilized with biosolids was much greater than expected. Biosolids improved the sustainability of agricultural soils by increasing soil storage of carbon, nitrogen, phosphorus, and water—all of which contribute to enhanced crop yield, water savings, and reduced greenhouse gases.
- Work continued on the design of a project at the West Point Treatment Plant to meet the state's biosolids management rule (WAC 173-308-205) regarding removal of manufactured items, such as plastic, metals, and ceramics, that remain relatively unchanged during wastewater or solids treatment processes. The project will upgrade and replace the screening equipment that filters out trash and other debris to meet the state's requirements. Construction is expected to be complete in 2014.
- Construction began on the West Point Treatment Plant Digestion System Improvements project. The project will enhance the reliability of the 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 the 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 produce heat, electricity, and natural gas. In addition, 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 the South Treatment Plant, digester gas is used to provide fuel to the boiler system that generates heat needed for the treatment process. Any unused digester gas is "scrubbed" to the quality required for pipeline natural gas and then sold to Puget Sound Energy (PSE). WTD used

over 260,000 therms of digester gas for plant processes and sold approximately 370,000 therms of natural gas to PSE in 2011, generating \$189,963 in revenue.

In 2011, construction was completed on West Point Treatment Plant's Waste-to-Energy project, which installed a new cogeneration facility that uses digester gas to generate electricity and heat for the plant. The project's two internal combustion engines have the ability to produce up to 4.6 megawatts of electricity. Startup activities will take place in 2012, and the facility is expected to be operating in 2013.

Other activities in 2011 include the following:

- Continued replacement of preaeration blowers at the West Point plant with more efficient blowers. This effort is expected to be completed in 2012 and was funded by a combination of an Energy Efficiency and Conservation Block Grant (EECBG) award and a conservation-based incentive payment from Seattle City Light.
- Continued work, with the help of incentive funding from PSE, to replace three secondary aeration blowers at South plant with more efficient models.
- Started an Investment Grade Audit (IGA) at the West Point plant 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 the Energy Recovery and Efficiency Program 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 Reclaimed Water Program is available at

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

Reclaimed Water from the County's Treatment Plants

South Treatment Plant

The South Treatment Plant produced 92 MG of reclaimed water in 2011. The majority of the water was used at the plant for process water and irrigation, which saved \$120,000 in potable water costs in 2011. About 2.4 MG of reclaimed water 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.

West Point Treatment Plant

The West Point Treatment Plant produced 195 MG of reclaimed water in 2011. All of the reclaimed water produced was used at the plant site for process water and irrigation, which saved \$900,000 in potable water costs in 2011.

Carnation Treatment Plant

In 2011, the Carnation Treatment Plant discharged 33.5 MG of reclaimed water to enhance a wetland in the County's Chinook Bend Natural Area.

Brightwater Treatment Plant

The Brightwater Treatment Plant began distributing reclaimed water to the plant's Environmental and Education Center in December 2011. Reclaimed water is used at the center for non-drinking purposes such as toilet flushing and landscape irrigation. About 3,000 gallons of reclaimed water were used for these purposes in 2011. When the Brightwater Treatment Plant is fully operational, reclaimed water will be available for use in select locations in the Sammamish Valley and Bothell for irrigating golf courses, athletic fields, nurseries, and farms and for commercial and industrial uses.

Reclaimed Water Comprehensive Planning

The reclaimed water comprehensive planning process continued in 2011. Activities in 2011 focused on responding to requirements of Motion 13483: (1) conducting economic, engineering, and environmental analyses on three reclaimed water strategies, (2) developing reclaimed water policies to guide decisions on any future expansion of the County's reclaimed water system, and (3) identifying alternatives to reclaimed water. The overall goal of these efforts is to determine if, how, when, where, and by what funding mechanisms the existing Reclaimed Water Program should expand.

In October 2011, WTD issued draft reclaimed water policies for public comment through early December 2011. Over 20 interested parties and individuals provided a wide range of comments on the draft policies.

More information on the reclaimed water comprehensive planning efforts is available 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 accuracy from planning level to final construction level 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.⁵

Table 1 compares 2011 and 2010 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,

⁵ Accuracy of cost estimates for projects in planning can range from -50 to +100 percent.

expenditures that have occurred through 2011 are included at their original value and future expenditures, planned for 2012 to 2030, are adjusted for inflation to a base year of 2011.

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.

Comparison of 2011 and 2010 RWSP Cost Estimates

Table 1 lists the 2011 RWSP cost estimates and compares them to the 2010 cost estimates. The 2011 estimate for implementing all the projects and programs associated with the RWSP through 2030 is approximately \$3.63 billion in 2011 dollars, an increase of about \$49 million, or 1.37 percent, from the 2010 RWSP cost estimate of \$3.58 billion in 2011 dollars. The change is largely attributed to (1) more developed scopes of work for CSI projects that were in the planning or project development phase in 2010 and (2) change orders to the Brightwater liquids and solids contracts and non-construction cost increases.

Table 1. Comparison of 2011 and 2010 RWSP Cost Estimates, 1999–2030 (million dollars)

RWSP Element	2010 RWSP Estimates (2010\$)	2010 RWSP Estimates (2011\$)	2011 RWSP Estimates (2011\$)	Cost Change ^a (2010\$)
Total RWSP	\$3,541	\$3,581	\$3,630	\$49
Total Brightwater Treatment System^b	\$1,849	\$1,853	\$1,863	\$10
Brightwater Treatment Plant	\$667	\$669	\$679	\$10
Brightwater Conveyance	\$929	\$932	\$931	(\$1)
Land and Right-of-Way	\$104	\$104	\$104	--
Mitigation	\$148	\$148	\$148	--
Total Treatment & Odor Control Improvements	\$193	\$196	\$196	--
Phase I & II Odor Control at South Plant (completed)	\$8	\$8	\$8	--
West Point Odor Control (completed)	\$1	\$1	\$1	--
West Point Digestion Improvements	\$10	\$10	\$9	--
King Street Regulator Odor Control (completed)	\$7	\$7	\$7	--
South Plant Expansion	\$119	\$123	\$123	--
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)	\$883	\$900	\$936	\$37
Completed CSI projects, acquisitions, and planning	\$249	\$249	\$285	\$36
CSI projects in design or construction	\$216	\$220	\$221	\$1
Planned CSI projects, acquisitions, and planning	\$418	\$430	\$430	--
Total Infiltration/Inflow (I/I) Reduction^c	\$42	\$42	\$42	--
Total Combined Sewer Overflow (CSO) Control	\$509	\$523	\$528	\$5
CSO Control Projects ^d	\$438	\$451	\$451	--
CSO Planning and Updates	\$14	\$14	\$16	\$2
Sediment Management/Lower Duwamish Superfund	\$57	\$58	\$61	\$3
Total Reclaimed Water	\$41	\$41	\$39	(\$2)
Technology Demonstration (completed)	\$1	\$1	\$1	--
Existing Reclaimed Water Program	\$4	\$4	\$4	--
Water Reuse Satellite Facility (canceled)	\$5	\$5	\$5	--
Reclaimed Water Backbone	\$26	\$26	\$24	(\$2)
RWSP Water/Wastewater Conservation (completed)	\$1	\$1	\$1	--
Reclaimed Water Comprehensive Plan	\$3	\$3	\$3	--
Water Quality Protection: Freshwater Assessment Program and Reporting (completed)	\$16	\$16	\$16	--
Habitat Conservation Plan (HCP)/ Programmatic Biological Assessment (completed)	\$8	\$8	\$8	--
RWSP Planning and Reporting	\$2	\$3	\$3	--

Notes: Projects shown are not exhaustive, but are listed to illustrate changes. Totals may not add because of rounding to the nearest million. Parentheses () signify a cost decrease.

^a Cost changes are explained in the sections that follow (completed RWSP projects; Brightwater cost update; RWSP projects in design or construction; and RWSP projects planned for the future).

^b 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 2012.

^c 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.

^d The 2010 and 2011 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 in 2012. Once the baselines are established, costs will be updated in future RWSP annual reports. 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 and will be reflected in the RWSP 2012 Annual Report.

Completed RWSP Projects

Table 2 summarizes the expenditures associated with completed projects as of Dec. 31, 2011. The change from 2010 reflects adding the costs associated with completion of the Habitat Conservation Plan/Programmatic Biological Assessment efforts and completion of the Bellevue Pump Station Upgrade and Force Main Installation project.

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

	Expenditures as of Dec. 31, 2010	Expenditures as of Dec. 31, 2011	Change from 2010
Total completed projects	\$376	\$420	\$44
CSI projects, acquisitions, planning	\$249	\$285	\$36
Treatment and odor control projects	\$64	\$64	--
Reclaimed water projects	\$7	\$7	--
I/I pilot study projects/program	\$40	\$40	--
Water Quality Protection: Freshwater Assessment Program and Reporting	\$16	\$16	--
Habitat Conservation Plan (HCP)/ Programmatic Biological Assessment	--	\$8	\$8

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

Brightwater Cost Update

The January 2012 Brightwater Cost Update marks the 11th cost update prepared for the Brightwater project. It describes construction activities through January 2012, identifies the costs associated with these activities, and compares current costs to those presented in the January 2011 Brightwater Cost Update. The Brightwater lifetime cost estimate as of January 2012 is \$1.86 billion. The current cost estimate represents an increase of \$10.7 million or 0.6 percent over the cost estimate presented in the January 2011 Brightwater Cost Update (Table 3).

Table 3. Comparison of Brightwater Cost Estimates Since January 2011 (million dollars)^a

Brightwater Component	January 2011	January 2012	Dollar Change	Percent Change	December 2011 OMC ^b Estimate
Treatment	\$885.1	\$896.3	\$11.2	1.3	\$886.1
Conveyance	\$964.1	\$963.6	(\$0.5)	(0.1)	\$966.5
Total	\$1,849.2	\$1,859.9	\$10.7	0.6	\$1,852.6

^a Totals may not add due to rounding.

^b OMC = oversight monitoring consultant.

The increase in treatment costs is related to construction cost increases in change orders to the liquids and solids contracts and to non-construction cost increases for engineering services, construction management, and staffing resulting primarily from a reassessment of resources required to complete the project. Much of the increase in construction costs was offset by the use of the construction contingency.

More information on the January 2012 Brightwater Cost Update is available at <http://mkcclegisearch.kingcounty.gov/January 2012 Brightwater Cost Trend>.

RWSP Projects in Design or Construction

Table 4 shows cost estimates of RWSP projects in design or construction as of Dec. 31, 2010, and as of Dec. 31, 2011. These projects were included as part of the 2011 and 2012 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 projects in design or construction in 2011 is \$368 million, a change of \$5 million from the 2010 estimate of \$363 million. This change is the net result of moving costs of the Habitat Conservation Plan/Programmatic Biological Assessment efforts and the Bellevue Pump Station Upgrade and Force Main Installation project to the completed projects table (Table 2) and increases in costs of some of the projects.

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

	2010 Cost Estimates ^a	2011 Cost Estimates ^b	Change from 2010
Total Costs for RWSP Projects in Design/Construction	\$363	\$368	\$5
Total Conveyance Projects	\$231	\$241	\$9
Bellevue Pump Station Upgrade and Force Main Installation	\$37	--	(\$37)
Kent-Auburn Conveyance System Improvements (Phase A and Phase B pipelines) ^c	\$52	\$54	\$2
North Creek Pipeline ^d	\$49	\$29	(\$20)
North Creek Interceptor ^d		\$65	\$65
Bellevue Influent Trunk Parallel	\$7	\$6	--
Sunset/Heathfield Pump Station Replacement and Force Main Replacement	\$81	\$81	--
Decennial Flow Monitoring	\$5	\$5	--
Total Treatment and Odor Control	\$10	\$9	(\$1)
West Point Digestion Improvements	\$10	\$9	(\$1)
Total I/I^e	\$2	\$2	--
Total CSO Control Program^f	\$76	\$82	\$6
Sediment Management/Lower Duwamish Superfund ^g	\$61	\$64	\$3
CSO Planning and Updates ^h	\$15	\$17	\$2
Habitat Conservation Plan (HCP)/Programmatic Biological Assessment	\$8	--	(\$8)
Reclaimed Water	\$33	\$31	(\$2)
Brightwater Reclaimed Water Backbone	\$26	\$24	(\$2)
Future Water Reuse	\$4	\$4	--
Reclaimed Water Comprehensive Plan	\$3	\$3	--
RWSP Planning and Reporting	\$3	\$3	--

Note: Totals may not add because of rounding to the nearest million.

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

^b Project costs in this column reflect costs reported in the 2012–2017 WTD CIP budget submittal (September 2011).

^c The cost estimate to complete Phase A pipelines and 50 percent design and easement acquisition of Phase B pipelines is approximately \$21 million; the cost estimate to complete Phase B pipelines is approximately \$33 million.

^d North Creek Pipeline costs reflect costs associated with closing out of past construction contracts; North Creek Interceptor costs reflect the costs associated with completing the project. (See the discussion of the North Creek Interceptor earlier on in this report.)

^e 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.

^f Although the Puget Sound Beach CSO control projects were included in the 2011–2016 and 2012–2017 WTD CIP budget submittal, they are not reflected in this table. The baseline budgets for these projects will be established at the completion of predesign in 2012. Because their existing cost estimates reflect planning-level costs developed in 1998 and adjusted for inflation, these project costs are included in Table 1, RWSP Projects Planned for the Future.

^g The change in costs reflects costs associated with expanded source control work for the Lower Duwamish Feasibility Study, and an increase in sampling efforts for the Sediment Management Plan update.

^h The change in costs for CSO Planning and Update is attributed to additional modeling and calibration for the CSO Control Program review and for development of a system model with Seattle Public Utilities; additional staffing to respond to the EPA compliance review; amendments to the consultant contract for the CSO Control Program review; inclusion of project contingency; and additional budget for another year of the CSO Control Program as part of the six-year CIP budget process.

RWSP Projects Planned for the Future

Table 5 shows 2010 and 2011 planning-level cost estimates for RWSP projects planned for the future. The costs are presented in constant dollars.

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

	2010 Cost Estimate (2010\$)	2010 Cost Estimate (2011\$)	2011 Cost Estimate (2011\$)	Cost Change (2011\$)
Total Planned Projects	\$975	\$1,004	\$1,004	--
CSI projects ^a	\$418	\$430	\$430	--
CSO Control projects ^b	\$438	\$451	\$451	--
South Plant expansion ^c	\$119	\$123	\$123	--

^a CSI 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 2011 dollars.

^b Cost estimates for the planned CSO control projects reflect 1998 planning-level estimates adjusted for inflation, using the 3 percent per year assumption, to 2011 dollars. The 2012 CSO Control Program Review will include updated cost estimates for planned projects and will be included in the RWSP 2012 Annual Report.

^c South Plant expansion cost estimates reflect 1998 planning-level estimate adjusted for inflation, using the 3 percent per year assumption, to 2011 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 applied 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.

The pilot program ended in April 2011. Since 2001, the program generated nearly \$84 million in savings for ratepayers. Because the program ended in 2011, this is the last year it will be included in the RWSP annual report.

More information on the Productivity Initiative Pilot Program, including the 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 173 MG of wastewater each day in 2011. The West Point, South, and Vashon treatment plants operated without a single violation of their NPDES effluent limits. The Carnation Treatment Plant exceeded its reclaimed water permit instantaneous maximum turbidity limits on two days in March 2011.⁶

⁶ The Carnation Treatment Plant's reclaimed water permit calls for the facility to filter Class A water at all times and turbidity—cloudiness in water caused by the suspension of tiny particles—must not exceed an average operating turbidity of 0.2 nephelometric turbidity units (NTU) determined monthly, and 0.5 NTU at any time. The NTU instantaneous maximum is defined as the value not to be exceeded by a continuous measurement.

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 14 years of 100 percent permit compliance, and the West Point Treatment Plant has attained 10. The Vashon Treatment Plant received NACWA's Gold Peak Performance Award for achieving 100 percent compliance with its NPDES permit for the year, and the Carnation Treatment Plant received NACWA's Silver Peak Performance Award for having less than five permit violations.

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 they are not considered a violation of effluent permit limits or overflows of untreated wastewater. Nine SSOs and seven permit deviations occurred in 2011.

Causes of the SSOs are as follows:

- One SSO occurred at the Vashon Treatment Plant when a ground fault tripped the plant's main breaker and caused a power loss.
- Three SSOs occurred at the Elliott West CSO Treatment Facility. Two occurred when the hypochlorite system did not operate properly, and the third occurred when a control interlock caused the dechlorination system to shut down prematurely.
- Two SSOs occurred at pump stations. One occurred at the Bellevue Pump Station as the result of a power surge related to a fire at one of PSE's electrical substations. The other occurred at the Kirkland Pump Station during a power failure.
- Three SSOs occurred in conveyance pipes. One occurred in the South Treatment Plant's Effluent Transfer System when a contractor removed a manhole cover when the flow was too high; another occurred from an obstruction in the influent pipe that connects to the Vashon Treatment Plant; and the third occurred due to damage in the pipe that carries effluent from the Brightwater Treatment Plant during interim commissioning. The pipe was repaired.
- The permit deviations all occurred at the West Point Treatment Plant. Voltage sags, which are brief reductions in voltage and a common power disturbance, caused two deviations; four deviations resulted from mechanical failures; and operator error contributed to one deviation.

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 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 2011, there were 196 untreated CSO events with a total discharge of 666 MG, representing a 72 percent reduction from the 1981–1983 baseline volume of 2,339 MG. Major storm events occurred in March and November, resulting in a discharge of 398 MG, or 60 percent of the annual total. The largest overflow was 88.70 MG at the Lander CSO during a storm lasting 59 hours on November 22–24.

More information on 2011 CSO events is available in the CSO Control Program 2011 Annual Report to Ecology 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. The 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. KCIW works cooperatively with more than 1,400 companies and facilities to protect surface water and biosolids quality, the environment, public health, and the wastewater system. The program provides technical assistance and ensures that industries treat wastewater for harmful substances before discharging the wastewater to sewers. KCIW issues three main kinds of discharge approvals: letters of authorization, discharge authorizations, and permits.

During 2011, KCIW conducted 415 business and facility inspections and collected more than 2,000 discrete compliance samples. In addition, 126 permits and 292 discharge authorizations were in effect. Notices of Violation were issued to 38 companies and facilities for 82 violations; none of the violations caused NPDES permit exceptions at King County treatment plants.

More information on KCIW is available 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 2011, the program collected 1,441 tons of household hazardous waste from more than 44,500 customers.

More information on LHWMP is available 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 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 County's 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 2011 were largely consistent with those observed in 2010 and in previous years. Key findings in 2011 include the following:

- 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.
- Some freshwater and Puget Sound swimming beaches had incidents that exceeded bacteria guidelines; most were of short duration and did not result in beach closures.
- 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 when the lakes are stratified.
- 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.
- Dissolved oxygen concentrations in Quartermaster Harbor continued to be low in the fall months and oxygen dynamics were tightly associated with phytoplankton abundance in the harbor.

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- There were no exceedances of the standards for fecal coliform bacteria levels at the County's treatment plant outfalls in 2011.
 - Northern Puget Sound waters show slightly different nutrient dynamics than other sites monitored in open waters.

In addition, investigations to locate sources of bacteria in Juanita Creek, Issaquah Creek, Idylwood Creek, and drainages in White Center continued in 2011. When sources are identified, staff works with other entities, such as county and local stormwater programs, local sewer districts, and Public Health-Seattle & King County to ensure identified sources are controlled.

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

Conclusion

WTD continued to implement the RWSP in 2011. Highlights of RWSP implementation in 2011 are as follows:

- The Brightwater Treatment Plant began operating on September 6, 2011, and a grand opening was held on September 24, 2011.
- Design and construction continued on five conveyance system improvement program projects.
- Preliminary design work began on four projects to control combined sewer overflows (CSOs) in Puget Sound.
- In October 2011, WTD issued its recommended plan to control the County's remaining 14 uncontrolled CSOs for public comment.
- The byproducts of wastewater treatment—biosolids, digester gas, and reclaimed water—continued to be reused for beneficial uses.