Combined Sewer Overflow Control Program

2015 Annual CSO and Consent Decree Report

July 2016

King County

Protecting Our Waters

Doing our part on rainy days

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BMP	Best Management Practices
CD	Consent Decree
City	City of Seattle
County	King County
CSO	combined sewer overflow
DOJ	Department of Justice
DSN	Discharge Serial Number
DWO	dry-weather overflow
EBI	Elliott Bay Interceptor
ECOSS	Environmental Coalition of South Seattle
EPA	Environmental Protection Agency
FOG	fats, oil, and grease
GSI	green stormwater infrastructure
HLKK	Hanford/Lander/King/Kingdome
hr	hour
IWP	Industrial Waste Program
JMCC	Joint Modeling Coordination Committee
Joint Plan	Joint Operations and System Optimization Plan
JOIST	Joint Operations Information System Team
JPA	Joint Project Agreement
L	liter
LID	Low Impact Development
Metro	Municipality of Metropolitan Seattle
MG	million gallons
MGD	million gallons per day
ml	milliliter
MLK	Martin Luther King
MS/WQA	Monitoring Study/Water Quality Assessment
NDS	natural drainage systems
NPDES	National Pollutant Discharge Elimination system
O&M	operations and maintenance
PCMP	Post Construction Monitoring Plan
PLC	programmable logic controller
PS	pump station
PSCAA	Puget Sound Clean Air Agency
RS	regulator station
RWSP	Regional Wastewater Services Plan
SBS	sodium bisulfite
SCADA	Supervisory Control and Data Acquisition
SMP	Sediment Management Plan
SPU	Seattle Public Utilities
SS	settleable solids
SSOP	sewer systems operations plan
TRC	total residual chlorine
TSS	total suspended solids
UIC	underground injection control
WAC	Washington Administrative Code
WTD	Wastewater Treatment Division
WWS	Wet Weather Storage
WWTS	Wet Weather Treatment System

1.0 Introduction

King County's (County) Wastewater Treatment Division (WTD) is responsible for managing the regional wastewater system. WTD prepares annual reports on its combined sewer overflow (CSO) control program to fulfill requirements under the National Pollutant Discharge Elimination System (NPDES) permit for the County's West Point Treatment Plant (WA0029181) in Seattle and requirements in Washington Administrative Code (WAC) 173-245-090. King County submits these reports to the Washington State Department of Ecology (Ecology). The most recent NPDES permit was issued for West Point Treatment Plant on December 19, 2014 and became effective on February 1, 2015.

On July 3, 2013, a Consent Decree (CD), Civil Action No. 2:13-cv-677, between the United States Department of Justice (DOJ), United States Environmental Protection Agency (EPA), Ecology, and King County was finalized. Section VIII of the CD requires submittal of an annual report detailing implementation of the CD. With the agreement of EPA and Ecology, beginning with the 2014 Annual Report, the CSO and CD annual reports were consolidated into one report. This annual report meets the CD, WAC, and NPDES requirements.

CSO control is important to King County because CSOs are a recognized source of water pollution that can result in temporary increases in bacterial counts, aesthetic degradation of shorelines, long-term adverse effects on sediment quality at discharge points, and raised public health concerns in areas where there is potential for human contact. Compliance with environmental regulations, the NPDES permit, and the CD is a top priority for King County.

In addition, the County is committed to meeting all the milestones and actions outlined in the CD. WTD is continuing to provide its staff with ongoing trainings, briefings, and division-wide communication on the CD to ensure everyone works together to achieve these priorities. As a result, all the projects and plans outlined in the CD are currently on schedule to achieve their CD milestones.

This report documents King County CSO control program activities and information for 2015 on the following topics:

- Implementation of early action and long-term CSO control plan measures.
- CSO volumes and frequency of overflows (including overflow durations and associated rainfall data).
- Information on any CSO-related bypasses at the West Point Treatment Plant.
- Information on any dry-weather overflows (DWO).
- Sewer Systems Operations Plan (SSOP) implementation.
- Development of the Joint Operations and System Optimization Plan (Joint Plan) between the City of Seattle and King County.
- Coordination between King County and the City of Seattle on CSO control projects.
- NPDES permit compliance for the King County wet weather treatment stations.

The following sections provide background on King County's wastewater system, its CSO control program, and NPDES and CD requirements.

1.1 King County CSO System

King County provides wholesale wastewater conveyance and treatment of flows from 17 cities, 16 local sewer utilities, and one tribal government.

The City of Seattle's (City) local wastewater collection system contains combined sewers that collect both wastewater and stormwater. Other, newer local systems use separate sewers to convey wastewater and stormwater. Seattle's combined sewers convey flows to King County trunks and interceptors, which convey the majority of flows to the West Point Treatment Plant in Seattle's Discovery Park. A small portion of flows from the combined system are treated at the County's South Treatment Plant in Renton. King County's responsibility for sewerage facilities begins at the point where 1,000 acres of drainage come together.

When large storms occur and flows exceed the capacity of County conveyance system facilities, CSOs may occur at any of the 39 County CSO locations that discharge to Lake Washington, Lake Union, the Lake Washington Ship Canal, the Duwamish River, Elliott Bay, and Puget Sound (Figure 1). Some of the County's 39 CSO locations have multiple discharge points. CSOs also may occur at the City of Seattle's 87 CSO locations in their local sewer system. The City is responsible for separately managing and reporting on those locations.

In May 2015, Ecology and WTD clarified inconsistencies on how to count overflows within the combined system for meeting the one uncontrolled event per year (based on a 20-year moving average) standard. During the review of the Facility Plan for the Rainier Valley Wet Weather Storage (Rainier Valley WWS) Project, Ecology questioned how WTD counted the overflow locations at Bayview Street and Hanford Street to be controlled by the Rainier Valley WWS Project. Along with two other controlled overflow locations, these two (separately permitted) overflow locations discharge into a single City of Seattle storm drain that empties to the Duwamish River at the Hanford #1 Overflow. In the past, WTD interpreted the one event per year as applying to those overflows that occur at each CSO location. In other words, an overflow at Bayview St. is one separate event and an overflow at Hanford St. is another separate event - with the two separate events draining via the shared Hanford #1 Overflow. During review of the Facility Plan, Ecology commented that overflows from separate CSO locations could not count as separate overflows when they discharge via a shared outfall. Ecology has clarified that overflows from the Bayview St. and Hanford St. CSO locations be counted as single events at the shared outfall. This means that if one overflow occurred at Bayview St. in November and a separate overflow occurred at Hanford St. in an event in December, WTD must count them as two separate events at Hanford #1 and not one event at Bayview St. and one event at Hanford St. in a single year. WTD corrected this assumption in modeling efforts and worked to catalog all of the other CSO location(s) this assumption may affect.

Figure 1. King County CSO Locations

WTD has modified its CSO event reporting for this report. Moving forward, this new procedure for counting will also be incorporated into modeling, design, operational modifications, and the 2018 Long-term Control Plan (LTCP) Update.

In summary, WTD has 45 overflow locations that are monitored, but only 39 of which are permitted CSO overflow locations because several CSOs share the same outfall (see Figure 8 for the locations of permitted CSO locations).

1.2 CSO Control Plans, Amendments, and Updates

Since the 1970s, the Municipality of Metropolitan Seattle (Metro) and its successor, King County, have been implementing CSO control projects to improve water quality in the Seattle area. King County does this under a CSO Control Plan that is amended or updated with each renewal of the West Point Treatment Plant's NPDES permit. Prior to each CSO Control Plan update, the County reviews the plan, progress toward CSO control, and its existing program against conditions that may have changed since the last update – conditions such as flow patterns, scientific developments, changed regulations, new technologies, and public priorities. Significant changes may require adjustment of the CSO Control Plan and the CD.

1.2.1 CSO Control Plans, 1979-2012

Metro first formalized CSO control with the development of the *1979 CSO Control Program* (1979 Program), which was developed in cooperation with EPA and the City of Seattle. The 1979 Program identified nine Metro projects to reduce the number of CSO events into fresh water (Lake Washington, Lake Union, and the Lake Washington Ship Canal). In 1985, the Washington State Water Pollution Control Act (Chapter 90.48 RCW) introduced new regulations that required all municipalities with CSOs to develop plans for "the greatest reasonable reduction at the earliest possible date." Metro prepared the *1986 Final Supplemental Plan for Secondary Treatment Facilities and Combined Sewer Overflow Control* (1986 Plan) to meet this requirement.

Before the 1986 Plan could be implemented, Ecology promulgated new regulations (WAC 173-245-020) that defined "greatest reasonable reduction" to mean "control of each CSO such that an average of one untreated discharge may occur per year." Metro worked with Ecology to develop an interim goal of 75 percent reduction of CSO volumes system-wide by the end of 2005. Metro's *Final 1988 Combined Sewer Overflow Control Plan* (1988 Plan) identified 11 CSO control projects designed to meet this interim goal.

King County took over responsibility for operating and maintaining the regional wastewater system from Metro in 1994. As part of the 1995 NPDES permit renewal for the West Point Treatment Plant, King County prepared an update and amendment to the 1988 Plan. The *1995 CSO Control Plan Update* (1995 Plan Update) assessed the effectiveness of CSO reduction efforts to date, reevaluated priorities for control of CSO sites, and identified three control projects for completion between 1995 and 2000.

In the late 1990s, King County developed a major update to its comprehensive sewerage plan, including both the combined and separated systems, called the *1999 Regional Wastewater Services Plan* (RWSP). During that period, Ecology agreed to discontinue the 75 percent volume reduction interim target for County CSO control to allow prioritization of control projects according to public health and environmental benefit rather than volume. The final RWSP adopted by the King County Council in 1999 included a revision to the 1995 Plan Update that consisted of 21 control projects to complete system control by 2030. The revision was included with the June 2000 submission of the West Point Treatment Plant NPDES permit renewal application as the *Year 2000 CSO Control Plan Update* (2000 Plan Update). The 2000 Plan Update described King County's progress in CSO control, documented its compliance with CSO control requirements, and identified two large control projects—Denny Way/Lake Union and Henderson/Martin Luther King (MLK)/Norfolk CSO control projects—for completion in the next five-year NPDES permit cycle. The resulting Elliott West Wet Weather Treatment System (WWTS) and Henderson/Martin Luther King Jr. Way Wet Weather Treatment Station (Henderson/MLK Jr. Way WWTS) came online in spring 2005.

In the RWSP, the King County Council called for a review of the County's CSO control program ahead of the NPDES permit renewal application and update to the 2000 Plan Update that was expected to be due in 2005. Issuance of the NPDES permit took longer than expected, pushing back the due date for the next application to 2008. King County completed the review in 2006 as the basis for the 2008 CSO Control Plan Update (2008 Plan Update), which was then submitted as a part of the NPDES permit renewal application in 2008. The 2008 Plan Update described the County's wastewater system and the control status of its CSOs; overall progress toward CSO control; indicated how the County met the EPA's Nine Minimum Controls; and summarized the scientific studies that have shaped the control program over time. The 2008 Plan Update also described completed, in progress, and planned CSO control projects. No changes to the 1999 RWSP CSO Control Plan were recommended and King County committed to implementing the first four of the RWSP CSO projects—Barton St., Murray St., South Magnolia, and North Beach— together known as the Puget Sound Beach Projects.

In 2012, the County completed a three-year comprehensive review of the CSO control program. The 2012 CSO Control Plan was approved by the King County Council as the amended 2012 CSO Control Plan in September 2012. The 2012 CSO Control Plan was submitted to Ecology and EPA as the amended 2012 Long-term Control Plan (2012 LTCP) on November 20, 2012, ahead of the June 2013 application date for the NPDES permit renewal and as part of the CD negotiations. The approved projects in the 2012 LTCP emerged from an evaluation of new conditions, opportunities, science, regulations, and community input since the last major CSO plan update in 1999. Project alternatives were developed for all uncontrolled CSOs to determine which were the most cost effective. The approved projects reflected community priorities heard during the public review process, including:

- Completing most projects in the Lower Duwamish River area first to support ongoing regional efforts to clean up the river, with later projects to control CSOs in the Lake Washington Ship Canal.

- Conducting more detailed evaluation of the use of green stormwater infrastructure (GSI) on four projects to complement traditional CSO control techniques by diverting stormwater away from the combined sewer.
- Collaborating with the City of Seattle on projects when it is cost effective to do so.

The approved 2012 LTCP is the County's current CSO Control Plan and contains 9 projects to control 14 CSOs by the end of 2030. The schedule of projects is shown in Figure 2. Two projects are to construct CSO high rate sedimentation wet weather treatment facilities in the Lower Duwamish and East Waterway area. Seven projects will control CSOs by building storage tanks or conveyance pipes. Four projects will be built in the Lake Washington Ship Canal/Montlake Cut area and five in the Duwamish River/Elliott Bay area. The 2012 LTCP calls for King County and the City of Seattle to continue to collaborate on three of the seven storage tank projects and a possible Ship Canal tunnel alternative as per both agencies' approved long-term control plans. King County will conduct GSI early, ahead of traditional CSO control projects, in four basins to reduce the size of the gray infrastructure needed to control CSOs.

The King County Council also approved a plan to complete a water quality assessment and monitoring study early in the 2018 LTCP schedule to confirm or to possibly adjust some of the future projects or schedules as part of a potential Integrated Plan proposal or within the LTCP. The recommendation for this study emerged through conversations with stakeholders and the public asking that CSO control be evaluated more fully along with other programs that improve water quality in the region. The water quality assessment and monitoring study is discussed further in Section 1.2.3 Water Quality Assessment/Monitoring Study.

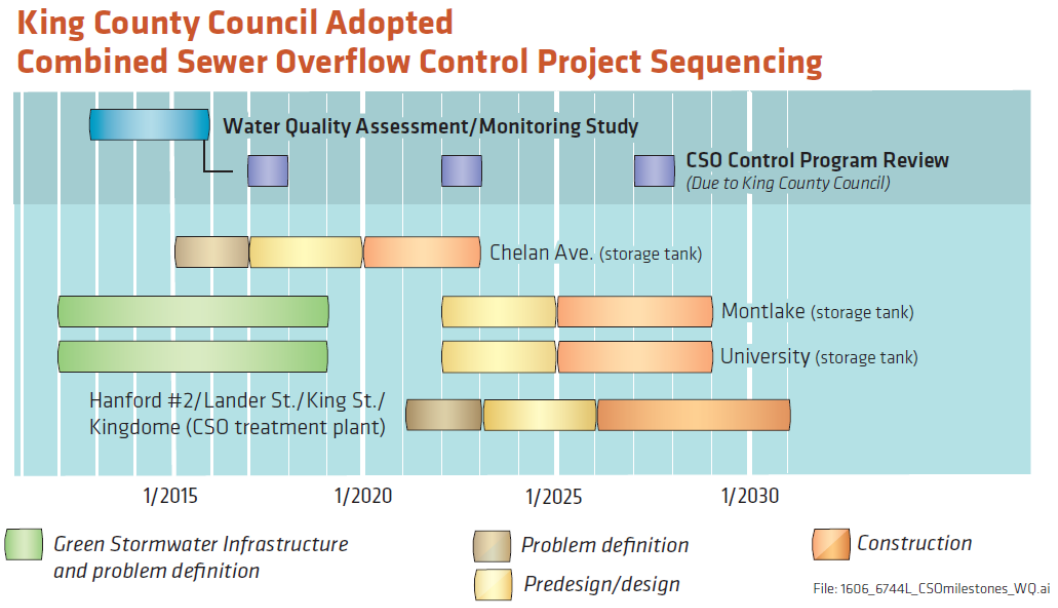

Figure 2. Adopted 2012 Project Schedule to Complete King County CSO Control Program by End of 2030

1.2.2 2018 Long-term Control Plan Update

In 2015, King County began a comprehensive update of the CSO control program and the 2012 LTCP. Every five years, updates are required by the WAC 173-245-090, West Point Treatment Plant's NPDES Permit, and King County Code 28.86.080. The resulting 2018 LTCP Update will be submitted to Ecology and EPA with the next West Point Treatment Plant NPDES permit renewal application, due mid-2018.

In the 2018 LTCP, WTD will be conducting analyses of the remaining uncontrolled CSO locations where projects are not already being implemented, including an evaluation of the CSO control project selected in the 2012 LTCP and a comprehensive assessment of control measures for each uncontrolled permitted CSO location. A significant amount of new flow and modeling information has been obtained since the 2012 LTCP was completed. This information, along with additional thinking on options for collaboration with the City of Seattle, will inform the 2018 LTCP Update. The comprehensive assessment of control measures is intended to be an extensive, innovative analysis that includes consideration of multi-basin and multiple control options. It will consider separation, GSI, and in-line or offline storage and treatment as well as collaborative or joint projects with the City of Seattle. In addition, since the 2012 LTCP was completed, two additional CSO locations are considered not fully controlled (Denny Way Regulator Station Overflow [Denny Way RS Overflow] and Harbor Avenue Regulator Station Overflow [Harbor Ave. RS Overflow]) and will be added to the 2018 LTCP Update. The scope of the 2018 LTCP Update is being amended to include the Denny Way RS overflow and Harbor Ave. RS Overflow; the amendment will be completed in early 2016.

The 2018 LTCP Update will provide recommendations on any changes being considered to the 2012 LTCP and include refined cost estimates, schedule and project priorities, and sizing assumptions for recommended projects to address all uncontrolled CSO locations. The updated project recommendations, sizing assumptions, and costs will reflect environmental, social, and financial goals to meet current needs, consider stakeholder interests, and the best approaches currently available to meet CD requirements. King County will continue to brief Ecology on the 2018 LTCP Update process so any changes to the 2012 LTCP will be discussed early in the process.

1.2.3 Water Quality Assessment/Monitoring Study

King County has been conducting a Water Quality Assessment/Monitoring Study (WQA/MS) as directed by King County Ordinance 17413, Section 2 that was approved in September 2012. Work began in 2013 with the primary objectives of generating information and recommendations for input to the 2018 LTCP Update. The WQA/MS includes a comprehensive scientific and technical analysis of the current water quality of the receiving waters where uncontrolled County CSOs discharge (Elliott Bay, Lake Union/Lake Washington Ship Canal, and the Duwamish River), projections of future conditions in these waters, and review of ongoing and planned activities to improve water quality. King County will use the information to identify opportunities to lower the costs of implementing the CSO control plan, establish baseline conditions for post-construction monitoring of CSO control projects, inform the sequencing/schedule of

the remaining projects, and inform a decision on whether to pursue a CSO Integrated Plan allowed under the CD.

The WQA/MS sets out to generate information that will help answer the following questions:

1. What are the existing and projected water quality impairments in receiving waters where King County CSOs discharge?
2. How do King County CSOs contribute to the identified impairments?
3. How do other sources contribute to the identified impairments?
4. What activities are planned through 2030 that could affect water quality in the receiving waters?
5. How can CSO control projects and other planned or potential corrective actions be most effective in addressing the impairments?
6. How do various alternative sequences of CSO control projects integrated with other corrective actions compare in terms of cost, schedule, and effectiveness in addressing impairments?
7. What other possible ways (e.g., coordinating projects with the City of Seattle and altering the design of planned CSO control projects) could make CSO control projects more effective and/or help reduce the costs to King County and the region of completing all CSO control projects by 2030?

Elements of the assessment and timeframes for their completion are shown in Table 1.

Table 1. Elements and Timeframes for the Water Quality Assessment and Monitoring Study

Element	Timeframe
Review and analyze existing scientific and technical data on impairments (defined as water quality-related concerns) in receiving waters where uncontrolled County CSOs discharge, the sources of impairments, and planned and potential corrective actions.	2013
Provide venues for stakeholders to be engaged throughout the process.	2013–2016
Conduct targeted data gathering and monitoring, as necessary, to fill identified gaps in scientific data on water quality in these receiving waters.	2014–2015
Analyze, synthesize, and summarize scientific and technical data collected in 2014-2015 and reviewed during the assessment and produce a comprehensive synthesis report.	2015–2016

An external Scientific and Technical Review Team has been assembled to review methodology and results. A synthesis report will incorporate the results of the analyses, data gap studies, and additional assessments to evaluate how to maximize water quality benefits from CSO improvements. Depending on assessment findings, the King County Council may choose to direct the formation of an Executive's Advisory Panel of approximately ten regional leaders to develop independent recommendations to the King County Executive on CSO control project sequencing and other CSO water quality related activities.

In 2015, the Scientific and Technical Review Team completed the bulk of the scientific and technical analyses and has been holding a series of briefings with Ecology and other stakeholders. In 2016, the Scientific and Technical Review Team will be completing the reports summarizing the technical work and will complete the synthesis report, which will be the final report on the complete WQA/MS.

More information on the WQA/MS is available at:
http://www.kingcounty.gov/services/environment/wastewater/cso/projects/water-quality-study.aspx

1.3 National Pollutant Discharge Elimination Permit

The West Point Treatment Plant NPDES permit was renewed on December 19, 2014 and became effective on February 1, 2015. The renewed permit contained new requirements for aspects of the CSO control program, including:

- Revised effluent limits for fecal coliform and settleable solids for Elliott West Wet Weather Treatment Station (Elliott West WWTS). See Appendix E for more information.
- Additional monitoring for dissolved oxygen and copper for Elliott West WWTS and Henderson/MLK Jr. Way WWTS. See Appendix E & F for more information.
- Stormwater pollution prevention approaches in combined basins. Meetings with Seattle Public Utilities are set to begin in 2016.
- Sediment monitoring or modeling of five CSO locations. For more information see Section 1.5.

- Copper reduction and settleable solids removal assessments for Elliott West WWTS. Monitoring and sampling began in the winter of 2015-2016.

1.4 Consent Decree

After King County Council approval of the 2012 LTCP, King County submitted the LTCP to Ecology and EPA for approval. EPA and Ecology approved the County's LTCP as meeting federal requirements on March 7, 2013. EPA, Ecology, and DOJ based on the approved version, finalized a negotiated CD between King County, EPA, and Ecology. The CD was formally filed in United States District Court on July 3, 2013.

The CD commits King County to implement the LTCP CSO capital projects specified in the 2012 LTCP within the timelines also specified in the 2012 LTCP as well as complete several related plans. King County has made it a high priority to meet all CD milestones and, to date, is on schedule.

Project summaries detailing 2015 progress, planned work in 2016, and their schedule of milestones can be found in Section 3.1 of this report.

In addition to the specific CSO program implementation detailed in Section 3.1, the CD required several plans that are now completed or in progress. These plans include:

- Supplemental Compliance Plans for Dexter Avenue Regulator Station Overflow (Dexter Ave. RS Overflow), Denny Avenue Regulator Station Overflow (Denny Ave. RS Overflow), and Harbor Ave. RS Overflow (submitted August 2013, with an amendment to the plan for Harbor Ave. RS Overflow submitted September 2013).
    - Dexter Ave. RS Overflow is controlled. Denny Way RS Overflow and Harbor Ave. RS Overflow are not yet fully controlled as of December 31, 2015.
- Sewer System Operations Plan (SSOP), submitted September 2013. A letter approving the SSOP was received from Ecology on May 30, 2014 and from EPA on July 29, 2014. Some minor revisions have been requested and will be incorporated in the next update.
- Joint Operations and System Optimization Plan (Joint Plan) with the City of Seattle (due March 1, 2016). Progress Reports were submitted by December 31 in 2013, 2014, and 2015.

Summaries for these plans, detailing 2015 progress, planned work in 2016, and their schedule of milestones, can be found in Section 3.2 and Section 3.3 of this report.

WTD has proposed a non-material change to the CD to Ecology for 3rd Avenue West Overflow (3rd Ave. W. Overflow) and 11th Avenue Northwest Overflow (11th Ave. NW Overflow) by substituting the Ship Canal Water Quality Project (Ship Canal Project, a proposed joint SPU/WTD project) as an alternative to those individual projects. These modifications to the CD have been requested, but not yet approved, although a draft Facility Plan for the Ship Canal Project will be jointly submitted to Ecology and EPA in early 2016. The formal CD change will not be submitted to the Court for recording until the King County Council has agreed to the County's participation in the project by approving the Joint Project Agreement (JPA) to be signed by the City of Seattle and King County.

1.5 Sediment Sampling and Analysis

In 1999, King County prepared a sediment management plan (SMP) for addressing contaminated sediment at County CSO locations. The County is continuing to update that plan through 2016. As part of the update process, a predictive sediment contamination model for CSO discharges has been developed. Two supplemental rounds of sampling at CSO locations were used to calibrate and verify model performance. Sediment sampling results of the first round covering the following locations were provided to Ecology at the end of 2012:

- Barton Street Pump Station Overflow (Barton St. PS Overflow)
- Murray Street Pump Station Overflow (Murray St. PS Overflow)
- North Beach Pump Station Inlet Overflow/North Beach Pump Station Wet Well Overflow (North Beach PS Inlet Overflow/North Beach PS Wet Well Overflow)
- South Magnolia Overflow (S Magnolia Overflow)
- Chelan Avenue Regulator Station Overflow (Chelan Ave. RS Overflow)
- 53rd Avenue Southwest Pump Station Overflow (53rd Ave. SW PS Overflow)
- Brandon Street Regulator Station Overflow (Brandon St. RS Overflow)
- Montlake Regulator Station Overflow (Montlake RS Overflow)
- University Regulator Station Overflow (University RS Overflow)
- 3rd Ave. W Overflow.

In 2012, a second set of sampling covered:

- Belvoir Pump Station Overflow (Belvoir PS Overflow)
- University RS Overflow (additional sampling)
- Chelan Ave. RS Overflow
- Murray St. PS Overflow
- North Beach PS Inlet Overflow/North Beach PS Wet Well Overflow
- S. Magnolia Overflow.

These results were provided to Ecology in April 2014. These two sampling events also collected baseline conditions at Barton St. PS Overflow, Murray St. PS Overflow, North Beach PS Inlet Overflow/North Beach PS Wet Well Overflow, and S Magnolia Overflow for the post-construction monitoring requirement. Sampling in the vicinity of the Ballard CSO location was completed in 2015.

1.6 Organization of this Report

Subsequent sections and appendices in this report present the following information:

- Report on implementation of EPAs Nine Minimum Controls (Section 2).
- Status of CSO control projects in progress (Section 3).
- Discussion of 2015 rainfall and CSO events (Section 4).
- Summary of Consent Decree violations in 2015 (Section 5).
- Table showing the 20-year average frequency of untreated CSO events (Section 6).
- Description of post-construction monitoring (Section 7).

- Detailed event-based tables for untreated CSOs in 2015 (Appendix A).
- Detailed event-based tables for treated CSOs in 2015 (Appendix B).
- Annual reports for the four satellite CSO treatments facilities: Alki Wet Weather Treatment Station (Alki WWTS), Carkeek Wet Weather Treatment Station (Carkeek WWTS), Elliott West WWTS, and Henderson/MLK Jr. Way WWTS (Appendices C through F).

This report meets the requirements of the CD, WAC, and NPDES Permit that must be reported in annual reports. The crosswalks shown in Table 2 indicate where information meeting the requirements of each can be found in this report.

Table 2. Consent Decree, Washington Administrative Code, and National Pollutant Discharge Elimination System Permit Regulations Crosswalks

Consent Decree Section	Content	Annual Report Location
VIII.43.a	(i) the status of all Consent Decree compliance measures, including Currently Under Way and Early Action CSO Control Measures, the implementation of all CSO Control Measures in Appendix B, Post-Construction Monitoring Plan, SSOP, and Information Sharing/Coordination Program Plan Between County and the City of Seattle. (ii) any problems anticipated or encountered, along with the proposed or implemented solutions. (iii) any anticipated or ongoing operation and maintenance activities relating to all CSO Control Measures. (iv) remedial activities that will be performed in the upcoming year to comply with the requirements of this Consent Decree.	(i) 3.1 Project Summaries 3.3.1 Sewer System Operations Plan 3.3.2 Information Sharing/Coordination Program Plan Between County and the City of Seattle (called Joint Operations and Optimization Plan in the CD Appendix D) 7.0 Post-construction monitoring (ii) Included in sections above, 4.4 and App. C-F for CSO Treatment Facilities (iii) 2.1 Reducing CSOs Through Operations and Maintenance App. C-F for wet weather treatment stations (iv) All above
VIII.43.b	A description of any non-compliance with the requirements of this Consent Decree and an explanation of the likely cause and duration of the violation and any remedial steps taken, or to be taken, to prevent or minimize such violation.	5.0 Summary of Consent Decree Violations 2.1 Reducing CSOs Through Operations and Maintenance App. C-F for wet weather treatment stations

WAC Section	Content	Annual Report Location
WAC 173-245-090(1)(a)	Details the past year's frequency and volume of combined sewage discharged from each CSO site, or group of CSO sites in close proximity. The report shall indicate whether a CSO site or group of sites has increased over the baseline annual condition.	4.0 Summary of Rainfall and CSO Events 6.0 Twenty-Year Moving Average of Event Frequencies Appendix A Untreated CSO Events Appendix B Treated CSO Events App. C-F for wet weather treatment stations
WAC 173-245-090(1)(b)	Explains the previous year's CSO reduction accomplishments.	3.1 Project Summaries
WAC 173-245-090(1)(c)	Lists the projects planned for the next year.	3.1 Project Summaries

NPDES Permit WA0029181	Content	Annual Report Location
S18.B.2	In the Annual CSO Reports, the Permittee must include a summary of the number of untreated discharge events per outfall on a 20-year moving average, calculated once annually. The Permittee must determine which of the permitted CSO outfalls can be categorized as meeting the "greatest reasonable reduction" which means control of each CSO such that an average of one untreated discharge may occur per year. The Permittee must determine whether a CSO outfall meets this regulatory requirement based on historical long-term discharge data (total of 20 years – past and present data), modeling, or other reasonable methods as approved by Ecology. A listing of CSO outfalls which have been identified by the Permittee as meeting this regulatory requirement must be included in the CSO Annual Reports. At the same time of the annual CSO Report submission, the Permittee must also submit an electronic template file that includes event-based reporting for all CSO discharges for the reporting period. Ecology will provide the electronic template file to the Permittee.	6.0 Twenty-year Moving Average of Event Frequencies Electronic Template submitted electronically with annual report; hardcopy of content in Appendices A and B
S18.H	Compliance with the Nine Minimum Controls must be documented in the annual CSO Annual Report as required in S18.B.2.	2.0 Programs to Meet EPA's Nine Minimum controls
S18.K.1	The Permittee must report the average number of discharge events per controlled outfall per year based on a 20-year moving average to be reported in the annual report per S18.B.2. Compliance with the performance standard is determined annually.	6.0 Twenty-Year Moving Average of Event Frequencies
S18.K.2	The Permittee must report the number of overflow events per year during this permit term from the below-listed CSO outfalls in the Annual CSO Report and the CSO Reduction Plan Amendment required in Sections S18.B.2 and S18.C, respectively.	6.0 Twenty-Year Moving Average of Event Frequencies Appendix A Untreated CSO Events Appendix B Treated CSO Events App. C-F for wet weather treatment stations

2.0 Programs to Meet EPA's Nine Minimum Controls

The Nine Minimum Controls are actions that can be taken to minimize CSO impacts while long-term capital projects are under way. King County has implemented a number of programs to satisfy the requirements of the Nine Minimum Controls, which are a part of EPA's codified CSO Control Policy and included in the West Point Treatment Plant NPDES permit. The following sections describe King County's programs and activities in regard to each of the Nine Minimum Controls, with emphasis on activities undertaken in 2015.

2.1 Control 1—Reducing CSOs through Operation and Maintenance

Implement proper operation and maintenance programs for the sewer system and all CSO outfalls to reduce the magnitude, frequency, and duration of CSOs. The program must consider regular sewer inspections; sewer, catch basin, and regulator cleaning; equipment and sewer collection system repair or replacement, where necessary; and disconnection of illegal connections.

Proper facility operation is managed by West Point Treatment Plant and South Treatment Plant staff using King County's Supervisory Control and Data Acquisition (SCADA) system. The SCADA system provides monitoring and control capabilities for the treatment plant collection systems. See Control 2 (Section 2.2) for information on King County's transition to a new SCADA system.

Under the Asset Management Program, updated in 2010, King County employs asset management tools, including a standardized inventory system and condition rating systems, and is developing long-range asset replacement and renewal forecasts, including action plans, to avoid failure of critical assets. The Asset Management Program, implemented by West Point Treatment Plant, South Treatment Plant, and conveyance inspection staff, ensures regular maintenance of CSO outfalls, regulator stations, and pump stations. Conveyance inspection staff inspects sewers on a specified schedule and performs corrective actions when deficiencies are found. Maintenance schedules and records of visits are available for inspection on request.

A review performed by King County several years ago indicated that installing permanent backup generators in pump stations that lack reliable dual power feeds could help to prevent overflows. The installation process is nearly complete. The last generator will be installed at the Murray Street Pump Station (Murray St. PS) by December 31, 2016, as part of the CSO control projects (Murray Street Wet Weather Storage [Murray St. WWS]). Until then, a portable generator is available.

Major Improvement Projects at West Point Treatment Plant during 2015

The following improvements were ongoing during 2015 to improve the solids treatment process, which could limit the amount of flow that can be treated at West Point Treatment Plant.

Screenings Building and Upgrades

In 2015, the replacement of six 5/8-inch screens with finer screens (four 3/8-inch and two 1/4-inch screens) was finalized. Most of the work was completed in 2014. New screenings handling facilities were

constructed to process the increased volume of the screened material and new washer/compactors were installed to produce cleaner and drier screenings. The new washing/compacting process resulted in fewer truck trips leaving the plant and reduced odors.

Major Improvement Projects at Wet Weather Treatment Stations during 2015

The following operation and maintenance (O&M) activities have been implemented at the wet weather treatment stations (WWTS) as part of the effort to improve operations. These activities have been described to EPA and Ecology in regular briefings provided by King County Operations and NPDES staff. More detail on wet weather treatment station O&M activities is available in the facility Annual Reports in Appendices C-F.

Alki WWTS

Completed Activities

- Cleaned out the effluent channel of accumulated solids and debris to improve solids removal.
- Set the solids flights set point to start sooner in the treatment process so that solids can be removed and pumped to prevent potential wash out and carry over to the effluent.

Current and Future Activities

- Continue to evaluate and make any necessary adjustments to the dechlorination system as part of the Dechlorination System Improvement Project.
- Continue with the project for new Variable Frequency Drives for the 63rd Avenue Southwest Pump Station pumps.
- Continue with a project work request initiated to evaluate feed pump capacity size and make recommendations on the replacement of the current oversized hypochlorite feed pumps.

Carkeek WWTS

Completed Activities

- Made modifications to the sodium bisulfite (SBS) feed system to prevent crystallization and improve the reliability of the system.

Current and Future Activities

- None planned.

Elliott West WWTS

Completed Activities

- Replaced one of the two SBS flash mixers and the pre-dechlorination sample pump in August 2015.

- Continued the automated Mercer Street Treatment Tunnel (Mercer St. Treatment Tunnel) flushing program at the East Portal flushing gate as an attempt to flush and capture the solids settled in the Mercer St. Treatment Tunnel.
- Made changes to the main pump control program with the goal to minimize large pump flow swings impacting treatment and impacts to upstream conveyance.
- Began design and permitting for Instrumentation and Sampling Equipment Relocation project work. This project is to relocate and improve sample delivery, and to relocate the process instrumentation and monitoring equipment at Denny Way Station (the location of Elliott West WWTS dechlorination and final effluent monitoring).

Current and Future Activities

- Implement the project to relocate instrumentation and sampling equipment into a separate room out of the SBS day tank room. The design team met throughout 2015 and the final design is under review as of early 2016.
- A new pump control strategy was incorporated into the pump controls in late 2015 and evaluation of the pumping controls will continue.
- Hire consultants to evaluate plant performance and make recommendations on how to improve solids removal.

Henderson/MLK Jr. Way WWTS

Completed Activities

- Installed dissolved oxygen and pH meters.
- Installed a system (e.g., carbon bed and flow mixing) to continuously supply the outfall chlorine analyzer in between CSO events with a water source whose chlorine concentration is near the outfall's permitted chlorine limit.

Current and Future Activities

- No major projects are currently in progress. An extensive list of proposed and potential upgrades is included in Appendix F.

2.2 Control 2—Storing CSOs in Collection System

Implement procedures that will maximize use of the collection system for wastewater storage that can be accommodated by the storage capacity of the collection system in order to reduce the magnitude, frequency, and duration of CSOs.

The West conveyance system is essentially a deep inline tunnel system that conveys and stores a wide range of flows. The sizing of the largest in-line tunnels are shown in Figure 3. As described in the 2014 SSOP, maximizing storage in the conveyance system works in concert with maximizing conveyance to the West Point Treatment Plant to minimize overflows and obtain high quality treatment for service

area flows. The 2014 SSOP describes how the system has been built to operate as much as possible based gravity flow and on levels in the interceptors and trunks, with little operator intervention.

When levels reach pre-determined set points, programmable logic controllers (PLC) automatically adjust gates and pumps to manage the flows. These set points have been determined over the years by experience, hydraulic analysis, and modeling to balance conveyance to the treatment plant while maximizing storage in the pipelines and off-line storage facilities, and minimizing overflows and backups. Critical alarms and process data are communicated to the treatment plant operators using monitoring systems that report data in independent communication pathways from the control system. Operators at West Point Treatment Plant's Main Control will remotely take control of certain facilities – primarily Interbay Pump Station (Interbay PS) to force storage in the Mercer Street Treatment Tunnel (Mercer St. Treatment Tunnel) and the West Seattle Pump Station (West Seattle PS) to force storage in the West Seattle Tunnel – to manage flows to and through the West Point Treatment Plant. The intent of this operations strategy is to avoid surges and oscillations in the plant to protect the biological system and avoid plant shut-down, optimize conveyance of flows to the plant for treatment, and maximize the use of system storage capacity.

Senior operators assess a range of system factors in making decisions to begin manual control. Which factors are most important depends on the direction storms come from, how fast flows are changing, and antecedent conditions. Decisions require extensive senior operator experience, a sense for antecedent conditions, and the ability to anticipate changing flows.

In 2003, King County embarked on a division-wide effort to improve its operations by developing instrumentation and control standards that would be applied to all of its existing facilities. After developing the standards, Ovation™ by Emerson Process Management was selected as the control system. The control system was designed to enable regional monitoring and control of all facilities feeding King County's treatment plants. The South Treatment Plant upgrade is complete and work continues at the West Point Treatment Plant. It is anticipated that the Ovation control system upgrades will be completed system-wide by the end of 2016.

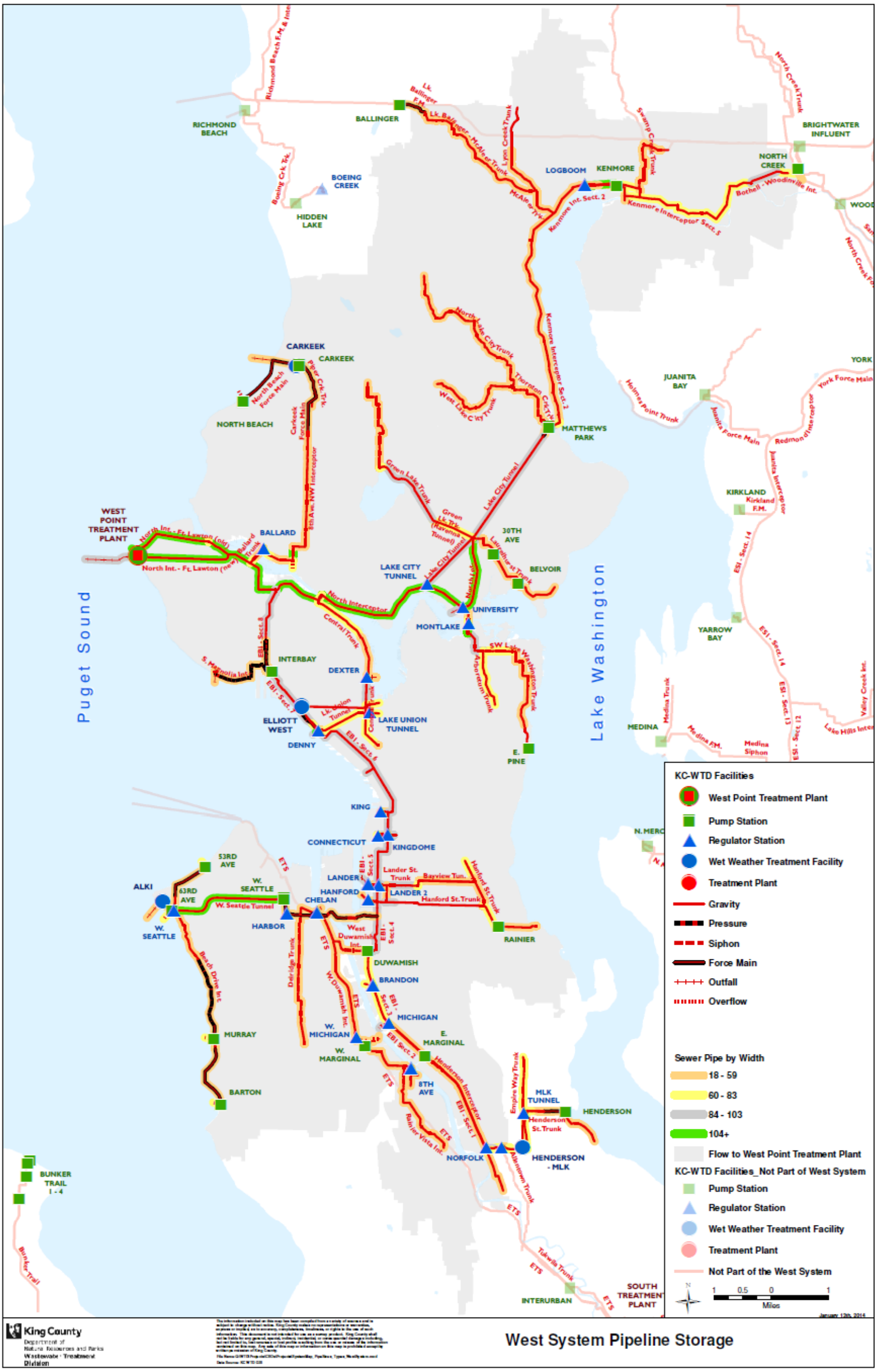

Figure 3. King County Wastewater West System Pipeline Storage

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In 2005, King County installed the OSI PI™ process data historian for long-term trending of all key King County process, operational, and monitoring data (treatment plants, conveyance facilities, CSO control facilities, and offsite pump stations). King County periodically modifies the collection system control strategies in response to data trends, to take into account advances in SCADA and computer modeling, to incorporate more recent field data, and to reflect modifications to the wastewater system.

A system optimization study is part of the 2018 LTCP Update. Implementation of the WTD and Seattle Public Utilities (SPU) LTCPs includes additional storage and conveyance upgrades that will increase collection system storage.

2.3 Control 3—Optimizing Pretreatment Program

Review and modify, as appropriate, existing pretreatment program to minimize CSO impacts from discharges due to nondomestic users.

King County's Industrial Waste Program (IWP) issues approvals that set limits on the chemical contents of industrial discharges. The program includes monitoring and permit enforcement, education, and technical assistance to businesses on appropriate waste pretreatment and disposal techniques. Local discharge limits are reviewed on a regular basis according to Ecology requirements. The County submits an annual pretreatment report to Ecology detailing permitting, monitoring and inspections, and enforcement actions taken during the year as well as an evaluation of influent, effluent, and biosolids, focusing on loading and removal rates. King County also administers and helps fund the Local Hazardous Waste Management Program.

Influent and effluent quality at the West Point Treatment Plant is assessed for trends that would suggest concurrent changes in CSO discharges. In addition, biosolids quality data from the West Point Treatment Plant are tracked as an indicator of changed loading to the system that could influence CSO quality. The only trends observed in 2015 are the slow decrease or stability in pollutant concentrations.

The County completed the Source Tracking Characterization study to more fully characterize industrial discharges as required in the previous 2009-2014 NPDES permit. This wastewater characterization study of selected industrial users did not identify any new sources of chemical inputs that have the potential to impact the King County sanitary sewer system. In addition, the study confirmed the appropriateness of the current mechanisms in effect to regulate the discharges of industrial wastewater to the sanitary sewer including:

- numerical local discharge limits
- federal categorical discharge limits
- authority from King County Code (Title 28)
- local discharge limits public rule to establish discharge limits for organic chemicals on a case-by-case basis.

The results of the King County Source Tracking Characterization were submitted to Ecology in 2013 with the application for the renewal of the West Point Treatment Plant NPDES permit.

Beginning in 2016, WTD will include the downstream CSO to which each discharger contributes in the annual Pretreatment Report submitted to Ecology.

King County is currently working with Ecology on the Source Control Implementation Plan for the Lower Duwamish. The first draft was submitted in June 2014. King County received comments from Ecology on April 3, 2015 and will send a revised version of the Plan to Ecology in early 2016. King County is currently implementing the plan, which covers 2014-2018. Another 5-year plan will be developed to cover the next 5 years (2019-2023).

2.4 Control 4—Maximizing Flow to Treatment Plant

Operate the POTW [publicly owned treatment works] at maximum treatable flow during all wet weather flow conditions to reduce the magnitude, frequency, and duration of CSOs. The Permittee must deliver all flows to the treatment plant within the constraints of the treatment capacity of the POTW.

The 2014 SSOP describes how maximizing storage in the conveyance system works in concert with maximizing conveyance to the treatment plant to minimize CSOs and obtain high quality treatment for service area flows. As described in Control 2 (Section 2.2) and shown in Figure 3, the West System is essentially a deep in-line tunnel system that can convey a wide range of flows to the West Point Treatment Plant. SCADA is used to maximize flow to the secondary treatment plant, while protecting the biological treatment system, via operation of regulators and pump stations. The parallel Fort Lawton Tunnel was built in 1992 to convey up to 440 million gallons per day (MGD) to the West Point Treatment Plant. West Point Treatment Plant provides secondary treatment for all base flows (defined by Ecology as 2.25 times the average wet-weather flow) and CSO/primary treatment for flows between 300 MGD and the peak hydraulic capacity of 440 MGD. CSO/primary treated flows are mixed with secondary effluent for disinfection, dechlorination, and discharge from the deep marine outfall. The resulting effluent must meet secondary effluent quality limits, with a small reduction—80 percent instead of 85 percent removal during the wet season months of November through April—in total suspended solids (TSS) percent removal requirements.

Up to 24 MGD of combined flows are conveyed to South Treatment Plant from southeast Seattle to receive full secondary treatment. This conveyance minimizes CSOs to the Duwamish River along the Elliott Bay Interceptor (EBI).

Where captured CSO cannot be conveyed to secondary plants due to conveyance system limitations flows are conveyed to CSO treatment facilities. King County currently operates four wet weather treatment stations at Alki WWTS, Carkeek WWTS, Elliott West WWTS, and Henderson/MLK Jr. Way WWTS. The amended 2012 LTCP includes two additional facilities to maximize treatment. 1) Georgetown Wet Weather Treatment Station (Georgetown WWTS) for the Brandon St. RS Overflow and South Michigan Street Regulator Station Overflow (S Michigan St. RS Overflow). 2) Hanford/Lander/King/Kingdome Wet weather Treatment Station (HLKK WWTS)) for the Hanford

#1/Lander Street Regulator Station (Lander St. RS)/King Street Regulator Station (King St. RS)/Kingdome Regulator Station (Kingdome RS).

Treatment process stability is monitored and optimized to manage flows based on information from automatic sensors and an array of analytical tests. Process control laboratories at each plant conduct testing and analysis, and then recommend adjustments to the processes if necessary to ensure that quality treatment is provided.

2.5 Control 5—Preventing Dry-Weather Overflows

Dry-weather overflows from CSO outfalls are prohibited. The Permittee must report each dry-weather overflow to the permitting authority as soon as it becomes aware of the overflow. When it detects a dry-weather overflow, the Permittee must begin corrective action immediately and inspect the dry-weather overflow each subsequent day until it has eliminated the overflow.

The County provides enough capacity in the combined sewer system to transfer 2.25 times the average wet-weather flow to secondary treatment, as negotiated with Ecology. As a result, overflows during the dry season are not the result of a lack of capacity. During dry weather, the County only experiences overflows in the combined system when problems such as power outages, mechanical failures, or human error occur. Similarly, during wet weather, CSOs occurring as a result of precipitation may be exacerbated by power outages, mechanical failures, or human error. While these events are rare and are immediately corrected and reported to Ecology, King County's ongoing Asset Management Program reduces the likelihood of these kinds of failures.

To minimize the risk of a dry-weather overflow (DWO) due to power loss at a pump station, a capital program was initiated to install new backup generators and replace old generators that had reached the end of their useful life. This program will be completed with the installation at Murray St. PS by December 31, 2016. By installing generators and automatic power transfer systems at pump stations throughout the system, the program greatly reduces the risk of overflows associated with a loss of power.

To minimize the risk of mechanical failure, the King County Asset Management Program includes an assessment to determine the criticality of pump station equipment. This assessment identifies assets essential to pumping sewage, and inspection and maintenance routines have been developed to increase service time and reduce failures for these critical assets. These efforts contribute to reducing overflows by decreasing the probability of mechanical failures.

Operation and maintenance programs, as described for Control 1 (Section 2.1), focus on DWOs and exacerbated CSOs. The conveyance system is monitored through SCADA and direct inspection, and corrective action is taken immediately if a problem occurs. Equipment problems are immediately reviewed and repair or replacement is undertaken in a timely manner.

2.6 Control 6—Controlling Solids and Floatables

Implement measures to control solid and floatable materials in CSOs.

The majority of floatables in the King County system are captured in the large volume of wastewater transferred to the treatment plants before overflows occur.

The County routinely engages in the following practices to control floatables:

- Capturing the "first flush" (maximizing flow to treatment plants) so that most solids and floatables that do enter the sewer are conveyed to the secondary treatment plants for removal and disposal before pipelines reach overflow conditions.
- Constructing facilities with gates and weirs that retain and minimize the release of solid and floatable materials. Gates are set to maximize flow containment. Baffles are used in front of weirs to help hold back all but the smallest items in the flow that passes over them.
- Coordinating with the City of Seattle on measures to reduce the washing of street solids and trash into sewers via stormwater and to promote proper disposal of trash so that it is not flushed down toilets. The City of Seattle's catch basin maintenance program limits the introduction of floatable materials to sewers.
- Educating the public on keeping trash and grease out of the sewers (http://www.kingcounty.gov/environment/wtd/Education/ThingsYouCanDo.aspx).
- Encouraging less water use to reduce unnecessary flows in the sewer that contribute to overflows (http://www.kingcounty.gov/environment/wtd/Education/ThingsYouCanDo/UseLessWater.aspx).
- Monitoring the development of new floatables control technologies for future CSO control projects.
- Educating the public on flushable items. In recent years, WTD operations employees have noticed an increasing number of mechanical problems, equipment breakdowns, and other operational impacts that seem to be closely related to the growing popularity of flushable cleaning wipes and pads. King County developed its "Flushing Awesome" information campaign in 2014 to educate the public about the problems caused by wipes and trash in the sewer system (http://www.kingcounty.gov/services/environment/wastewater/education/protect-environment/flush-trouble.aspx). The goal was to create awareness about how simple changes at home, such as using a trash can instead of a toilet, can protect Puget Sound and help keep our sewers working right. The campaign included radio and television ads in English, Spanish and Mandarin Chinese that ran in the summer of 2014 as well as bus advertising.
- Observations of the quantity of floatables are noted in logs at each facility and are available for inspection on request. These observations and a three-year floatables study, ordered by EPA in July 2009 to observe for floatables in water bodies near nine CSOs within four hours of an overflow, confirmed that additional floatables and solids controls are not needed at this time. During the study, overflow observations were compared to photos of each area during summer non-overflow periods. Before and after photos showed no accumulation of sewage-related

solids or floatables around the discharge points. The final floatables report was submitted to Ecology and EPA concurrent with the 2011 CSO Annual Report.

2.7 Control 7—Preventing Pollution

Implement a pollution prevention program focused on reducing the impact of CSOs on receiving waters.

King County's IWP is a major participant in the Local Hazardous Waste Management Program. Both programs serve to reduce discharge to sewers of chemicals and other substances that adversely impact the environment and the wastewater treatment process.

The IWP limits the discharge of fats, oil, and grease (FOG) from a petroleum or mineral origin (nonpolar FOG) to 100 milligrams per liter. Industries must use oil/water separators to pretreat oily wastewater to prevent harm to the biological phase of wastewater treatment and must submit plans for the separators to the local sewer utility or to IWP for review and approval before installing the separators. FOG from an animal or a vegetable origin (polar FOG) can block sewer lines. Although polar FOG has no numerical limit, dischargers are required to minimize free-floating polar FOG and may be required to complete a FOG control plan for IWP's review and approval.

King County also prohibits discharge to the sewer of materials such as ashes, sand, grass, and gravel. Industrial wastewater must contain less than 7 milliliters per liter of solids capable of settling. Food waste, including food-grinder waste, must be capable of passing through a 0.25-inch sieve. Discharge rates and maximum volumes are also set for construction dewatering projects with strict restrictions during the wet season.

Educational materials on controlling trash disposal to sewers are a part of the larger public information program as described in Control 6 (Section 2.6).

In partnership with the City of Seattle, King County has administered the RainWise program since 2010. This program provides rebates to homeowners living in specific combined sewer areas for installing rain gardens and cisterns on their own property. RainWise helps to slow, detain, or retain stormwater, which reduces both the volume and timing of combined sewer flows and reduces sources of pollution into the combined system.

King County manages grant programs to help residents and small businesses implement small-scale projects to improve air and water quality and support the success of King County's CSO projects by controlling new and ongoing sources of pollution that could harm the environment or re-contaminate cleaned up areas in the waterway. The grants also help promote partnerships around source control, develop local expertise in water quality protection, and enhance small-scale environmental and economic opportunities in the community. The grants help King County residents protect their long-term investment in CSO projects.

In 2015, the following grants were awarded through the King County Council-allocated water quality improvement grant funding, funded and administered by the King County Wastewater Treatment Division. Funding for these 26 projects, including administration, totaled $2,096,043.

1. *Adopt-a-Stream: North Lake Washington Tributaries Streamkeepers ($15,000).* This project includes environmental stewardship activities in Seattle and North King County cities, including working with residential associations to install and maintain storm drain filters, stream restoration technical assistance, and Streamkeeper Academy Field Training courses and events. The Streamkeeper Academy Field Training provides information on how to adopt a stream and field sessions teach how to gather monitoring data and present findings to decision makers.
2. *City of Black Diamond: North Commercial and State Route 169 Stormwater Treatment Facility ($243,643).* Grant funds will be used for final design and construction of wetland and infiltration swale to address stormwater outfall to provide treatment prior to discharge to Ginder Creek. This project will provide treatment for the largest and most polluted stormwater outfall in Black Diamond, which is within the Green/Duwamish Watershed.
3. *City of Federal Way: Stormwater Low Impact Development (LID) Outreach Project at Federal Way Town Square Park ($104,500).* This project has two parts, expanding the existing school program (Storming the Sound with Salmon) and developing and integrating curriculum on LID. The school program includes supplies and support for raising salmon in the classroom and salmon release field trips for 11 schools. The LID piece includes the design, development, integration, review, and installation of curriculum and interactive elements (including an educational 'virtual tour' video) demonstrating LID elements at Town Square Park.
4. *City of Kirkland: Totem Lake Residential Stormwater Retrofits - Yard Smart Rain Rewards ($165,000).* The City of Kirkland is launching this program to increase awareness and prevent polluted stormwater runoff. Through this grant they plan to provide 100 consultations with homeowners on options for installing stormwater facilities and provide rebates for 50 homeowners to reduce the cost of installing stormwater control facilities.
5. *City of Kirkland: Totem Lake Spill Prevention Program ($17,000)*. Through this project, at least 100 new businesses will receive on-site training in spill prevention and cleanup, leading to increased awareness, source control, and prevention of polluted stormwater runoff. At least 25 previously contacted businesses will receive follow-up training, information, and materials. Contract staff can provide services in 10 languages for businesses owners and employees that speak languages other than English.
6. *City of Maple Valley: 216th Avenue SE Roadway Improvements ($45,000).* This project supports design and construction of traditional and LID treatment of surface water currently draining to and impacting Cranmar Creek. Cranmar Creek is a tributary to Jenkins Creek and both provide critical habitat for Coho salmon smolt. The project includes four Department of Ecology approved Modular Wetland Systems with downstream infiltration chambers, designed to remove over 80 percent of TSS.
7. *City of Sammamish: Zackuse Creek Fish Passage and Stream Restoration ($157,400)*. Through this project, the City of Sammamish will replace a culvert on East Lake Sammamish Parkway to re-establish aquatic species and relocate and restore approximately 200 feet of the stream

channel of Zackuse Creek. This project is expected to divert a significant point source of sediment and stormwater runoff from the road surface into the creek, home to native kokanee and other salmonids.

8. *City of Seattle, SPU: Cedar River Stewardship in Action - Unincorporated King County ($50,000).* This project supports riparian restoration, removing knotweed and other invasive plant species, and installing native plantings on approximately three acres (five to seven private properties) along the Cedar River to improve water quality and native fish habitat. Native vegetation on stream and riverbanks is expected in decrease temperature and protect against erosion, which should decrease sediment, turbidity, and fecal coliform levels. This project, a partnership with two agencies and one non-profit organization, also includes educating and engaging landowners as stewards of their property and encourages them to become permanent stewards of the Cedar River.
9. *City of Seattle, SPU: In-Stream Methodology for Detecting Sewage Flow into Receiving Waters ($320,000)*. This project supports development of a methodology to identify sources of bacterial pollution in four to five waterways/creeks in north, east, and south King County, using in-stream data loggers that measure temperature and conductivity.
10. *City of Shoreline: Boeing Creek Basin Water Quality Improvement Projects ($15,000).* Supports rain garden installation with educational signage and ditch and catch basin cleaning in the Boeing Creek Basin within the City of Shoreline.
11. *EarthCorps: Puget Sound Stewards - Duwamish and Beyond ($50,000)*. This project consists of recruiting and organizing 25 stewards/volunteers to manage 200 community volunteers at up to 25 project sites and two large volunteer efforts restoring the environment along the Lower Duwamish-Green River.
12. *Environmental Coalition of South Seattle (ECOSS): Greening Community Spaces ($50,000)*. Supports construction of one to two green infrastructure/outdoor learning spaces and demonstration projects (diverting stormwater) at public community spaces in King County.
13. *ECOSS: Puget Sound Spill Kit Incentive Program - Multicultural Outreach ($40,000).* This project supports training of approximately 400 non-English speaking businesses by multilingual coordinators for spill prevention and clean-up in six additional cities or unincorporated areas in King County that have expressed interest (but currently do not have resources to support it). This training helps businesses reduce their impact on local waterways.
14. *Finn Hill Neighborhood Alliance: Rainwater Harvesting System Installation ($15,000)*. This project supports installation of rainwater harvesting system in the Finn Hill Neighborhood, which helps reduce stormwater impact on area creeks and wetlands.
15. *Forterra: Bear Creek Watershed Riparian Improvement ($68,000)*. This project supports surveying and mapping of invasive and native plant populations and develops weed control project parameters and a riparian re-vegetation plan of action in the Bear Creek watershed. This project is a partnership between Forterra, the City of Redmond, and King County's Noxious Weed Control Program.
16. *Forterra: Cedar River Stewardship in Action – Renton ($20,000)*. This project supports riparian restoration, removing knotweed, and installing native planting on approximately one acre or 2,500 linear feet on private or public properties along the Cedar River in Renton. This project is a

partnership between Forterra, the City of Renton, and City of Seattle and King County's Noxious Weed Control Program.

17. *King County, Water and Land Resources Division: Fairwood 4 Stormwater Improvement ($45,000)*. This project supports replacement of a failing pipe that conveys Molasses Creek under a neighborhood in the Fairwood area and removes fish blockage. Collapse of the pipe would deposit eroded materials into creek.
18. *King County, Water and Land Resources Division: Cooling the Green River ($250,000).* This project Supports acquisition of easements on properties (between river miles 11-32 of the Green River) prior to re-vegetation to shade the river. Re-vegetating the riverbanks will decrease pollutants and contaminants in runoff, provide shade and help cool the river in summer and early fall, improve groundwater recharge, and improve salmon and wildlife habitat. Acquisition of easements is a first step in planning for re-vegetation of this area.
19. *King County, Water and Land Resources Division: Soil Testing at Teuful Nursery ($18,000)*. This project supports sampling and testing for dieldrin (pesticide) soil contamination prior to potential sub-leasing of land to low-income farmers in-training, to prevent surface and/or groundwater contamination.
20. *King County, Water and Land Resources Division: Sammamish Valley Farmers' Irrigation Water Support ($95,000)*. This project supports working with farmers who need additional water (to expand production) to use recycled water, including potentially assisting with water hauling. The Sammamish River suffers from low stream flows in the summer months and currently does not meet Washington state water quality standards for temperature, dissolved oxygen, and bacteria. By expanding recycled water use in the Sammamish Valley, more water can be kept in the river system to support flows and water quality in the Sammamish River.
21. *Lake Forest Park Streamkeepers: Rain Garden Installation at Lake Forest Park City Hall ($15,000)*. Supports installation of a rain garden with educational signage at Lake Forest Park City Hall, which will intercept toxics in stormwater runoff from the city hall parking lot. Information about the City's rain garden benefits will be included in environmental educational programs.
22. *Lake Sawyer Park Foundation: Lake Sawyer Regional Park Interpretive Trail ($12,500).* This project supports installation of educational signs and creating and producing educational materials related to the interpretative trail and water quality improvements. This project is a partnership between the Lake Sawyer Park Foundation and the City of Black Diamond.
23. *Seattle Parks Foundation in partnership with Urban Systems Design LLC: Green Infrastructure Job Corps ($75,000)*. This project supports three sessions of the Green Infrastructure Job Corps for young adults providing job training, which includes maintenance through 2016 of already completed green infrastructure projects across the Duwamish Valley.
24. *Sno-King Watershed Council*: Sno-King Watershed Council Water Quality Monitoring and Stewardship ($15,000). This project supports volunteer-based water quality monitoring and education/outreach projects and working with partners on restoration of riparian habitat in North King County and South Snohomish County watersheds.
25. *Stewardship Partners: RainWise Access Grant Expanded Pilot ($60,000)*. This project supports expansion of RainWise programs (rain gardens and cisterns incentive program through the City of Seattle and King County) to reach underserved communities in every RainWise basin. The goal

of the project is to reduce the water quality threats posed by combined sewer overflow events by increasing on-site storage and biorention of stormwater on private property.

26. *Thornton Creek Alliance*: Promoting Stewardship in the Thornton Creek Watershed ($15,000). This project supports a range of activities including data collection, clean-up work parties, and community communications around environmental restoration of the Thornton Creek watershed. The goals are to improve water quality, stabilize water flow, prevent flooding, and improve habitat.

As part of the King County grant program, the Puget Sound Clean Air Agency (PSCAA) settlement agreement (Notice and Order of Civil Penalty No. 12-020 CP Section III.C. February 23, 2012) stipulated awarding $411,300 in grants over four years for air or water quality improvement projects, salmon habitat protection and restoration projects, or environmental education and community outreach efforts within the Green River/Duwamish River basin. The grant award funding is divided equally over the four-year period, with $104,670 allocated for each year. 2016 is the last year of the program. For 2016, the projects and recipients are:

- *Green Solutions to Air Pollution* ($45,000). This project will implement strategies to address sources of air pollution in Georgetown and South Park. Strategies will be selected from those identified as highly effective in a literature review (green walls, green billboards, and redesigning tree-planting methods). Strategies will be chosen and implemented in collaboration with the community, including mapping potential locations, engaging businesses, training interested community members, and collaborating with other opportunities.
- *Restoration of Wetland at 23rd Avenue SW and SW Findlay Street* ($40,000). Delridge Neighborhood Development Association will lead a community effort to improve the water quality and hydrology of Longfellow Creek and its outfall into the West Waterway of the Duwamish River through the purchase and restoration of a 7,144 square foot wetland. The wetland is part of a 20,000 square foot parcel being surplused by Seattle City Light. The project will provide needed green infrastructure in a combined sewer overflow basin and an underserved neighborhood. It provides the opportunity to engage the surrounding community with hands-on science related to water quality and wetland restoration.
- Green Infrastructure Job Corps: Growing Green Infrastructure Careers through On-the-Job Training ($15,980 and $37,000 from WTD Green Stormwater Infrastructure Program). This project will provide a portion of the funding needed to organize and run 3 sessions of the "Green Infrastructure Job Corps" (Fall 2015, Winter 2016, and Spring 2016). This program will develop skills and career pathways for young adults 17 years and older to pursue green infrastructure design, construction, landscaping, or operations and maintenance careers. The grant will pay stipends to participants and the other funding will pay for technical support for small-scale green infrastructure projects in the Georgetown and South Park neighborhoods of Seattle. The program will build confidence in young adults through training and participating in a crew that assists with community-driven projects like tree-planting, wetland restoration, rain garden design and construction, maintaining existing GSI installations, and vegetation management.

In 2012, King County funded a three-year Source Control Inspector position within Ecology to conduct stormwater inspections in separated and combined basins of the Lower Duwamish Waterway. In 2016, King County will use the findings from the inspections in the combined basins, supplemented by other source control information from the Lower Duwamish Waterway, to initiate discussions between King County and the City of Seattle on the nature and type of source control activities in combined basins that could have the greatest potential to-influence CSO quality. In addition, in June 201, King County submitted a draft Source Control Implementation Plan for the Lower Duwamish to Ecology that includes identifying and tracing sources in the combined system that discharge to the Lower Duwamish to address comments received from Ecology on the draft Plan submitted in 2014. King County has been implementing the Plan since 2014.

In 2016, WTD will begin work with City of Seattle to understand the stormwater pollution prevention Best Management Practices (BMPs) implemented within the City of Seattle consistent with each agency's NPDES permit. A description of the program's approach, appropriate BMPs, and the legal authority and administrative procedures that can to support the program will be included in the 2017 Annual Report.

2.8 Control 8—Notifying the Public

Implement a public notification process to inform the citizens of when and where CSOs occur. The process must include (a) a mechanism to alert persons of the occurrence of CSOs and (b) a system to determine the nature and duration of conditions that are potentially harmful for users of receiving waters due to CSOs.

King County operates a CSO Notification and Posting Program as a joint project with the City of Seattle and Public Health–Seattle & King County. This program includes signs at publicly accessible CSO locations, an information phone line, websites, a brochure, and other public outreach activities.

A website providing real-time notification of recent and current CSO discharges went live in December 2007 (http://www.kingcounty.gov/environment/wastewater/CSOstatus.aspx). In April 2011, King County completed the process to incorporate City of Seattle near real-time overflow information on this website. The website presents overflow status for the majority of City and County CSOs with links to and from each agency's independent website. The community has access to consolidated information to assist in making choices about use of local waters. In 2015, the website was upgraded to be more usable on mobile devices and allows users to zoom in and out to get more get details.

In 2014, the two new projects (Rainier Valley Wet Weather Storage [Rainier Valley WWS] to control Hanford #1 Overflow and Georgetown WWTS to control Brandon St. RS Overflow and S Michigan St. RS Overflow) implemented their outreach and involvement programs. King County uses resources and skills throughout the division to support community based education partnerships, providing resources that will in turn be further disseminated throughout the region.

In 2015, the CSO Control Program and the CSO Status Web pages had 27,258 page views (representing 19,983 unique page views, with 58 percent "bouncing" to deeper page levels). This is approximately 20 percent more views than 2014.

2.9 Control 9—Monitoring CSO Outfalls

Monitor CSO outfalls to characterize CSO impacts and the efficacy of CSO controls. This must include collection of data that will be used to document the existing baseline conditions, evaluate the efficacy of the technology-based controls, and determine the baseline conditions upon which to base the long-term control plan. This data must include:

A. **Characteristics of the combined sewer system, including the population served by the combined portion of the system and locations of all CSO outfalls in the combined sewer system.**
B. **Total number of CSO events and the frequency and duration of CSOs for a representative number of events.**
C. **Locations and designated uses of receiving water bodies.**
D. **Water quality data for receiving water bodies.**
E. **Water quality impacts directly related to CSO (for example, beach closing, floatables, wash-up episodes, fish kills).**

In 1986, Metro began a sampling program to characterize each CSO and identify high priority sites for early control. The program included collecting overflow quality data for five CSO sites per year and collecting sediment samples at each site. In the 1990s, sampling was expanded to assess compliance with Washington State Sediment Management Standards. The County's extensive monitoring for its 1999 CSO Water Quality Assessment of the Duwamish River and Elliott Bay found that the majority of risks to people, wildlife, and aquatic life would not be reduced by removal of CSOs because most risk-related chemicals come from sources other than CSOs.

Under the previous NPDES permit for the West Point Treatment Plant effective July 1, 2009, King County developed a comprehensive sediment quality summary report for all CSO discharge locations (submitted December 2009). It can be found at:
http://your.kingcounty.gov/dnrp/library/wastewater/cso/docs/SedQuality/0912_CompSedQualSumRptCSODischargeLoc.pdf.

King County's Post-Construction Monitoring Plan (PCMP) is designed to assess, document, and report on the effectiveness of its CSO control program in achieving performance requirements and complying with state water and sediment quality standards. The King County PCMP was submitted to Ecology in July 2010 and was approved on September 28, 2012. It can be found at:
http://your.kingcounty.gov/dnrp/library/wastewater/cso/docs/ProgramReview/2012/AppH_CSO_PostConstructionMonitoringPlan,Sept2012.pdf

3.0 Currently Under Way CSO Control Measures

This section describes the progress made on implementing current CSO control projects and projects that affect CSO control. It includes project specific summaries of progress made in 2015, planned activities for 2016, and where each project is in relation to its schedule of milestones.

The CD requires the County to report on projects under way and early action CSO control measures. The CD milestone statuses through 2015 are summarized in Table 3.

Table 3. Summary of King County Consent Decree Milestones through 2015

Project Name	DSN	CD Milestone and Required Date	Actual Milestone Completion Date
Barton Street Roadside Raingardens	057	Construction Completion by December 2016	Construction/maintenance ongoing in 2015
Georgetown WWTS	039, 041	Submit Facility Plan by December 31, 2015	November 2015
Murray Street Wet Weather Storage	056	Construction Completion by December 31, 2016	Construction ongoing in 2015
North Beach Wet Weather Storage	048, 048b	Construction Completion by December 31, 2015	December 2015
Rainier Valley WWS	031a, 031b,	Submit Facility Plan by December 2014	February 2014
Ship Canal Water Quality Project	004, 008	Submit Facility Plan December 2018 for DSN 008 and December 2026 for DSN 004[1]	N/A
South Magnolia Wet Weather Storage	006	Construction Completion by December 31, 2015	December 2015
West Michigan Street and Terminal 115 (West Duwamish) CSO	038, 044	Submit Facility Plan by December 31, 2020	N/A
Chelan Ave. RS Overflow	036	Submit Facility Plan by December 31, 2018	N/A
Dexter Ave. RS Overflow	009	Submit to Ecology & EPA within 30 days of CD (July 3, 2013)	August 2013
Denny Way RS Overflow	027a	Submit to Ecology & EPA within 30 days of CD (July 3, 2013)	August 2013
Harbor Ave. RS Overflow	037	Submit to Ecology & EPA within 30 days of CD (July 3, 2013)	August 2013

[1] The future proposed modification to the CD dates are December 31, 2017 for both locations.

The CSO component of the Ballard Siphon Project achieved the performance standards in 2014. In accordance with the Post-Construction Monitoring Plan, ambient water quality monitoring will continue

in the Lake Washington Ship Canal. In addition, the Ballard CSO meets Water Quality Standards under the one-event per year exemption (WAC 173-201A-400).

3.1 Project Summaries

A summary project status page for each active project follows.

CD/CSO Report Project Status
Barton St. Roadside Raingardens

CSO(s): DSN 057 (Barton St. PS Overflow)

Project Description: Construct green stormwater infrastructure (biorentention swales and associated drainage structures) and underground injection control wells for CSO control. For more information see: http://www.kingcounty.gov/environment/wtd/Construction/Seattle/BartonCSO-GSI.aspx.

Milestones	CD Milestone Date (Actual Date)	2010	2011	2012	2013	2014	2015	2016	2017
Submission of Facilities Plan	N/A (final 9/20/2011)								
Submission of Final Plans & Specifications	12/31/2012 (6/13/2013)								
Start of Construction	12/31/2013 (10/21/2013)								
Construction Completion	12/31/2016								
Achievement of Performance Standard	12/31/2017 (N/A)								

2015 Accomplishments:

- Successfully completed the testing and well cleaning of the last five streets.
- Submitted the deliverables to Ecology for the loan agreement.

2015 Challenges and Corrections:

- None.

2016 Activities in Progress or Expected:

- Train WTD staff on maintenance of underground injection control (UIC) wells.
- Establish landscape maintenance contracts.
- Develop procedure for maintenance with contractor and design consultants before evaluating compliance.
- Begin close-out activities.

CD/CSO Report Project Status
Georgetown Wet Weather Treatment Station

CSO(s): DSN 041 (Brandon St. RS Overflow) and DSN 039 (S. Michigan St. Overflow)
Project Description: Site, design, and construct a wet weather treatment station, associated conveyance, and marine outfall. For more information see: http://www.kingcounty.gov/environment/wtd/Construction/Seattle/BrandonMichiganCSO.aspx.

Milestones	CD Milestone Date (Actual Date)	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
Submission of Facilities Plan	12/31/2015 (draft 11/2/2015)											
Completion of Bidding	12/31/2017 (N/A)											
Construction Completion	12/31/2022 (N/A)											
Achievement of Performance Standard	12/31/2024 (N/A)											

2015 Accomplishments:

- Recommended a site for the treatment station and entered into negotiations with property owners. Acquired 2 of the 4 required parcels for the wet weather treatment station.
- Amended the design contract to include design work through 60 percent design.
- Hired an Expert Review Panel to review the project.
- Added Kruger to the design contract via amendment. Kruger will be providing the ballasted sedimentation treatment equipment.
- Conducted a competitive procurement for the ultra-violet disinfection equipment. Selected and entered into negotiations with Suez/Ozonia for their Aquaray 3x system.
- Conducted a constructability review of the 10 percent design with an independent consultant team.
- Submitted the Draft Facility Plan to Ecology in November 2015, ahead of the CD deadline.
- Completed 15 percent design and received approval to advance the recommended alternative to 30 percent design in November 2015.
- Conducted geotechnical field investigations and survey work, which will continue through early 2016.
- Began the permit processes with the U.S. Army Corps of Engineers and City of Seattle. Permit applications submitted and review meetings conducted.
- Held regular community Design Advisory Group meetings to obtain community input on the design.

2015 Challenges and Corrections:

- Completing property acquisitions for the treatment station and relocation of businesses by December 2016.

2016 Activities in Progress or Expected:

- Complete predesign and develop baseline costs to be reviewed by the Expert Review Panel and approved by the Project Review Board.
- Complete 60 percent design.
- Conduct a project optimization effort, with review by the Expert Review Panel.
- Hire a construction management consultant to assist throughout construction of the complete system.
- Complete the property acquisition and relocation process.
- Negotiate the final design amendment with consultant design team.
- Issue the SEPA Determination of Nonsignificance.
- Receive final approval of the Facility Plan from Ecology.
- Continue permitting processes and obtain permits necessary for the site preparation and demolition work.
- Continue community outreach meetings and activities.

CD/CSO Report Project Status
Murray Street Wet Weather Storage

CSO(s): DSN 056 (Murray St. PS Overflow)
Project Description: Construct wet weather storage. For more information see:
http://www.kingcounty.gov/environment/wtd/Construction/Seattle/MurrayCSOStorage.aspx.

Milestones	CD Milestone Date (Actual Date)	2010	2011	2012	2013	2014	2015	2016	2017
Submission of Facilities Plan	N/A (final 9/30/2011)								
Submission of Final Plans & Specifications	12/31/2012 (12/31/2012)								
Start of Construction	12/31/2013 (10/16/2013)								
Construction Completion	12/31/2016 (N/A)								
Achievement of Performance Standard	12/31/2017 (N/A)								

2015 Accomplishments:

- Completion of concrete pours for the storage tank walls and roof.
- Began 60-inch pipe installation and utilities connecting the pump station to the tank.
- Completion of building structural concrete for walls, floor, and roof.
- Continued installation of electrical, plumbing, instrumentation, and yard piping.
- Completion of architectural wall treatment of the exposed facility surfaces.

2015 Challenges and Corrections:

- Installation of the 60-inch pipe and associated utilities took longer than anticipated.
- Seattle City Light power coordination was difficult.

2016 Activities in Progress or Expected:

- Continue electrical, plumbing and instrumentation installation.
- Begin backfill of the project site in preparation for final site grading.
- Completion of the 60-inch pipe installation.
- Install landscape and art work.
- Complete upgrade of the Murray St. PS and install emergency generator.
- Substantial completion is anticipated by October 2016.

CD/CSO Report Project Status
North Beach Wet Weather Storage

CSO(s): DSN 046 a & b (North Beach PS Inlet/Wet Well Overflows)

Project Description: Construct wet weather storage. For more information see: http://www.kingcounty.gov/environment/wtd/Construction/Seattle/NBeachCSOStorage.aspx.

Milestones	CD Milestone Date (Actual Date)	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
Submission of Facilities Plan	N/A (final 9/30/2011)											
Submission of Final Plans & Specifications	12/31/2012 (12/31/2012)											
Start of Construction	12/31/2013 (12/30/2013)											
Construction Completion	12/31/2015 (12/3/2015)											
Achievement of Performance Standard	12/31/2016 (N/A)											

2015 Accomplishments:

- Completed construction and commissioning.
- Achieved CD construction completion milestone on 12/3/2015.
- Submitted Facility O&M Plan to Ecology.
- Submitted change order packages to Ecology.

2015 Challenges and Corrections:

- Aggressive schedule to complete commissioning and to meet CD deadline.

2016 Activities in Progress or Expected:

- Complete punchlist.
- Complete as-built drawings.
- Begin close-out
- Close out permits.
- Submit final change orders to Ecology.
- Monitor project for compliance.

CD/CSO Report Project Status
Rainier Valley Wet Weather Storage

CSO(s): DSN 031 (Hanford #1 Overflow- Hanford @ Rainier Overflow, Bayview North Overflow, and Bayview South Overflow)

Project Description: Construct CSO Storage Tank and Conveyance Improvements. For more information see: http://www.kingcounty.gov/environment/wtd/Construction/Seattle/HanfordCSO.aspx.

Milestones	CD Milestone Date (Actual Date)	2013	2014	2015	2016	2017	2018	2019	2020
Submission of Facilities Plan	12/31/2014 (draft 2/28/2014)								
Completion of Bidding	12/31/2016 (N/A)								
Construction Completion	12/31/2019 (N/A)								
Achievement of Performance Standard	12/31/2020 (N/A)								

2015 Accomplishments:

- All permits approved for the project (e.g., Seattle Department of Transportation Street improvement permit, Building and Construction permits).
- 100 percent design completed.
- Facility Plan approved.
- Project Labor Agreement successfully negotiated.
- Construction Management Services contract Notice of Selection issued.
- Amended Facility Plan to adjust for inconsistencies discussed in Section 1.1

2015 Challenges and Corrections:

- Condemnation process at Bayview site took longer than anticipated. Original condemnation request was not approved, requiring a secondary review and approval. Use and possession granted, but final resolution will not occur until 2016.
- Facility Plan corrections needed due to incorrect interpretation of location of Hanford #1 Overflow. Issue successfully resolved in amended Facility Plan.

2016 Activities in Progress or Expected:

- Construction contract will be awarded in the second quarter of 2016.
- Construction Notice to Proceed will be issued and construction will begin in the second quarter of 2016, 6 to 8 months ahead of the Consent Decree deadline.
- Final resolution of property easement at the Bayview site.

CD/CSO Report Project Status

Ship Canal Water Quality Project

CSO(s): DSN 004 (3rd Ave. W Overflow) and DSN 008 (11th Ave. NW Overflow)

Project Description: The Ship Canal Project will provide offline storage of combined wastewater in a deep storage tunnel constructed between the Ballard and Wallingford neighborhoods, on the north side of the Ship Canal. The Ship Canal Project will control the SPU Ballard (Outfalls 150, 151 and 152), Fremont (Outfall 174), and Wallingford CSO basins (Outfall 147) and the King County 3rd Ave. W Overflow (DSN008) and 11th Ave. NW Overflow (DSN004). For more information see: http://www.seattle.gov/util/EnvironmentConservation/Projects/ShipCanalWaterQuality/index.htm

Milestones	CD Milestone Date (Actual Date)	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026
Submission of Draft Facilities Plan	3/31/2017 (N/A)												
Completion of Bidding	7/1/2021 (N/A)												
Construction Completion	12/31/2025 (N/A)												
Achievement of Performance Standard	12/31/2026 (N/A)												

2015 Accomplishments

- Developed a collaborative process with SPU (who is the lead agency for this project). WTD is providing appropriate Subject Matter Experts to participate in technical meetings and reviews with SPU.
- Advanced the design of the tunnel and dewatering pump station to approximately 20 percent complete.
- Developed a scope of work and Request for Proposals for final design of the tunnel, conveyance, and dewatering pump station.

2015 Challenges and Corrections:

- Completed negotiations of the Joint Project Agreement (JPA) with SPU. The JPA was approved by the Seattle City Council in December 2015 and is being considered by the King County Council in 2016.

2016 Activities in progress or expected:

- Submit the draft Facilities Plan to Ecology and EPA for review in January 2016. Anticipating comments second quarter 2016. Submission of the final document is expected by first quarter 2017.
- Following execution of the JPA, King County will submit a CD modification request to substitute the joint Ship Canal Project for the standalone 3rd Ave. W Overflow and 11th Ave. NW Overflow CSO projects.

- Support SPU's selection of final design consultant during the third quarter 2015 to have SPU award the contract to prepare the final design. The 30 percent design packages are expected for joint agency review during the second quarter 2016. The 60 percent design is expected fourth quarter 2016.
- Value Engineering will take place third quarter 2016.

CD/CSO Report Project Status

South Magnolia Wet Weather Storage

CSO(s): DSN 006 (S. Magnolia Overflow)
Project Description: Construct wet weather storage and new conveyance. For more information see: http://www.kingcounty.gov/environment/wtd/Construction/Seattle/SMagnoliaCSOStorage.aspx.

Milestones	CD Milestone Date (Actual Date)	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
Submission of Facilities Plan	N/A (final 9/30/2011)											
Submission of Final Plans & Specifications	12/31/2012 (12/31/2012)											
Start of Construction	12/31/2013 (12/16/2013)											
Construction Completion	12/31/2015 (12/31/2015)											
Achievement of Performance Standard	12/31/2016 (N/A)											

2015 Accomplishments:

Storage Facility

- Completed commissioning and met CD construction completion milestone on 12/31/2015.
- Continued site restoration and landscaping.
- Submitted draft facility O&M Manual to Ecology
- Submitted change orders packages to Ecology.

Conveyance Pipeline:

- Completed construction.

2015 Challenges and Corrections:

- Coordination with other utilities in order to complete commissioning. Able to complete commissioning by 12/31/2015 to meet CD construction completion date.
- Scheduling a 3-day continuous concrete pour. Pour occurred in less than 30 hours.

2016 Activities in Progress or Expected:

Storage Facility

- Complete punch list.
- Finalize facility O&M Manual.
- Finalize as-built drawings.
- Begin close-out.
- Submit final change orders to Ecology.
- Monitor project for compliance.
- Close out permits.

Conveyance Pipeline

- Complete as-built drawings.
- Complete close-out of change orders.

3.2 Supplemental Plan Summaries

A supplemental compliance status page for each project under a Supplemental Compliance Plan follows.

CD/CSO Report Supplemental Compliance Plan Status
Dexter Avenue Regulator Station Overflow

CSO(s): DSN 009 (Dexter Ave. RS Overflow)
Project Description: Adjust facilities built in 2005 to achieve final control per the Supplemental Compliance Plan submitted to Ecology and EPA in 2012. Starting in 2010, several years of control system adjustments were made and monitored the next wet season but did not achieve control. Alternatives analysis described in the Supplemental Compliance Plan recommended modifications to the diversion structure to the Mercer Street Treatment Tunnel to increase the upstream diversion of Central Trunk flows. The modifications were made in 2014 and compliance was achieved in 2015.

2015 Activities:

- Monitoring completed.
- Compliance achieved.

2015 Challenges and Corrections:

- None.

2016 Activities in Progress or Expected:

- None (compliance has been achieved).

CD/CSO Report Supplemental Compliance Plan Status
Denny Way Regulator Station Overflow

CSO(s): DSN 027a (Denny Way RS Overflow)
Project Description: Adjust facilities built in 2005 to achieve final control per the Supplemental Compliance Plan included in the 2011 TM 970, and updated to Ecology and EPA in 2012. Investigation suggested that two of the inputs—Denny Local and Denny Lake Union—were overflowing more than intended. The investigation recommended removal of the lower Denny local weir and modification of the Elliott West pump ramp-up strategy to drop the lead pump start set point by 2.25 feet and improve flow into the Elliott West facility. The weir modifications were completed in July 2011 and pumping strategy modifications were completed on November 17, 2011. Additional work on the pumping strategy was completed in the fall of 2015.

2015 Activities:

- Additional monitoring continued after modifications to the pumping strategy. However, the changes were made late in the year so limited monitoring data was collected in 2015.

2015 Challenges and Corrections:

- In 2015, there were five overflows: one lasting one hour, one lasting one minute, one lasting six minutes, one lasting two minutes, and one lasting 15 minutes. The largest discharge was 2.7 MG and the smallest was 2,346 gallons.
- Additional changes were made to the pumping strategy in fall 2015.

2016 Activities in Progress or Expected:

- Performance of programing improvements will continue to be monitored and additional adjustments will be investigated. As required in the CD, King County will report control status through 2015 in this Report. In addition, King County will document the 20-year average based on the re-modeled changed system facilities for the previous 20-year rainfall pattern in the same report. Since compliance was not achieved by December 31, 2015, Denny Way Basin will be included in the alternative analysis being performed in the 2018 LTCP Update.

CD/CSO Report Supplemental Compliance Plan Status
Harbor Avenue Regulator Station Overflow

CSO(s): DSN 037 (Harbor Ave. RS Overflow)
Project Description: Adjust facilities built in 1998 to achieve final control per the Supplemental Compliance Plan submitted to Ecology and EPA in August 2012 and amended in September 2012. It was determined that failed modulation of the Alki Gate to the West Seattle Tunnel resulted in less tunnel storage capacity being available to store Harbor flows – half of the tunnel capacity was to be available. Locking the gate partly open (51 percent) was recommended.

2015 Activities:

- WTD has optimized the control strategy, but the mechanical actuator on the gate cannot open the gate quickly enough to prevent overflows. Additional work is needed to modify or replace the gate actuator.

2015 Challenges and Corrections:

- In 2015, there were four overflows lasting less than one hour each. The largest event was 717,534 gallons and the smallest was 43 gallons. The gate actuator cannot open and close fast enough to keep up with the flows in the system.
- The control strategy is optimized for meeting the one-event per year standard. However, the gate cannot open quickly enough to prevent CSOs.

2016 Activities in Progress or Expected:

- Performance will be monitored. As required in the CD, King County will report control status through 2015 in this Report, Section 6. In addition, King County will document the 20-year average based on the system facilities for the previous 20-year rainfall pattern in the same report. Since compliance was not achieved by December 31, 2015, Harbor Ave. Basin will be included in the alternative analysis being performed in the 2018 LTCP Update.

3.3 Program Plan Summaries

The CD required development and implementation of two plans: the Sewer System Operations Plan (SSOP) and the Joint Operations and System Optimization Plan (Joint Plan) with the City of Seattle.

3.3.1 Sewer System Operations Plan

The CD required the County to submit its SSOP for Ecology and EPA approval within 90 days of the effective date of the CD. The County met this milestone through the submittal of its SSOP on September 27, 2013. Ecology and EPA approved the SSOP on May 29, 2014 and July 29, 2014, respectively. The SSOP is an electronic, interactive document with imbedded links to the most current base documents, such as O&M manuals, plant manuals, safety plans, and maps. King County staff typically access the SSOP from the County's intranet site. Portable storage device (thumb drive) versions are also provided at each facility and to key staff for access in the field or from home. Once a year in August, the team representatives of Operations, Offsite, and CSO control planning go over the plan to ensure that the electronic links still work. Every third year (beginning in 2016), the team will review the SSOP to ensure that base documents are being updated as needed and that any new or changed information is reflected in the SSOP. Thumb drives are replaced as needed.

3.3.2 Joint Operations and System Optimization Plan

The City of Seattle's and King County's CD's each contain language directing both agencies to work together to develop a single Joint Operations and System Optimization Plan (Joint Plan), to be submitted no later than March 1, 2016. In 2015, the Joint Plan team built on the work completed in 2014 by focusing on areas in the system that have the greatest potential for operational optimization. Over the course of the year, staff from both WTD and SPU participated in detailed analyses, and developed a set of recommended multi-basin joint commitments to be included in the Joint Plan. The recommendations were approved by the Directors of WTD and SPU's Drainage and Wastewater Line of Business. These commitments include:

- Establish a Joint System Debrief Committee to look at performance of the systems, identifying interconnections to improve operations and share information.
- Begin sharing data.
- Continue the Joint Operations Information System Team (JOIST) to share operational information and include operational considerations in capital projects in design.
- Continue the Real-time Data Sharing Pilot in the selected basin and explore permanent real-time data sharing.
- Improve rainfall data for forecasting with additional gauges.
- Establish a Joint Modeling Coordination Committee (JMCC) to share tools and modeled information to improve operational strategies.
- Coordinate startup/commissioning of CSO control facilities to work together to optimize facilities.

- Institute real-time CSO notification to improve both onsite (signs) and website information to improve customer communication.
- Reduce saltwater intrusion by continuing to work together on studies, data, and solutions for reducing intrusion.
- Develop and approve Early Action No. 3 for implementation: Operational Data Sharing Pilot. This Early Action established a framework for real-time data sharing and resulted in development of a secure connection between WTD's and SPU's SCADA systems. This is the first time that the two agency's SCADA systems have shared data with the other and the first time that staff has had access to real-time data from both systems. Data shared in the pilot is from the WTD University and SPU Windermere basins where both King County and SPU have pump stations and CSO control facilities and the potential for operational optimization and reduction of CSOs and sewer overflows is significant.

3.3.3 King County Coordination with City of Seattle CSO Control Projects

Similar to the County, the City of Seattle is implementing CSO control projects under their NPDES permit and CD. Unless these projects involve separation or GSI, Seattle projects will send captured CSO flows to the King County regional system for treatment at West Point Treatment Plant or at wet weather treatment stations. The two agencies have been working together for many years to identify joint project and operational opportunities to improve each agency's efforts and better protect the environment. King County and the City of Seattle have agreed to guiding principles to ensure that neither agency will adversely impact the compliance of the other. The following City of Seattle projects have recently begun sending captured CSO flows to the regional system (or will in the near future):

- Delridge – NPDES 168 and 169: construction completed in November 2015 with flows to the regional system in November 2015.
- Genesee – NPDES 40/41 and 43: construction complete in early 2015 with flows to the regional system in January 2015.
- Leschi – NPDES 26 through 36: Phase 1 construction completed in early 2015 with flows to the regional system in 2015 and Phase 2 construction will be completed in 2016 with flows to the regional system in 2016.
- North Union Bay – NPDES 18: construction will be completed in early 2016 and flows will be sent to the regional system in mid-2016.
- South Henderson – NPDES 46: construction completed in December 2015 with flows to the regional system in December 2015.
- South Henderson – NPDES 44/45: construction will be completed mid-2017 with flows to the regional system in 2017.
- South Henderson – NPDES 47C: construction completed October 2013 with flows to the regional system in December 2013.
- South Henderson – NPDES 47B/171: construction completed August 2015 with flows to the regional system in August 2015.

- South Park (14th and Concord): construction will be completed in July 2016 with flows to the regional system in mid-2016.
- Windermere – NPDES 13 and 15: construction completed in July 2015 with flows to the regional system in March 2015 (flows started during commissioning).

King County has been modeling flows from Seattle to the 30th Avenue Northeast (30th Ave. NE) and Belvoir Basins and determined that past SPU sewer system modifications from 2003 have been contributing additional flows to the regional system. WTD and the City of Seattle are working together to address the impacts to the regional system from these past sewer system improvement flows and from future planned flows from North Union Bay and Windermere Basins.

Verification monitoring is underway for all SPU projects. WTD will continue working with SPU on control and operational strategies as Seattle starts up and continues operating Genesee, Delridge, North Union Bay, Leschi, South Park, Windermere, and the remaining components of the Henderson projects.

SPU and WTD continue to work together to ensure GSI projects in the City of Seattle use a consistent approach, per the GSI Memorandum of Agreement signed by the two agencies in 2013. The term GSI describes a variety of measures that use soil to absorb stormwater or slow the rate of stormwater entering the combined sewer system. Green solutions control the sources of pollution by slowing, detaining, or retaining stormwater so that it does not carry runoff into nearby waterways. GSI projects reduce the volume and timing of flows into the combined sewer system. GSI facilities also are referred to as natural drainage systems (NDS) and are a type of low impact development (LID). Collaborative work between WTD and SPU in 2015 included:

- Integrating multiple web resources into a single internet site: http://www.700milliongallons.org/.
- Updating the GSI design manual to reflect lessons learned on completed projects. The GSI design manual serves as the “go-to” resource for SPU and WTD staff working on GSI improvements in the City of Seattle public right-of-way.
- Initiating design concepts for curbless roadway typologies.

4.0 Summary of Rainfall and CSO Events

King County measures rainfall in the Seattle area at several of its regulator stations, pump stations, overflow locations, and at the West Point Treatment Plant. It also monitors the frequencies and volumes of both untreated and treated CSOs at all of its permitted CSO locations.

This section describes rainfall data, reports on unpermitted overflows, and summarizes frequency and volume for all untreated and treated CSO discharges in 2015. Additional information can be found in the Appendices.

4.1 Annual Rainfall

Rainfall data is reported for each CSO event as measured by the nearest King County-owned rain gauge. Rainfall data for 2015 are included in Appendices A and B. The annual rainfall for 2015, as an average over local rain gauges, was 36.58 inches. However, the annual average at Sea-Tac Airport was 44.83 inches, a fair amount higher than the 20-year Sea-Tac Airport annual average of 37.49 inches. According to the Office of the Washington State Climatologist, the winter of 2015 was the wettest winter on record. Precipitation in 2015 was characterized by extreme highs and lows, which ended up averaging out for the annual rainfall over the local rain gauges. November (6.36 inches) and December (9.78 inches) had the highest rainfall.

While 2015 had record heat and snow drought, it was also a year of rainfall extremes. Half of the months in 2015 were wetter than normal and half were drier than normal. Two months were among the wettest on record (August and December) and a few were among the driest ever (May, June, and July). November (6.36 inches) and December (9.78 inches) had the highest rainfall. More than five inches separated the year's rainiest, hilltop location (West Seattle, 42.51 inches) from its driest, rain-shadowed location (Georgetown, 37.11 inches). SPU's rain gauges recorded an above average 12 storms with heavy rainfall (intensity equal to or greater than a two-year recurrence interval) in 2015. Of those events, three were extreme (equal to or greater than a 25-year recurrence interval). Each extreme event also contained embedded 100-year rainfall, which places 2015 among the most extreme precipitation years in a 38-year record.

So while the annual average was below the 20-year average, there were extreme wet and dry months. Long-term, WTD needs to look at how storms over the last 20 years may compare to storms of the next 20 years. Ecology and WTD are funding work at the University of Washington Climate Impacts Group to examine the next century of precipitation.

4.2 Unpermitted Overflows

Overflows can occur from CSO structures, broken pipelines, and manholes. Overflows in the combined system that are not caused by rainfall are called dry-weather overflows (DWO). In King County's system, when DWOs occur, they usually result from mechanical failures, power outages, or human error. Under EPA's Nine Minimum Controls, DWOs are to be prevented. Overflows that occur during precipitation,

but are worsened by mechanical failures, power outages, or human error, are referred to as "exacerbated CSOs." Overflows that occur either in the absence of or during precipitation, but are caused by mechanical failures, power outages, or human error, and not high volumes due to rain, are referred to as sanitary sewer overflows (SSO). An SSO can mean any overflow, spill, diversion, or release of wastewater from or caused by the Sanitary Sewer System or the Combined Sewer System upstream of a County's CSO Outfall.

No DWOs or exacerbated CSOs occurred in the County system in 2015. There were six SSOs, which are shown in Section 5.0.

4.3 Annual Untreated CSO Events

Hydraulic modeling predicts that King County CSOs will discharge 800 million gallons (MG) of untreated CSO in an average year of rainfall. In 2015, there were 26 storm events resulting in untreated CSO discharges. Some storm events spanned multiple days and, at times, there were multiple discharges on the same day. Conditions in 2015 resulted in 265 untreated events discharging 1,474 MG and 41 treated CSO events discharging 1,021 MG.

West Point Treatment Plant's SCADA system monitors the volume and frequency of CSOs at regulator and pump stations. Portable flow meters are deployed at 12 CSO locations not currently monitored by SCADA or to supplement SCADA monitoring: 11th Ave. NW Overflow, 30th Ave. NE Overflow, Southwest Alaska Street Overflow (SW Alaska St. Overflow), Bayview North Overflow (Bayview N Overflow), Bayview South Overflow (Bayview S Overflow), East Duwamish Pump Station Overflow (E Duwamish PS Overflow), W Duwamish Overflow, Hanford@Rainier Overflow, S Magnolia Overflow, Murray Pump Station Overflow (Murray PS Overflow), North Beach PS Inlet Overflow, and Terminal 115 Overflow.

With higher than normal winter rainfall, King County CSOs discharged a total of 1,474 MG over 265 events during 2015, about 80 percent higher volume than the 800 MG predicted during a normal rainfall year, but with fewer events than a normal year. The most storm events and the highest precipitation (9.78 inches) as well as the highest volume (639 MG) occurred in December. The second highest precipitation occurred in November (6.36 inches). However, March had more overflow events (30 in March versus 27 in November) and a slightly higher overflow volume (256 MG in March versus 223 MG in November).

Appendix A lists the untreated events from County CSOs during 2015. These data are also provided in electronic form to Ecology with this report.

4.4 CSO Treatment

King County provides CSO treatment, defined in Chapter 173-245 WAC as "equivalent to primary" treatment and disinfection, at the West Point Treatment Plant for flows above its secondary capacity of 300 MGD and at four satellite facilities: Alki, Carkeek, Elliott West, and Henderson/MLK Jr. Way WWTSs.

The following sections summarize performance and compliance at each facility during 2015. Appendix B of this report provides more detail on volumes and events. Appendices C-F contain the annual reports for each wet weather treatment station.

4.4.1 West Point CSO-related Bypass

In addition to secondary treatment of up to 300 MGD of base wastewater flows (defined as 2.25 times the average wet-weather flow of 133 MGD) the West Point Treatment Plant provides CSO/primary treatment for flows above 300 MGD and up to a peak of 440 MGD. Combined sewer flows that would otherwise overflow to surface waters are transferred to the West Point Treatment Plant. After receiving CSO treatment, these flows are blended with secondary effluent prior to disinfection, dechlorination, and discharge from the deep marine outfall. The resulting effluent must meet secondary effluent quality limits, with a small reduction—80 percent instead of 85 percent—in the monthly removal requirements during the typical wet season months of November through April. WTD submitted, and Ecology accepted, documentation that there are no feasible alternatives to this practice as it is a fundamental component to King County's CSO control strategy.

The West Point Treatment Plant had 17 CSO-related bypasses during 2015. The total volume was 584.5 MG. All occurred when total plant flows were above 300 MGD and the final blended effluent met NPDES limits. All occurrences are listed in Appendix B.

4.4.2 Alki Wet Weather Treatment Station

The transfer of Alki area base flows to the West Point Treatment Plant was completed in 1998 and conversion of the Alki Treatment Plant from a continuously operating primary plant to a wet weather treatment station was completed in 2001. There were 12 filling events and four discharge events during 2015. The Alki WWTS received a total inflow of 182.3 MG and discharged 160.1 MG.

Overall, TSS removal was 33.7 percent, which did not meet the annual 50 percent TSS removal limit. The annual average settleable solids (SS) was 0.1 milliliter per liter per hour (ml/L/hr), which met the SS limit of 0.3 ml/L/hr. The Alki WWTS met its maximum monthly geomean fecal coliform limit, maximum daily average total residual chlorine (TRC) limit, and pH limits in 2015. More detail is available in Appendix C.

4.4.3 Carkeek Wet Weather Treatment Station

The transfer of Carkeek area base flows to the West Point Treatment Plant and the conversion of the Carkeek Treatment Plant from a continuously operating primary plant to a wet weather treatment station was completed in 1994. In 2015, Carkeek WWTS operated 10 times with a total inflow volume of 12.6 MG and discharged three times with a total discharge volume of 9.9 MG.

The annual average solids removal, as measured by the TSS percent removal, was 51.3 percent, meeting the NPDES permit limit of 50 percent. All remaining parameters also met NPDES permit limits with the exception of one discharge day exceeded total chlorine residual limit. More detail is available in Appendix D.

4.4.4 Elliott West Wet Weather Treatment Station

The Elliott West WWTS was brought online in May 2005 as a joint project with Seattle's East Lake Union CSO control projects. In 2015, there were 27 filling events totaling 491.4 MG and 14 discharge events, with a total volume of 251.6 MG. Elliott West WWTS continues to address corrections that are identified and implemented across intermittent operations.

The 50 percent annual average TSS removal limit was met, with a removal of 57.7 percent. The annual average SS limit of 0.3 ml/L/hr was not met, with a SS of 2.60 ml/L/hr. The TRC was not met on nine days and the instantaneous minimum pH was not met on nine days. The fecal coliform levels exceeded permit limits three out of the seven discharge months. More detail can be found in Appendix E.

4.4.5 Henderson/MLK Jr. Way Wet Weather Treatment Station

The Henderson/MLK Jr. Way WWTS was brought online in May 2005. The Henderson/MLK Jr. Way WWTS had four filling events totaling 26.6 MG and three discharge events to the Duwamish Waterway totaling 15.0 MG. All NPDES permit performance conditions were met except for maximum daily chlorine limit on March 15 and monthly fecal coliform geomean on December 8. More detail is available in Appendix F.

5.0 Summary of Consent Decree Violations in 2015

Section VIII. 43 of the CD requires the listing of any violations of the CD in the Annual Report. Table 4 identifies CD violations in 2015. Detail on causes and corrective actions are provided in Appendices C-F. All notifications to Ecology were made in a timely manner.

Table 4. Summary of Consent Decree Violations in 2015

Date of Event	Facility	Description of Violation(s)
1/17/15	Elliott West WWTS	total chlorine residual
2/6/15	Elliott West WWTS	total chlorine residual
2/7/15	Elliott West WWTS	pH
Feb. 2015	Elliott West WWTS	fecal coliform
3/15/15	Elliott West WWTS	total chlorine residual
3/15/15	Elliott West WWTS	pH
3/15/15	Henderson/MLK Jr. Way WWTS	total chlorine residual
6/1/15	Harbor Ave. Overflow	SSO due to blown fuse that
8/14/15	Elliott West WWTS	total chlorine residual
8/29/15	Elliott West WWTS	total chlorine residual
10/12/15	King St. Overflow	SSO due to debris in gate
10/14/15	Elliott West WWTS	total chlorine residual, pH
10/30/16	Elliott West WWTS	total chlorine residual, pH
11/13/16	Elliott West WWTS	total chlorine residual, fecal
11/13 & 11/15/15	Barton PS Overflow	SSOs due to pump malfunction
11/14/15	Carkeek WWTS	total chlorine residual
Dec. 2015	Elliott West WWTS	fecal coliform
12/7/15 -12/10/15	Elliott West WWTS	total chlorine residual x3, pH x3
12/7/15 -12/9/15	Henderson/MLK Jr. Way WWTS	total chlorine residual, fecal
12/9/15	Henderson Pump Station Overflow	SSO due to high winds that caused
12/9/15	W Duwamish Overflow	SSO due to windstorm power
12/17/15	Elliott West WWTS	total chlorine residual, pH
12/21/15	Elliott West WWTS	total chlorine residual, pH
12/21/15	Alki WWTS	missed sample
2015 annual	Alki WWTS	annual TSS removal
2015 annual	Elliott West WWTS	annual settleable solids

6.0 Twenty-Year Moving Average of Event Frequencies

The NPDES permit for the West Point Treatment Plant, effective July 1, 2009, implemented a new interpretation of the performance standard for CSO control, which is derived from the Washington state regulatory requirements for "greatest reasonable reduction" as specified in WAC 173-245-022(22). The CD recognizes this performance level. This standard of "not more than one untreated discharge event per year per outfall on average" is based on a 20-year moving average. The number of untreated discharges that occurred over each of the previous 20 years is reported for each CSO site and then averaged (Table 5). This average is used each year to assess compliance with the performance standard. However, since the upgraded SCADA system was fully brought online in 2005 and began to report data for all sites over time, a full 20 years of data are not available for all sites. Locations lacking the full 20 years of measured data are noted. For sites where new control facilities have been built and, thus, lack the 20 years of measured data, modeled data of how the new facilities would have performed over those years of rainfall have been substituted for the early missing data. For sites not identified as controlled, only available measured data are reported.

The following 17 CSOs were identified as controlled through the monitoring and modeling data:

1. 30th Ave. NE Overflow
2. 53rd Avenue Southwest Pump Station Overflow (53rd Ave. SW PS Overflow)
3. 63rd Avenue Southwest Overflow (63rd Ave. SW Overflow)
4. 8th Avenue South Overflow[1] (8th Ave. S Overflow)
5. Ballard Siphon Overflow
6. Canal Street Overflow (Canal St. Overflow)
7. Dexter Ave. RS Overflow
8. E Duwamish PS Overflow
9. East Marginal Way Pump Station Overflow (E Marginal Way PS Overflow)
10. East Pine Street Pump Station Overflow (E Pine St. PS Overflow)
11. Henderson Street Pump Station Overflow (Henderson St. PS Overflow)
12. Martin Luther King Junior Way Overflow (MLK Jr. Way Overflow)
13. Matthews Park Pump Station Overflow (Matthews Park PS Overflow)
14. Norfolk Street Overflow (Norfolk St. Overflow)
15. Rainier Avenue Pump Station Overflow (Rainier Ave. PS Overflow)
16. SW Alaska St. Overflow
17. W Duwamish Overflow.

Projects previously completed at two CSO sites, Denny Way RS Overflow and Harbor Ave. RS, have not fully achieved control to the Washington state standard. Work completed or currently under way to complete control is described in Section 3.1 of this report.

The Belvoir PS Overflow was considered controlled. However, updated modeling indicates that it may be uncontrolled due to upstream changes in the SPU system, which are contributing additional flows to the regional system. King County will continue to monitor Belvoir PS Overflow to address any compliance issues with SPU.

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Table 5. King County Untreated CSO Events, Averages, and Baselines, 1996–2015

Overflow Name	Discharge Serial Number (DSN)	1996	1997[a]	1998	1999	2000[b]	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	20-Year Average[c]	1983 Baseline (24 hr inter-event)
11th Ave. NW[d]	004	18	21	10	12	14	14	8	8	6	11	22	10	7	16	19	16	20	12	25	17	14.3	16
30th Ave. NE	049	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	0	2	3	1.7	1
3rd Ave. W[e]	008	15	9	8	4	1	11	4	6	4	5	13	6	3	9	8	7	13	5	12	7	7.5	17
53rd Ave. SW PS[f]	052	NM	NM	NM	NM	0	0	0	0	0	0	2	1	0	0	0	0	1	0	0	0	0.3	<1
63rd Ave. SW[f]	054	NM	NM	NM	NM	0	0	0	2	0	1	0	0	0	0	1	1	3	2	2	4	1.0	2
8th Ave. S	040	3	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0.2	6
Ballard Siphon[g]	003	0	1	0	0	0	0	0	0	0	1	0	0	0	0	0	1	0	0	2	0	0.3	13
Barton St. PS[f]	057	NM	NM	NM	NM	0	0	0	3	4	5	11	3	1	2	4	1	4	5	11	5	3.7	9
Belvoir PS	012	1	1	0	1	0	0	0	2	2	0	1	1	0	0	1	0	1	1	1	4	0.9	1
Brandon St. RS[h]	041	55	40	31	32	30	30	21	28	21	27	11	NM	3	16	11	7	12	7	16	14	21.7	36
Canal St.	007	3	1	2	0	1	0	0	0	0	0	0	1	0	1	1	0	1	0	1	1	0.7	1
Chelan Ave. RS	036	15	8	5	5	2	7	2	3	1	2	5	2	0	0	3	4	13	4	13	13	5.4	7
Denny Way RS	027a	54	37	23	23	25	26	15	25	20	11	9	1	2	4	2	2	1	2	1	5	14.4	32
Dexter Ave. RS	009	3	1	0	0	0	1	0	0	1	0	1	1	0	0	0	0	0	0	1	1	0.5	15
E Duwamish PS[d]	034	0	0	0	0	0	0	0	0	0	1	0	1	0	0	1	0	0	0	0	0	0.2	1
E Marginal Way PS	043	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	1
E Pine St.	011	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	1
Hanford #1[d, i, j ,k, l]	031a	20	14	17	5	0	0	3	6	8	NM	16	4	6	14	13	13	18	10	26	16	11.0	30
Hanford #2 RS	032	20	17	17	18	17	13	10	12	16	15	26	12	8	17	17	15	23	9	27	16	16.3	28
Harbor Ave. RS[m]	037	39	1	1	0	0	2	0	2	0	3	5	2	0	0	1	1	3	2	1	4	3.4	30
Henderson St. PS[n]	045	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	0	0	0	0	0	0	0	0	0	0	0.0	12
King St. RS	028	17	18	11	14	10	14	12	16	15	20	27	7	3	15	18	15	13	2	23	19	14.5	16
Kingdome RS	029	14	11	3	0	1	0	0	0	2	5	4	5	1	8	6	2	11	6	22	17	5.9	29
Lander St. RS	030	16	12	10	15	11	10	10	12	9	8	28	8	6	19	17	15	25	8	29	17	14.3	26
Matthews Park PS	018	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	1
MLK Jr. Way[n]	013	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	0	0	0	0	0	0	0	0	0	0	0.0	16
Montlake RS	014	7	2	7	0	2	0	5	11	5	6	NM	0	1	3	10	8	18	7	20	15	6.7	6
Murray St. PS[f]	056	NM	NM	NM	NM	0	0	0	3	5	10	10	3	1	11	8	3	5	2	3	6	4.4	5
Norfolk St.[n]	044a	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	0	0	0	0	0	0	0	0	0	1	0.1	20
North Beach PS Inlet[d]	048b	22	20	13	9	11	10	1	6	6	10	13	4	3	13	6	15	13	3	14	7	10.0	18
North Beach PS Wet Well[o]	048a	w/inlet	w/inlet	w/inlet	w/inlet	w/inlet	w/inlet	w/inlet	w/inlet	w/inlet	3	15	6	3	14	10	8	20	13	29	13	12.2	18
Rainier Ave. PS	033	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	1
S Magnolia[d]	006	48	34	19	5	0	0	5	18	17	26	30	21	26	25	38	22	36	16	38	23	22.4	25
S Michigan St. RS	042	6	6	3	3	2	7	5	4	1	3	8	4	0	8	9	3	5	2	3	6	4.4	5

Twenty-Year Moving Average of Event Frequencies

Overflow Name	Discharge Serial Number (DSN)	1996	1997[a]	1998	1999	2000[b]	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	20-Year Average[c]	1983 Baseline (24 hr inter-event)
SW Alaska St.[d]	055	0	0	0	0	0	0	0	0	0	0	1	1	1	0	1	1	1	0	0	0	0.3	1
Terminal 115[d, p]	038	NM	NM	NM	NM	NM	NM	NM	2	0	2	7	4	0	3	3	0	1	1	0	1	1.8	4
University RS	015	13	9	10	4	3	5	4	4	4	3	12	5	3	9	8	6	13	4	14	11	7.2	13
W Duwamish[d]	035	NM	NM	NM	NM	NM	NM	NM	NM	NM	1	0	1	0	0	1	0	0	1	0	0	0.4	1
W Michigan St.[q]	039	0	0	0	10	8	12	8	9	6	5	13	5	3	10	12	14	16	8	26	17	9.1	34
Rainfall (inches)		42.28	35.23	41.32	33.81	29.82	35.99	27.39	34.46	27.79	31.32	42.82	31.11	24.90	31.46	40.30	32.20	42.57	24.93	42.24	44.83	35.05	37.00

Notes:

[a] CSO "event" definition changed to be based on a 48-hour dry period.
[b] CSO "event" definition changed to be based on a 24-hour dry period.
[c] Blue 20-year averages are those that meet the no more than one event per year on a 20-year average.
[d] Portable monitors are used at 11th Ave. NW, 30th Ave NE, SW Alaska St., Bayview North and South, E Duwamish, W Duwamish, Hanford @ Rainier, S Magnolia, North Beach PS Inlet, and Terminal 115. The Bayview North monitor was installed in 2010; the Bayview South monitor was installed in 2011.
[e] The 3rd Ave. W monitor was down June 2006 through November 2006.
[f] Monitoring began in June 2000 at 53rd Ave. SW PS, 63rd Ave. SW, Barton St., and Murray St..
[g] Years 1995-2013 are modeled data and numbers may be updated in future reports as new information is gathered. Modeled data have been substituted to simulate how current facilities would have performed under rain patterns during that time.
[h] The monitor at Brandon St. RS was down June 2006 to March 2008. A portable monitor was installed in March 2008. Monitoring by SCADA was restored beginning with the 2009 period.
[i] Monitoring began at Hanford #1 (Hanford @ Rainier) in January 1996.
[j] The monitor at Hanford #1 was down June 2000 through May 2001 and was not operating properly June 2007 to December 2007. From June 2005 to May 2006 the portable meter provided questionable data.
[k] Hanford #1 (Bayview S) began monitoring in 2011.
[l] Hanford #1 (Bayview N) began monitoring in 2010.
[m] No data were recorded at Harbor Ave. in April and May 2004.
[n] Henderson, MLK Jr. Way, and Norfolk St. were controlled as of 2006. Modeled data through 2005 (in italics) have been substituted to simulate how current facilities would have performed under rain patterns during that time.
[o] Monitoring began in June 2005 at North Beach wet well.
[p] Monitoring began in June 2003 at Terminal 115.
[q] Monitoring began at W Duwamish in June 2005.

7.0 Post-Construction Monitoring

King County's Post-Construction Monitoring Plan (PCMP) was approved by Ecology on September 28, 2012. Volume and frequency of overflow monitoring at the controlled untreated discharge locations listed above is on-going, reported monthly to Ecology, and summarized in each CSO Annual Report (Appendix A and B). Volume, frequency, and NPDES permit effluent monitoring and effluent compliance for the wet weather treatment stations are reported monthly and summarized in Appendix B.

King County's ongoing ambient monitoring program provides data for post-construction monitoring as described in the PCMP. Additional details can be found in the PCMP's Appendix D (Receiving Water Characterization Study Sampling and Analysis Plan and Quality Assurance Project Plan), Appendix E (Major Lakes Sampling and Analysis Plan), and Appendix F (Freshwater Swimming Beach Monitoring Sampling and Quality Assurance Project Plan).

Sediment monitoring for controlled sites is being performed as described in the PCMP. Details can be found in Appendix C (Sampling and Analyses Plan) of the PCMP. Sediment characterization data for 2012 was submitted to Ecology in April 2014. The Sediment Management Plan Update, which will contain modeling results for those CSOs not proposed to be sampled, will be available for review in 2017.

Design of a sampling plan specific to the Ballard Siphon site was completed in October 2015, in accordance with the PCMP. Data sampling collection was completed October 15, 2015. Analysis began shortly afterwards and will continue into early 2016. Validated data will be available by the second quarter of 2016.

Appendices

Appendix A. Untreated CSO Events, January–December 2015

Appendix B. Treated CSO Events, January–December 2015

Appendix C. Alki Wet Weather Treatment Station 2015 Annual Report

Appendix D. Carkeek Wet Weather Treatment Station 2015 Annual Report

Appendix E. Elliott West Wet Weather Treatment Station 2015 Annual Report

Appendix F. Henderson/MLK Jr. Way Wet Weather Treatment Station 2015 Annual Report

Appendix A
Untreated CSO Events

January–December 2015

DSN #	Overflow Name	Receiving Water	Event Starting Date & Time	Event Ending Date & Time	Duration (hours)	Volume (gallons)	Precipi-tation (in.)	Storm Duration (hours)	Note if DWO or SSO
003	Ballard Siphon Overflow	Lake Washington Ship Canal	N/A	N/A	N/A	N/A	N/A	N/A	
004	11th Ave. NW Overflow	Lake Washington Ship Canal	1/17/15 7:34 PM	1/17/15 8:25 PM	0.85	56,275	0.59	9.2	
004	11th Ave. NW Overflow	Lake Washington Ship Canal	2/5/15 5:18 AM	2/5/15 6:01 AM	0.72	38,870	0.57	19.72	
004	11th Ave. NW Overflow	Lake Washington Ship Canal	2/7/15 6:34 AM	2/7/15 7:41 AM	1.12	84,691	2.14	69.1	
004	11th Ave. NW Overflow	Lake Washington Ship Canal	3/15/15 10:11 AM	3/15/15 9:42 PM	11.52	2,437,676	2.74	46.45	
004	11th Ave. NW Overflow	Lake Washington Ship Canal	3/31/15 4:41 PM	3/31/15 5:37 PM	0.93	821,074	0.13	17	
004	11th Ave. NW Overflow	Lake Washington Ship Canal	4/1/15 7:52 PM	4/2/15 7:51 AM	11.98	18,954	0.11	3.37	
004	11th Ave. NW Overflow	Lake Washington Ship Canal	8/14/15 2:30 PM	8/14/15 5:21 PM	2.85	901,594	1.03	3.95	
004	11th Ave. NW Overflow	Lake Washington Ship Canal	8/29/15 9:14 PM	8/30/15 12:41 AM	3.45	640,540	1.33	42.15	
004	11th Ave. NW Overflow	Lake Washington Ship Canal	9/5/15 5:14 PM	9/5/15 5:34 PM	0.33	137,463	0.92	0.93	
004	11th Ave. NW Overflow	Lake Washington Ship Canal	10/10/15 10:25 AM	10/10/15 11:22 AM	0.95	1,167,104	0.85	5.97	
004	11th Ave. NW Overflow	Lake Washington Ship Canal	10/31/15 1:17 AM	10/31/15 2:25 AM	1.13	101,170	0.84	23.88	
004	11th Ave. NW Overflow	Lake Washington Ship Canal	11/8/15 11:17 AM	11/8/15 11:37 AM	0.33	44,599	1.21	27.52	
004	11th Ave. NW Overflow	Lake Washington Ship Canal	11/14/15 6:14 AM	11/15/15 5:08 AM	22.9	164,688	3.09	60.78	
004	11th Ave. NW Overflow	Lake Washington Ship Canal	12/7/15 9:58 AM	12/9/15 1:39 AM	39.68	1,691,609	4.23	88.15	
004	11th Ave. NW Overflow	Lake Washington Ship Canal	12/10/15 4:45 AM	12/10/15 1:45 PM	9	362,435	0.68	10.03	
004	11th Ave. NW Overflow	Lake Washington Ship Canal	12/18/15 1:23 AM	12/18/15 2:44 AM	1.35	304,568	1.16	18.75	
004	11th Ave. NW Overflow	Lake Washington Ship Canal	12/21/15 9:23 AM	12/21/15 2:31 PM	5.13	190,315	0.99	36.58	
006	S Magnolia Overflow	Elliot Bay/Puget Sound	1/17/15 6:00 PM	1/18/15 10:30 AM	16.5	284,728	1.2	23.91	

DSN #	Overflow Name	Receiving Water	Event Starting Date & Time	Event Ending Date & Time	Duration (hours)	Volume (gallons)	Precipi-tation (in.)	Storm Duration (hours)	Note if DWO or SSO
006	S Magnolia Overflow	Elliot Bay/Puget Sound	2/2/15 8:30 AM	2/2/15 9:00 AM	0.5	34,378	0.29	22.93	
006	S Magnolia Overflow	Elliot Bay/Puget Sound	2/5/15 5:30 AM	2/7/15 8:00 AM	50.5	225,772	1.92	68.79	
006	S Magnolia Overflow	Elliot Bay/Puget Sound	2/8/15 11:30 PM	2/9/15 12:00 AM	0.5	2,818	0.16	3.06	
006	S Magnolia Overflow	Elliot Bay/Puget Sound	2/27/15 2:00 AM	2/27/15 4:30 AM	2.5	111,820	0.63	7.28	
006	S Magnolia Overflow	Elliot Bay/Puget Sound	3/15/15 9:40 AM	3/15/15 9:45 PM	12.08	1,723,510	2.58	46.03	
006	S Magnolia Overflow	Elliot Bay/Puget Sound	3/31/15 9:15 PM	3/31/15 9:30 PM	0.25	1,734	0.26	14.55	
006	S Magnolia Overflow	Elliot Bay/Puget Sound	4/10/15 8:15 PM	4/10/15 8:50 PM	0.58	64,375	0.19	4.41	
006	S Magnolia Overflow	Elliot Bay/Puget Sound	5/5/15 2:05 PM	5/5/15 2:45 PM	0.67	9,538	0.08	7.88	
006	S Magnolia Overflow	Elliot Bay/Puget Sound	8/14/15 2:10 PM	8/14/15 5:35 PM	3.42	23,512	1.02	4.42	
006	S Magnolia Overflow	Elliot Bay/Puget Sound	8/29/15 6:20 AM	8/30/15 12:20 AM	18	63,551	1.14	41.88	
006	S Magnolia Overflow	Elliot Bay/Puget Sound	9/5/15 5:25 PM	9/5/15 6:25 PM	1	23,108	0.43	1.7	
006	S Magnolia Overflow	Elliot Bay/Puget Sound	10/10/15 5:45 AM	10/10/15 11:50 AM	6.08	29,707	0.76	26.2	
006	S Magnolia Overflow	Elliot Bay/Puget Sound	10/30/15 11:05 PM	10/31/15 2:20 AM	3.25	14,089	0.94	64.7	
006	S Magnolia Overflow	Elliot Bay/Puget Sound	11/8/15 3:30 AM	11/8/15 9:35 PM	18.08	78,860	0.84	41.86	
006	S Magnolia Overflow	Elliot Bay/Puget Sound	11/13/15 9:50 PM	11/15/15 5:05 AM	31.25	44,285	2.99	61.11	
006	S Magnolia Overflow	Elliot Bay/Puget Sound	12/3/15 1:18 AM	12/3/15 2:02 AM	0.73	1,670	0.26	2.44	
006	S Magnolia Overflow	Elliot Bay/Puget Sound	12/4/15 5:02 AM	12/4/15 5:04 AM	0.03	27	0.68	29.37	
006	S Magnolia Overflow	Elliot Bay/Puget Sound	12/5/15 1:40 PM	12/5/15 2:10 PM	0.5	80	0.42	4.99	
006	S Magnolia Overflow	Elliot Bay/Puget Sound	12/6/15 11:48 PM	12/9/15 2:06 AM	50.3	931,629	3.8	88.4	
006	S Magnolia Overflow	Elliot Bay/Puget Sound	12/10/15 4:30 AM	12/10/15 1:44 PM	9.23	163,528	0.59	10.14	
006	S Magnolia Overflow	Elliot Bay/Puget Sound	12/12/15 12:20 PM	12/12/15 2:18 PM	1.97	4,549	0.36	19.53	
006	S Magnolia Overflow	Elliot Bay/Puget Sound	12/13/15 7:48 PM	12/13/15 8:06 PM	0.3	5,094	0.65	49.51	
006	S Magnolia Overflow	Elliot Bay/Puget Sound	12/18/15 12:00 AM	12/18/15 2:42 AM	2.7	74,052	1.09	19.26	

DSN #	Overflow Name	Receiving Water	Event Starting Date & Time	Event Ending Date & Time	Duration (hours)	Volume (gallons)	Precipi-tation (in.)	Storm Duration (hours)	Note if DWO or SSO
006	S Magnolia Overflow	Elliot Bay/Puget Sound	12/21/15 8:56 AM	12/21/15 2:32 PM	5.6	14,769	0.97	37.9	
006	S Magnolia Overflow	Elliot Bay/Puget Sound	12/25/15 6:00 AM	12/25/15 6:02 AM	0.03	49	0.21	59.98	
007	Canal St. Overflow	Lake Washington Ship Canal	12/10/15 12:56 PM	12/10/15 1:06 PM	0.18	12,779	0.67	9.8	
008	3rd Ave. W Overflow	Lake Washington Ship Canal	3/15/15 8:54 AM	3/15/15 9:34 PM	12.67	966,490	2.74	46.45	
008	3rd Ave. W Overflow	Lake Washington Ship Canal	8/14/15 1:40 PM	8/14/15 8:03 PM	6.38	2,315,377	1.15	5.4	
008	3rd Ave. W Overflow	Lake Washington Ship Canal	8/29/15 6:28 AM	8/30/15 3:13 PM	32.75	3,249,254	1.47	51.88	
008	3rd Ave. W Overflow	Lake Washington Ship Canal	9/5/15 4:39 PM	9/5/15 7:45 PM	3.1	558,616	0.98	1.34	
008	3rd Ave. W Overflow	Lake Washington Ship Canal	9/17/15 12:45 PM	9/17/15 7:39 PM	6.9	3,293,605	0.46	20.91	
008	3rd Ave. W Overflow	Lake Washington Ship Canal	10/10/15 10:01 AM	10/10/15 4:12 PM	6.18	1,665,411	1.01	9.31	
008	3rd Ave. W Overflow	Lake Washington Ship Canal	10/31/15 12:53 AM	10/31/15 2:54 AM	2.02	243,594	0.99	65.3	
009	Dexter Ave. RS Overflow	Lake Union	1/18/15 10:39 AM	1/18/15 10:55 AM	0.27	1,913	1.43	24.1	
011	E Pine St. PS Overflow	Lake Washington	N/A	N/A	N/A	N/A	N/A	N/A	
012	Belvoir PS Overflow	Lake Washington	1/18/15 10:39 AM	1/18/15 11:20 AM	0.68	56,871	1.4	23.72	
012	Belvoir PS Overflow	Lake Washington	3/15/15 6:55 PM	3/15/15 9:54 PM	2.98	486,920	2.8	46.52	
012	Belvoir PS Overflow	Lake Washington	8/14/15 2:44 PM	8/14/15 3:04 PM	0.33	5,375	1.43	9.78	
012	Belvoir PS Overflow	Lake Washington	11/15/15 4:07 AM	11/15/15 4:39 AM	0.53	9,836	3.19	59.67	
012	Belvoir PS Overflow	Lake Washington	12/8/15 9:29 PM	12/8/15 10:54 PM	1.42	76,532	4.13	85.33	
013	MLK Jr. Way Overflow	Lake Washington via storm drain	N/A	N/A	N/A	N/A	N/A	N/A	
014	Montlake RS Overflow	Lake Washington Ship Canal	1/17/15 7:34 PM	1/18/15 12:00 PM	16.43	6,148,077	1.4	23.72	
014	Montlake RS Overflow	Lake Washington Ship Canal	2/5/15 5:33 AM	2/5/15 6:28 AM	0.92	594,894	0.62	20.55	
014	Montlake RS Overflow	Lake Washington Ship Canal	2/6/15 11:23 AM	2/7/15 7:49 AM	20.43	2,298,394	2.18	69.48	
014	Montlake RS Overflow	Lake Washington Ship Canal	2/27/15 3:11 AM	2/27/15 4:01 AM	0.83	677,316	0.6	29.5	
014	Montlake RS Overflow	Lake Washington Ship Canal	3/15/15 10:14 AM	3/15/15 10:12 PM	11.97	19,036,897	2.8	46.52	

DSN #	Overflow Name	Receiving Water	Event Starting Date & Time	Event Ending Date & Time	Duration (hours)	Volume (gallons)	Precipi-tation (in.)	Storm Duration (hours)	Note if DWO or SSO
014	Montlake RS Overflow	Lake Washington Ship Canal	8/14/15 1:56 PM	8/14/15 2:50 PM	0.9	2,304,446	1.4	9.37	
014	Montlake RS Overflow	Lake Washington Ship Canal	8/29/15 9:48 PM	8/30/15 12:44 AM	2.93	4,041,252	1.46	23.6	
014	Montlake RS Overflow	Lake Washington Ship Canal	9/5/15 5:29 PM	9/5/15 6:58 PM	1.48	3,288,653	1.05	1.5	
014	Montlake RS Overflow	Lake Washington Ship Canal	10/10/15 10:29 AM	10/10/15 3:05 PM	4.6	1,551,175	1.09	34.45	
014	Montlake RS Overflow	Lake Washington Ship Canal	10/31/15 1:28 AM	10/31/15 2:47 AM	1.32	2,641,826	0.94	34.03	
014	Montlake RS Overflow	Lake Washington Ship Canal	11/14/15 5:18 AM	11/15/15 5:31 AM	24.22	7,144,591	3.26	60.5	
014	Montlake RS Overflow	Lake Washington Ship Canal	12/7/15 10:33 AM	12/9/15 7:18 AM	44.75	15,837,946	4.54	93.03	
014	Montlake RS Overflow	Lake Washington Ship Canal	12/10/15 12:35 PM	12/10/15 1:35 PM	1	1,437,029	0.74	9.97	
014	Montlake RS Overflow	Lake Washington Ship Canal	12/18/15 1:32 AM	12/18/15 2:54 AM	1.37	2,436,914	1.41	19.13	
014	Montlake RS Overflow	Lake Washington Ship Canal	12/21/15 1:47 PM	12/21/15 2:27 PM	0.67	583,482	0.95	36.42	
015	University RS Overflow	Lake Washington Ship Canal	3/15/15 12:16 PM	3/15/15 10:17 PM	10.02	28,852,553	2.8	46.52	
015	University RS Overflow	Lake Washington Ship Canal	3/31/15 5:01 PM	3/31/15 5:31 PM	0.5	1,685,240	0.36	18.02	
015	University RS Overflow	Lake Washington Ship Canal	8/14/15 2:26 PM	8/14/15 5:26 PM	3	8,114,172	1.89	12.1	
015	University RS Overflow	Lake Washington Ship Canal	8/29/15 9:54 PM	8/30/15 12:48 AM	2.9	6,277,479	1.46	23.6	
015	University RS Overflow	Lake Washington Ship Canal	10/10/15 10:44 AM	10/10/15 12:16 PM	1.53	4,688,663	0.84	31.47	
015	University RS Overflow	Lake Washington Ship Canal	10/31/15 2:11 AM	10/31/15 2:55 AM	0.73	1,720,126	0.94	34.03	
015	University RS Overflow	Lake Washington Ship Canal	11/15/15 1:12 AM	11/15/15 6:21 AM	5.15	8,322,156	3.31	61.22	
015	University RS Overflow	Lake Washington Ship Canal	12/7/15 12:03 PM	12/7/15 3:31 PM	3.47	4,237,327	2.44	53.9	
015	University RS Overflow	Lake Washington Ship Canal	12/8/15 8:41 PM	12/9/15 2:27 AM	5.77	21,680,448	4.44	88.57	
015	University RS Overflow	Lake Washington Ship Canal	12/10/15 12:48 PM	12/10/15 2:24 PM	1.6	8,550,959	0.74	9.97	
015	University RS Overflow	Lake Washington Ship Canal	12/18/15 1:57 AM	12/18/15 3:03 AM	1.1	2,960,884	1.41	19.13	
018	Matthews Park PS Overflows	Lake Washington	N/A	N/A	N/A	N/A	N/A	N/A	
027a	Denny Way RS Overflow	Elliott Bay	1/18/15 10:17 AM	1/18/15 11:21 AM	1.05	2,734,623	1.22	24.1	

DSN #	Overflow Name	Receiving Water	Event Starting Date & Time	Event Ending Date & Time	Duration (hours)	Volume (gallons)	Precipi-tation (in.)	Storm Duration (hours)	Note if DWO or SSO
027a	Denny Way RS Overflow	Elliott Bay	3/15/15 6:55 PM	3/15/15 7:12 PM	0.02	75,654	2.26	43.73	
027a	Denny Way RS Overflow	Elliott Bay	10/31/15 2:26 AM	10/31/15 2:33 AM	0.11	28,948	0.95	64.97	
027a	Denny Way RS Overflow	Elliott Bay	12/8/15 4:50 AM	12/8/15 4:52 AM	0.04	2,346	2.56	67.7	
027a	Denny Way RS Overflow	Elliott Bay	12/10/15 12:57 PM	12/10/15 1:12 PM	0.25	31,427	0.58	9.63	
028	King St. RS Overflow	Elliott Bay	1/17/15 7:09 PM	1/18/15 12:53 PM	17.73	1,537,561	1.24	26.47	
028	King St. RS Overflow	Elliott Bay	2/7/15 6:43 AM	2/7/15 9:05 AM	2.37	443,982	2.18	69.7	
028	King St. RS Overflow	Elliott Bay	2/27/15 2:39 AM	2/27/15 6:59 AM	4.33	808,234	0.69	29.62	
028	King St. RS Overflow	Elliott Bay	3/15/15 10:08 AM	3/15/15 10:46 PM	12.63	5,022,665	3.05	47.07	
028	King St. RS Overflow	Elliott Bay	4/2/15 9:06 AM	4/2/15 9:11 AM	0.08	14,029	0.18	12.93	
028	King St. RS Overflow	Elliott Bay	8/14/15 1:34 PM	8/14/15 7:39 PM	6.08	731,044	0.7	5.9	
028	King St. RS Overflow	Elliott Bay	8/29/15 9:11 PM	8/30/15 1:07 AM	3.93	963,208	1.22	24.62	
028	King St. RS Overflow	Elliott Bay	9/5/15 6:18 PM	9/5/15 6:34 PM	0.27	207,242	0.39	0.8	
028	King St. RS Overflow	Elliott Bay	10/10/15 2:21 PM	10/10/15 3:19 PM	0.97	378,004	0.87	9.15	
028	King St. RS Overflow	Elliott Bay	10/12/15 8:40 PM	10/12/15 11:12 PM	2.53	242,638	0.26	2.77	SSO
028	King St. RS Overflow	Elliott Bay	10/31/15 1:22 AM	10/31/15 4:28 AM	3.1	966,202	0.91	65.33	
028	King St. RS Overflow	Elliott Bay	11/13/15 2:29 PM	11/15/15 10:51 AM	44.37	7,029,838	3.11	63.27	
028	King St. RS Overflow	Elliott Bay	11/17/15 11:23 AM	11/17/15 3:37 PM	4.23	525,562	0.32	25.87	
028	King St. RS Overflow	Elliott Bay	12/5/15 1:56 PM	12/6/15 8:16 AM	18.33	629,883	1.01	21.92	
028	King St. RS Overflow	Elliott Bay	12/7/15 10:40 AM	12/9/15 9:15 AM	46.58	8,139,953	3.81	93.32	
028	King St. RS Overflow	Elliott Bay	12/10/15 12:24 PM	12/10/15 2:10 PM	1.77	569,502	0.5	10.72	
028	King St. RS Overflow	Elliott Bay	12/12/15 1:21 PM	12/12/15 5:27 PM	4.1	501,349	0.38	7.9	
028	King St. RS Overflow	Elliott Bay	12/18/15 1:31 AM	12/18/15 2:36 AM	1.08	215,774	1.02	18.68	
028	King St. RS Overflow	Elliott Bay	12/21/15 1:34 PM	12/21/15 3:08 PM	1.57	249,198	0.83	38.2	

DSN #	Overflow Name	Receiving Water	Event Starting Date & Time	Event Ending Date & Time	Duration (hours)	Volume (gallons)	Precipi-tation (in.)	Storm Duration (hours)	Note if DWO or SSO
029	Kingdome RS Overflow	Elliott Bay	1/17/15 7:21 PM	1/18/15 12:34 PM	17.22	5,463,657	1.24	26.47	
029	Kingdome RS Overflow	Elliott Bay	2/5/15 7:03 AM	2/5/15 8:36 AM	1.55	33,230	0.72	21.52	
029	Kingdome RS Overflow	Elliott Bay	2/6/15 11:37 AM	2/7/15 9:52 AM	22.25	4,350,577	2.19	70.12	
029	Kingdome RS Overflow	Elliott Bay	2/27/15 2:46 AM	2/27/15 5:40 AM	2.9	1,292,920	0.69	29.62	
029	Kingdome RS Overflow	Elliott Bay	3/15/15 8:18 AM	3/16/15 12:40 AM	16.37	20,834,670	3.08	48.4	
029	Kingdome RS Overflow	Elliott Bay	8/14/15 4:37 PM	8/14/15 7:25 PM	2.8	578,613	0.7	5.9	
029	Kingdome RS Overflow	Elliott Bay	8/29/15 10:26 PM	8/30/15 1:34 AM	3.13	4,610,841	1.22	24.62	
029	Kingdome RS Overflow	Elliott Bay	9/17/15 6:22 PM	9/17/15 7:06 PM	0.73	46,233	0.66	20.32	
029	Kingdome RS Overflow	Elliott Bay	10/10/15 11:05 AM	10/10/15 3:17 PM	4.2	2,033,201	0.87	9.15	
029	Kingdome RS Overflow	Elliott Bay	10/31/15 1:26 AM	10/31/15 3:32 AM	2.1	2,170,985	0.91	65.33	
029	Kingdome RS Overflow	Elliott Bay	11/13/15 3:03 PM	11/15/15 2:56 PM	47.88	18,352,613	3.11	63.27	
029	Kingdome RS Overflow	Elliott Bay	11/17/15 11:40 AM	11/17/15 5:17 PM	5.62	645,661	0.32	25.87	
029	Kingdome RS Overflow	Elliott Bay	12/5/15 1:57 PM	12/9/15 11:31 AM	93.57	28,180,917	3.81	93.32	
029	Kingdome RS Overflow	Elliott Bay	12/10/15 12:09 PM	12/10/15 6:06 PM	5.95	1,801,200	0.6	14.25	
029	Kingdome RS Overflow	Elliott Bay	12/12/15 1:26 PM	12/12/15 6:17 PM	4.85	372,348	0.38	7.9	
029	Kingdome RS Overflow	Elliott Bay	12/17/15 8:24 PM	12/18/15 4:00 AM	7.6	2,265,363	1.04	19.2	
029	Kingdome RS Overflow	Elliott Bay	12/21/15 12:47 PM	12/21/15 4:08 PM	3.35	4,155,523	0.84	39	
030	Lander St. RS Overflow	Elliott Bay	1/17/15 7:42 PM	1/18/15 11:27 AM	15.75	5,974,640	0.94	24.28	
030	Lander St. RS Overflow	Elliott Bay	2/5/15 6:37 AM	2/7/15 5:11 PM	58.57	73,190,928	2.36	101.13	
030	Lander St. RS Overflow	Elliott Bay	2/27/15 2:54 AM	2/27/15 3:21 AM	0.45	61,104	0.62	6.33	
030	Lander St. RS Overflow	Elliott Bay	3/14/15 5:23 AM	3/14/15 6:08 AM	0.75	734,057	0.47	6.25	
030	Lander St. RS Overflow	Elliott Bay	3/15/15 8:15 AM	3/16/15 3:48 AM	19.55	44,225,286	2.76	49.48	
030	Lander St. RS Overflow	Elliott Bay	8/14/15 4:09 PM	8/14/15 8:03 PM	3.9	6,814,015	0.86	5.82	

DSN #	Overflow Name	Receiving Water	Event Starting Date & Time	Event Ending Date & Time	Duration (hours)	Volume (gallons)	Precipi-tation (in.)	Storm Duration (hours)	Note if DWO or SSO
030	Lander St. RS Overflow	Elliott Bay	8/29/15 10:53 PM	8/30/15 7:20 AM	8.45	5,527,935	1.51	47.15	
030	Lander St. RS Overflow	Elliott Bay	9/17/15 5:41 PM	9/17/15 8:12 PM	2.52	2,643,263	0.75	20.23	
030	Lander St. RS Overflow	Elliott Bay	10/10/15 10:54 AM	10/10/15 5:05 PM	6.18	7,324,980	0.89	9.2	
030	Lander St. RS Overflow	Elliott Bay	10/31/15 1:43 AM	10/31/15 2:46 AM	1.05	245,545	0.99	64.55	
030	Lander St. RS Overflow	Elliott Bay	11/14/15 4:39 AM	11/15/15 9:57 AM	29.3	25,262,131	3.32	64.6	
030	Lander St. RS Overflow	Elliott Bay	11/17/15 11:41 AM	11/17/15 12:05 PM	0.4	156,623	0.57	25.63	
030	Lander St. RS Overflow	Elliott Bay	12/5/15 2:25 PM	12/5/15 2:47 PM	0.37	87,380	0.48	5.63	
030	Lander St. RS Overflow	Elliott Bay	12/7/15 10:59 AM	12/10/15 6:42 PM	79.72	82,844,454	5.13	128.52	
030	Lander St. RS Overflow	Elliott Bay	12/12/15 1:49 PM	12/12/15 4:29 PM	2.67	150,178	0.41	8.93	
030	Lander St. RS Overflow	Elliott Bay	12/17/15 7:10 PM	12/18/15 9:07 PM	25.95	40,115,325	1.35	36.27	
030	Lander St. RS Overflow	Elliott Bay	12/21/15 10:41 AM	12/21/15 6:12 PM	7.52	43,454,740	0.86	38.77	
031	Hanford #1 Overflow	Duwamish River	1/17/15 7:25 PM	1/18/15 11:33 AM	16.13	2,030,370	0.94	24.28	
031	Hanford #1 Overflow	Duwamish River	2/5/15 5:22 AM	2/7/15 9:27 AM	52.08	5,363,166	2.24	93.52	
031	Hanford #1 Overflow	Duwamish River	2/27/15 2:49 AM	2/27/15 4:13 AM	1.4	793,131	0.68	7.1	
031	Hanford #1 Overflow	Duwamish River	3/15/15 8:11 AM	3/16/15 2:43 AM	18.53	33,945,396	2.76	49.48	
031	Hanford #1 Overflow	Duwamish River	8/14/15 1:40 PM	8/14/15 2:31 PM	0.77	894,733	0.22	1.37	
031	Hanford #1 Overflow	Duwamish River	8/29/15 9:45 PM	8/30/15 12:48 AM	2.97	2,151,164	1.23	40.48	
031	Hanford #1 Overflow	Duwamish River	9/5/15 6:30 PM	9/5/15 7:02 PM	0.33	404,715	0.02	0.37	
031	Hanford #1 Overflow	Duwamish River	9/17/15 3:20 PM	9/17/15 6:42 PM	1.98	523,840	0.75	20.23	
031	Hanford #1 Overflow	Duwamish River	10/10/15 10:10 AM	10/10/15 3:04 PM	4.9	535,671	0.89	9.2	
031	Hanford #1 Overflow	Duwamish River	10/31/15 1:06 AM	10/31/15 2:50 AM	1.73	1,722,354	0.99	64.55	
031	Hanford #1 Overflow	Duwamish River	11/13/15 2:13 PM	11/15/15 9:06 AM	42.88	16,351,133	3.32	64.6	
031	Hanford #1 Overflow	Duwamish River	12/8/15 4:40 AM	12/9/15 6:50 AM	26.17	612,014	4.37	93.55	

DSN #	Overflow Name	Receiving Water	Event Starting Date & Time	Event Ending Date & Time	Duration (hours)	Volume (gallons)	Precipi-tation (in.)	Storm Duration (hours)	Note if DWO or SSO
031	Hanford #1 Overflow	Duwamish River	12/10/15 11:49 AM	12/10/15 1:40 PM	1.85	978,486	4.99	124	
031	Hanford #1 Overflow	Duwamish River	12/12/15 1:17 PM	12/12/15 1:30 PM	0.22	560	0.32	6.23	
031	Hanford #1 Overflow	Duwamish River	12/18/15 1:25 AM	12/18/15 8:20 PM	18.92	1,755,523	1.35	36.27	
031	Hanford #1 Overflow	Duwamish River	12/21/15 1:14 PM	12/21/15 3:08 PM	1.9	911,643	0.85	38.15	
032	Hanford #2 RS Overflow	Duwamish River - East Waterway	1/17/15 7:36 PM	1/18/15 12:01 PM	16.42	5,114,681	0.95	25.53	
032	Hanford #2 RS Overflow	Duwamish River - East Waterway	2/5/15 6:55 AM	2/8/15 1:04 AM	66.15	62,100,111	2.47	107.92	
032	Hanford #2 RS Overflow	Duwamish River - East Waterway	2/27/15 2:49 AM	2/27/15 6:27 AM	3.63	7,454,672	0.72	9.37	
032	Hanford #2 RS Overflow	Duwamish River - East Waterway	3/14/15 5:24 AM	3/16/15 9:50 AM	52.43	48,871,840	2.76	49.48	
032	Hanford #2 RS Overflow	Duwamish River - East Waterway	8/14/15 4:10 PM	8/14/15 8:36 PM	4.43	3,587,836	0.86	5.82	
032	Hanford #2 RS Overflow	Duwamish River - East Waterway	8/29/15 10:53 PM	8/30/15 8:40 AM	9.78	17,961,288	1.52	48.73	
032	Hanford #2 RS Overflow	Duwamish River - East Waterway	9/17/15 5:42 PM	9/17/15 8:16 PM	2.57	4,024,410	0.75	20.23	
032	Hanford #2 RS Overflow	Duwamish River - East Waterway	10/10/15 10:50 AM	10/10/15 3:45 PM	4.92	10,639,248	0.89	9.2	
032	Hanford #2 RS Overflow	Duwamish River - East Waterway	10/31/15 1:39 AM	10/31/15 4:04 AM	2.42	6,816,012	1	65.95	
032	Hanford #2 RS Overflow	Duwamish River - East Waterway	11/13/15 2:19 PM	11/15/15 1:33 PM	47.23	43,761,529	3.32	64.6	
032	Hanford #2 RS Overflow	Duwamish River - East Waterway	11/17/15 11:41 AM	11/17/15 3:16 PM	3.58	3,015,430	0.67	28.43	
032	Hanford #2 RS Overflow	Duwamish River - East Waterway	12/5/15 2:25 PM	12/6/15 8:15 AM	17.83	6,911,057	1.19	22.35	
032	Hanford #2 RS Overflow	Duwamish River - East Waterway	12/7/15 10:53 AM	12/10/15 8:55 PM	82.03	78,727,630	5.13	128.52	
032	Hanford #2 RS Overflow	Duwamish River - East Waterway	12/12/15 1:38 PM	12/12/15 7:37 PM	5.98	1,849,992	0.44	11.17	
032	Hanford #2 RS Overflow	Duwamish River - East Waterway	12/17/15 7:12 PM	12/18/15 9:44 PM	26.53	24,055,633	1.35	36.27	
032	Hanford #2 RS Overflow	Duwamish River - East Waterway	12/21/15 12:46 PM	12/21/15 7:24 PM	6.63	7,191,902	0.86	38.77	
033	Rainier Ave. PS Overflow	Lake Washington	N/A	N/A	N/A	N/A	N/A	N/A	
034	E Duwamish PS Overflow	Duwamish River	N/A	N/A	N/A	N/A	N/A	N/A	
035	W Duwamish Overflow	Duwamish River	12/9/15 3:50 AM	12/9/15 4:15 AM	0.42	8,098	4.15	90.17	SSO

DSN #	Overflow Name	Receiving Water	Event Starting Date & Time	Event Ending Date & Time	Duration (hours)	Volume (gallons)	Precipi-tation (in.)	Storm Duration (hours)	Note if DWO or SSO
036	Chelan Ave. RS Overflow	West Waterway of Duwamish River	1/17/15 9:14 PM	1/18/15 1:11 AM	3.95	1,252,275	0.81	13.32	
036	Chelan Ave. RS Overflow	West Waterway of Duwamish River	2/5/15 6:52 AM	2/5/15 8:04 AM	1.2	123,380	0.79	44.47	
036	Chelan Ave. RS Overflow	West Waterway of Duwamish River	2/6/15 12:06 PM	2/7/15 11:19 AM	23.22	1,970,842	2.25	94.35	
036	Chelan Ave. RS Overflow	West Waterway of Duwamish River	3/15/15 9:22 AM	3/16/15 3:47 AM	18.42	11,735,447	2.76	49.48	
036	Chelan Ave. RS Overflow	West Waterway of Duwamish River	8/14/15 4:16 PM	8/14/15 7:29 PM	3.22	1,243,147	0.86	5.82	
036	Chelan Ave. RS Overflow	West Waterway of Duwamish River	8/29/15 11:43 PM	8/30/15 1:26 AM	1.72	734,598	1.23	40.48	
036	Chelan Ave. RS Overflow	West Waterway of Duwamish River	10/31/15 2:07 AM	10/31/15 3:44 AM	1.62	822,322	0.99	64.55	
036	Chelan Ave. RS Overflow	West Waterway of Duwamish River	11/13/15 2:54 PM	11/15/15 10:39 AM	43.75	17,509,985	3.32	64.6	
036	Chelan Ave. RS Overflow	West Waterway of Duwamish River	11/17/15 11:55 AM	11/17/15 2:41 PM	2.77	370,949	0.66	28.15	
036	Chelan Ave. RS Overflow	West Waterway of Duwamish River	12/7/15 10:47 AM	12/10/15 5:50 PM	79.05	45,832,247	5.13	128.52	
036	Chelan Ave. RS Overflow	West Waterway of Duwamish River	12/12/15 1:26 PM	12/12/15 3:50 PM	2.4	202,787	0.4	7.93	
036	Chelan Ave. RS Overflow	West Waterway of Duwamish River	12/17/15 10:00 PM	12/18/15 5:09 AM	7.15	766,238	1.11	19.07	
036	Chelan Ave. RS Overflow	West Waterway of Duwamish River	12/21/15 10:42 AM	12/21/15 4:35 PM	5.88	8,011,814	0.86	38.77	
037	Harbor Ave. RS Overflow	Duwamish River into Elliott Bay	3/15/15 7:18 PM	3/15/15 8:12 PM	0.9	717,534	2.56	44.47	
037	Harbor Ave. RS Overflow	Duwamish River into Elliott Bay	6/1/15 10:16 AM	6/1/15 10:22 AM	0.1	6,240	0.08	0.98	SSO
037	Harbor Ave. RS Overflow	Duwamish River into Elliott Bay	9/5/15 7:49 PM	9/5/15 7:50 PM	0.02	43	0.03	1.45	
037	Harbor Ave. RS Overflow	Duwamish River into Elliott Bay	10/10/15 2:14 PM	10/10/15 2:17 PM	0.05	18,017	0.77	8.65	
038	Terminal 115 Overflow	Duwamish River	12/7/15 2:50 PM	12/9/15 6:20 AM	39.5	621,896	4.8	92.8	
039	S Michigan St. RS Overflow	Duwamish River	1/17/15 7:24 PM	1/18/15 12:14 AM	4.83	738,568	0.82	14.78	
039	S Michigan St. RS Overflow	Duwamish River	2/5/15 5:57 AM	2/7/15 9:32 AM	51.58	3,668,195	2.48	70.9	
039	S Michigan St. RS Overflow	Duwamish River	2/27/15 1:38 AM	2/27/15 5:20 AM	3.7	1,539,010	0.95	41.25	

DSN #	Overflow Name	Receiving Water	Event Starting Date & Time	Event Ending Date & Time	Duration (hours)	Volume (gallons)	Precipi-tation (in.)	Storm Duration (hours)	Note if DWO or SSO
039	S Michigan St. RS Overflow	Duwamish River	3/15/15 7:54 AM	3/16/15 12:15 AM	16.35	16,319,855	2.82	48.55	
039	S Michigan St. RS Overflow	Duwamish River	4/10/15 9:17 PM	4/10/15 9:57 PM	0.67	25,100	0.42	5.05	
039	S Michigan St. RS Overflow	Duwamish River	8/14/15 4:10 PM	8/14/15 5:04 PM	0.9	251,339	0.61	4.02	
039	S Michigan St. RS Overflow	Duwamish River	8/29/15 9:51 PM	8/30/15 6:38 AM	8.78	2,564,105	1.47	28.3	
039	S Michigan St. RS Overflow	Duwamish River	9/17/15 5:22 PM	9/17/15 6:46 PM	1.4	1,340,732	0.38	19.65	
039	S Michigan St. RS Overflow	Duwamish River	10/10/15 10:08 AM	10/10/15 11:18 AM	1.17	109,520	0.58	8.07	
039	S Michigan St. RS Overflow	Duwamish River	10/31/15 12:54 AM	10/31/15 3:01 AM	2.12	1,811,168	0.95	65.08	
039	S Michigan St. RS Overflow	Duwamish River	11/13/15 1:54 PM	11/15/15 6:59 AM	41.08	16,675,041	3.74	62.47	
039	S Michigan St. RS Overflow	Duwamish River	11/17/15 11:04 AM	11/17/15 12:14 PM	1.17	597,452	0.63	31.72	
039	S Michigan St. RS Overflow	Duwamish River	12/7/15 9:42 AM	12/9/15 10:42 AM	49	51,885,505	4.86	93.48	
039	S Michigan St. RS Overflow	Duwamish River	12/10/15 11:47 AM	12/10/15 1:08 PM	1.35	582,358	5.54	123.2	
039	S Michigan St. RS Overflow	Duwamish River	12/12/15 12:50 PM	12/12/15 1:59 PM	1.15	221,905	0.43	5.52	
039	S Michigan St. RS Overflow	Duwamish River	12/17/15 9:28 PM	12/18/15 3:22 AM	5.9	1,194,385	1.22	19.28	
039	S Michigan St. RS Overflow	Duwamish River	12/21/15 9:26 AM	12/21/15 3:26 PM	6	1,940,238	1.09	39.43	
040	8th Ave. S Overflow	Duwamish River	N/A	N/A	N/A	N/A	N/A	N/A	
041	Brandon St. RS Overflow	Duwamish River	1/17/15 11:03 PM	1/18/15 12:17 AM	1.23	235,627	0.81	13.32	
041	Brandon St. RS Overflow	Duwamish River	2/5/15 6:27 AM	2/5/15 7:18 AM	0.85	34,060	0.76	43.78	
041	Brandon St. RS Overflow	Duwamish River	2/6/15 12:59 PM	2/7/15 10:05 AM	21.1	7,446,006	2.25	94.35	
041	Brandon St. RS Overflow	Duwamish River	2/27/15 2:28 AM	2/27/15 6:07 AM	3.65	833,925	0.71	7.78	
041	Brandon St. RS Overflow	Duwamish River	3/15/15 9:52 AM	3/16/15 12:23 AM	14.52	12,471,395	2.75	47.63	
041	Brandon St. RS Overflow	Duwamish River	8/14/15 3:57 PM	8/14/15 4:50 PM	0.88	176,334	0.66	3.68	
041	Brandon St. RS Overflow	Duwamish River	8/29/15 9:46 PM	8/30/15 12:37 AM	2.85	1,289,873	1.23	40.48	
041	Brandon St. RS Overflow	Duwamish River	9/17/15 4:52 PM	9/17/15 6:35 PM	1.72	678,496	0.74	19.53	

DSN #	Overflow Name	Receiving Water	Event Starting Date & Time	Event Ending Date & Time	Duration (hours)	Volume (gallons)	Precipi-tation (in.)	Storm Duration (hours)	Note if DWO or SSO
041	Brandon St. RS Overflow	Duwamish River	10/10/15 11:40 AM	10/10/15 1:47 PM	2.12	248,188	0.56	5.87	
041	Brandon St. RS Overflow	Duwamish River	10/31/15 1:18 AM	10/31/15 2:37 AM	1.32	609,164	0.99	64.55	
041	Brandon St. RS Overflow	Duwamish River	11/13/15 2:10 PM	11/15/15 9:36 AM	43.43	22,954,642	3.32	64.6	
041	Brandon St. RS Overflow	Duwamish River	12/7/15 11:55 AM	12/9/15 11:16 AM	47.35	33,275,493	4.37	93.55	
041	Brandon St. RS Overflow	Duwamish River	12/17/15 10:45 PM	12/18/15 4:45 AM	6	1,060,652	1.11	19.07	
041	Brandon St. RS Overflow	Duwamish River	12/21/15 1:50 PM	12/21/15 4:38 PM	2.8	2,647,240	0.86	38.77	
042	W Michigan St. RS Overflow	Duwamish River	3/15/15 1:55 PM	3/15/15 11:19 PM	9.4	637,991	2.81	48.17	
042	W Michigan St. RS Overflow	Duwamish River	11/13/15 2:02 PM	11/13/15 3:58 PM	1.93	165,260	1.26	22.6	
042	W Michigan St. RS Overflow	Duwamish River	11/15/15 1:08 AM	11/15/15 5:52 AM	4.73	503,359	3.7	61.45	
042	W Michigan St. RS Overflow	Duwamish River	12/7/15 2:09 PM	12/9/15 6:29 AM	40.33	2,338,753	4.8	92.8	
042	W Michigan St. RS Overflow	Duwamish River	12/18/15 2:46 AM	12/18/15 3:34 AM	0.8	62,420	1.22	19.28	
042	W Michigan St. RS Overflow	Duwamish River	12/21/15 2:01 PM	12/21/15 3:06 PM	1.08	86,809	1.09	39.43	
043	E Marginal Way PS Overflow	Duwamish River	N/A	N/A	N/A	N/A	N/A	N/A	
044a	Norfolk St. Overflow	Duwamish River	12/9/15 4:14 AM	12/9/15 8:51 AM	4.62	253,313	5.05	93.75	
045	Henderson St. PS Overflow	Lake Washington	12/9/15 3:27 AM	12/9/15 3:46 AM	0.32	90,000	4.27	90.11	SSO
048a	North Beach PS Wet Well Overflow	Puget Sound	1/17/15 7:27 PM	1/17/15 10:27 PM	3.01	8,798	0.79	11.28	
048a	North Beach PS Wet Well Overflow	Puget Sound	2/5/15 5:05 AM	2/5/15 6:51 AM	1.76	14,515	0.65	20.61	
048a	North Beach PS Wet Well Overflow	Puget Sound	2/6/15 9:52 AM	2/7/15 4:49 PM	30.95	51,218	2.36	78.27	
048a	North Beach PS Wet Well Overflow	Puget Sound	3/15/15 9:45 AM	3/15/15 10:44 PM	12.99	662,797	2.76	47.57	
048a	North Beach PS Wet Well Overflow	Puget Sound	3/31/15 4:22 PM	3/31/15 5:12 PM	0.84	116,856	0.12	16.44	
048a	North Beach PS Wet Well Overflow	Puget Sound	4/1/15 7:37 PM	4/1/15 7:47 PM	0.18	12,466	0.1	0.12	

DSN #	Overflow Name	Receiving Water	Event Starting Date & Time	Event Ending Date & Time	Duration (hours)	Volume (gallons)	Precipi-tation (in.)	Storm Duration (hours)	Note if DWO or SSO
048a	North Beach PS Wet Well Overflow	Puget Sound	8/14/15 2:43 PM	8/14/15 5:12 PM	2.49	127,259	1.01	3.72	
048a	North Beach PS Wet Well Overflow	Puget Sound	8/29/15 8:52 PM	8/29/15 10:30 PM	1.63	44,759	1.04	40	
048a	North Beach PS Wet Well Overflow	Puget Sound	10/10/15 10:15 AM	10/10/15 11:26 AM	1.18	1,433,291	0.85	5.97	
048a	North Beach PS Wet Well Overflow	Puget Sound	10/25/15 10:46 PM	10/25/15 10:53 PM	0.12	4,656	0.28	24.19	
048a	North Beach PS Wet Well Overflow	Puget Sound	10/31/15 1:16 AM	10/31/15 2:06 AM	0.84	8,925	0.82	23.63	
048a	North Beach PS Wet Well Overflow	Puget Sound	11/14/15 5:00 AM	11/15/15 5:25 AM	24.42	137,256	3.09	60.79	
048a	North Beach PS Wet Well Overflow	Puget Sound	12/8/15 8:34 PM	12/9/15 3:29 AM	6.9	530,464	4.27	90.06	
048b	North Beach PS Inlet Overflow	Puget Sound	2/7/15 4:24 PM	2/7/15 4:38 PM	0.23	646	2.36	78.27	
048b	North Beach PS Inlet Overflow	Puget Sound	3/15/15 12:06 PM	3/15/15 9:00 PM	8.9	131,326	2.72	45.94	
048b	North Beach PS Inlet Overflow	Puget Sound	3/31/15 4:20 PM	3/31/15 4:44 PM	0.4	45,768	0.11	16.08	
048b	North Beach PS Inlet Overflow	Puget Sound	4/1/15 7:36 PM	4/1/15 7:42 PM	0.1	2,082	0.1	0.12	
048b	North Beach PS Inlet Overflow	Puget Sound	5/5/15 9:18 AM	5/5/15 9:24 AM	0.1	203	0.05	0.61	
048b	North Beach PS Inlet Overflow	Puget Sound	8/14/15 4:14 PM	8/14/15 4:24 PM	0.17	829	0.91	3.01	
048b	North Beach PS Inlet Overflow	Puget Sound	10/10/15 10:16 AM	10/10/15 10:44 AM	0.47	4,086	0.8	5.35	
049	30th Ave. NE Overflow	Lake Washington	1/18/15 10:27 AM	1/18/15 11:27 AM	1	14,199	1.4	23.72	
049	30th Ave. NE Overflow	Lake Washington	8/14/15 2:25 PM	8/14/15 2:40 PM	0.25	7,859	1.4	9.37	
049	30th Ave. NE Overflow	Lake Washington	3/15/15 5:40 PM	3/15/15 6:50 PM	1.17	6,155	2.33	43.72	
052	53rd Ave. SW PS Overflow	Puget Sound	3/15/15 7:38 PM	3/15/15 9:09 PM	1.52	149,442	2.67	45.32	
054	63rd Ave. SW Overflow	Puget Sound	3/15/15 7:20 PM	3/15/15 8:46 PM	1.43	434,604	2.57	44.97	
054	63rd Ave. SW Overflow	Puget Sound	11/14/15 11:55 PM	11/15/15 5:56 AM	6.02	33,095,871	3.29	61.97	
054	63rd Ave. SW Overflow	Puget Sound	12/7/15 2:43 PM	12/9/15 7:38 AM	40.92	82,785,563	4.37	93.55	

DSN #	Overflow Name	Receiving Water	Event Starting Date & Time	Event Ending Date & Time	Duration (hours)	Volume (gallons)	Precipi-tation (in.)	Storm Duration (hours)	Note if DWO or SSO
054	63rd Ave. SW Overflow	Puget Sound	12/10/15 12:21 PM	12/10/15 1:44 PM	1.38	3,798,317	4.99	124	
055	SW Alaska St. Overflow	Puget Sound	N/A	N/A	N/A	N/A	N/A	N/A	
056	Murray St. PS Overflow	Puget Sound	3/15/15 7:23 PM	3/15/15 9:23 PM	2	2,016,300	2.68	45.5	
056	Murray St. PS Overflow	Puget Sound	8/14/15 1:39 PM	8/14/15 4:43 PM	3.07	763,729	0.65	3.48	
056	Murray St. PS Overflow	Puget Sound	10/10/15 2:33 PM	10/10/15 2:38 PM	0.08	31,377	0.86	8.82	
056	Murray St. PS Overflow	Puget Sound	12/7/15 2:26 PM	12/9/15 3:15 AM	36.82	1,363,971	4.15	90.17	
056	Murray St. PS Overflow	Puget Sound	12/18/15 1:35 AM	12/18/15 2:17 AM	0.7	659,766	1.09	18.67	
056	Murray St. PS Overflow	Puget Sound	12/21/15 12:40 PM	12/21/15 1:32 PM	0.87	838,764	0.76	36.95	
057	Barton St. PS Overflow	Puget Sound	3/15/15 7:30 PM	3/15/15 8:58 PM	1.47	1,324,430	3.16	45.26	
057	Barton St. PS Overflow	Puget Sound	8/14/15 1:38 PM	8/14/15 2:02 PM	0.4	222,779	0.69	1.1	
057	Barton St. PS Overflow	Puget Sound	8/29/15 11:38 PM	8/30/15 12:14 AM	0.6	74,732	1.25	23.66	
057	Barton St. PS Overflow	Puget Sound	10/31/15 1:24 AM	10/31/15 1:34 AM	0.17	7,925	0.81	22.92	
057	Barton St. PS Overflow	Puget Sound	11/13/15 1:49 PM	11/13/15 2:25 PM	0.6	287,985	1.26	25.75	SSO
057	Barton St. PS Overflow	Puget Sound	11/15/15 4:27 AM	11/15/15 4:39 AM	0.2	3,456	3.88	63.97	SSO
Total Volume (does not include any DWO or SSO volumes)						**1,474 MG**			

Notes:

1. Note that there was a discharge of clean water at North Beach PS Inlet Overflow on 7/24/15. On 7/24/15, about 1,150 gallons were discharged from 7:24 to 7:40 during a pipe pressure test.
2. The sensors at 3rd Ave. W Overflow were not reading properly due to failing conduit and struts. The County is investigating the possibility of installing a portable flow meter while we repair the corroded parts.
3. The portable flow meter at Hanford @Rainier was not working properly from 12/4/15 10:15 - 12/10/15 10:45
4. The portable flow meter at SW Alaska St. Overflow was not working properly from 12/24/15 - 12/28/15.

Appendix B
Treated CSO Events

January–December 2015

Outfall DSN #	Outfall Name	Receiving Water	Event Starting Date/ Time	Event Ending Date/ Time	Event Duration (hours)	Volume (gallons)	Precipi-tation (inches)	Storm Duration (hours)
001	West Point TP	Puget Sound	1/17/15 6:48 PM	1/18/15 3:02 PM	7.41	21,830,000	1.14	25.00
001	West Point TP	Puget Sound	2/2/15 12:58 PM	2/2/15 1:01 PM	0.07	150,000	0.31	24.52
001	West Point TP	Puget Sound	2/5/15 6:26 AM	2/7/15 7:16 PM	30.08	35,220,000	2.37	80.50
001	West Point TP	Puget Sound	2/27/15 12:32 AM	2/27/15 6:51 AM	3.28	9,940,000	0.66	31.50
001	West Point TP	Puget Sound	3/15/15 8:21 AM	3/16/15 3:11 AM	18.792	87,370,000	2.80	50.95
001	West Point TP	Puget Sound	8/14/15 3:21 PM	8/14/15 8:21 PM	4.66	20,750,000	1.15	5.40
001	West Point TP	Puget Sound	8/29/15 10:26 PM	8/30/15 2:49 AM	4.39	17,970,000	1.33	42.15
001	West Point TP	Puget Sound	9/5/15 6:21 PM	9/5/15 7:54 PM	1.514	4,940,000	0.99	3.28
001	West Point TP	Puget Sound	10/10/15 10:57 AM	10/10/15 2:28 PM	3.51	18,900,000	1.00	9.02
001	West Point TP	Puget Sound	10/31/15 1:28 AM	10/31/15 4:52 AM	3.4	13,400,000	0.85	24.08
001	West Point TP	Puget Sound	11/14/15 4:05 AM	11/15/15 9:25 AM	28.32	112,100,000	3.11	63.18
001	West Point TP	Puget Sound	11/17/15 11:56 AM	11/17/15 1:35 PM	1.65	2,880,000	0.44	25.03
001	West Point TP	Puget Sound	12/3/15 3:17 AM	12/3/15 4:41 AM	1.4	1,500,000	0.45	5.17
001	West Point TP	Puget Sound	12/5/15 1:33 PM	12/10/15 8:19 PM	57.96	197,510,000	4.29	95.67
001	West Point TP	Puget Sound	12/5/15 1:33 PM	12/10/15 8:19 PM	Event caused by two distinct storm events.	N/A	0.78	14.73
001	West Point TP	Puget Sound	12/12/15 1:21 PM	12/12/15 4:45 PM	3.1	7,260,000	0.42	7.85
001	West Point TP	Puget Sound	12/17/15 7:50 PM	12/18/15 5:41 AM	9.81	24,930,000	1.16	18.75
001	West Point TP	Puget Sound	12/21/15 10:29 AM	12/21/15 6:05 PM	7.1	7,820,000	1.01	37.58
051b	Alki WWTS	Puget Sound	3/15/15 12:43 PM	3/16/15 4:30 AM	13.78	30,450,000	1.91	18.22
051b	Alki WWTS	Puget Sound	11/14/15 7:52 AM	11/15/15 11:12 AM	25.59	41,940,000	3.33	64.60
051b	Alki WWTS	Puget Sound	12/7/15 2:40 PM	12/10/15 7:54 PM	49.68	84,540,000	5.15	128.52
051b	Alki WWTS	Puget Sound	12/18/15 2:52 AM	12/18/15 7:54 AM	3.18	3,180,000	1.35	22.67

Appendix B. Treated CSO Events

Outfall DSN #	Outfall Name	Receiving Water	Event Starting Date/ Time	Event Ending Date/ Time	Event Duration (hours)	Volume (gallons)	Precipi-tation (inches)	Storm Duration (hours)
046b	Carkeek WWTS	Puget Sound	3/15/15 2:14 PM	3/16/15 3:03 AM	11.10	2,170,000	1.88	50.95
046b	Carkeek WWTS	Puget Sound	11/15/15 12:43 AM	11/15/15 9:45 AM	8.71	1,170,000	1.70	63.2
046b	Carkeek WWTS	Puget Sound	12/7/15 1:05 PM	12/10/15 2:43 PM	38.03	6,500,000	5.07	106.9
027b	Elliott West WWTS	Puget Sound	1/17/15 9:41 PM	1/18/15 2:36 PM	5.80	10,480,000	1.24	25.52
027b	Elliott West WWTS	Puget Sound	2/6/15 8:17 AM	2/7/15 6:51 PM	12.45	14,300,000	2.06	77.7
027b	Elliott West WWTS	Puget Sound	2/27/15 5:39 AM	2/27/15 7:30 AM	1.90	1,160,000	1.16	8.0
027b	Elliott West WWTS	Puget Sound	3/15/15 11:23 AM	3/16/15 7:53 AM	11.35	46,190,000	2.62	48.5
027b	Elliott West WWTS	Puget Sound	8/14/15 4:31 PM	8/14/15 8:55 PM	4.40	11,320,000	1.14	5.5
027b	Elliott West WWTS	Puget Sound	8/29/15 11:16 PM	8/30/15 1:12 AM	2.00	10,290,000	1.34	41.9
027b	Elliott West WWTS	Puget Sound	10/10/15 12:13 PM	10/10/15 3:47 PM	2.00	6,330,000	0.96	29.3
027b	Elliott West WWTS	Puget Sound	10/31/15 2:34 AM	10/31/15 5:57 AM	1.50	3,520,000	0.98	65
027b	Elliott West WWTS	Puget Sound	11/14/15 3:00 AM	11/15/15 9:29 AM	25.48	60,800,000	3.05	62.6
027b	Elliott West WWTS	Puget Sound	12/6/15 4:20 AM	12/6/15 8:31 AM	3.20	1,940,000	1.35	45.9
027b	Elliott West WWTS	Puget Sound	12/7/15 12:17 PM	12/9/15 9:55 AM	36.20	66,850,000	3.30	62.8
027b	Elliott West WWTS	Puget Sound	12/10/15 1:03 PM	12/10/15 7:20 PM	4.60	7,710,000	0.58	Continued storm from 12/7/2015
027b	Elliott West WWTS	Puget Sound	12/18/15 12:40 AM	12/18/15 4:17 AM	3.60	8,990,000	1.1	19.3
027b	Elliott West WWTS	Puget Sound	12/21/15 2:45 PM	12/21/15 4:33 PM	1.80	1,72 0,000	0.99	38.7
044b	Henderson/MLK Jr. Way WWTS	Duwamish Waterway	3/15/15 8:20 PM	3/16/15 3:25 AM	7	5,450,000	2.33	48.6
044b	Henderson/MLK Jr. Way WWTS	Duwamish Waterway	11/15/15 1:47 AM	11/15/15 10:30 AM	8.72	3,530,000	4.46	48.7
044b	Henderson/MLK Jr. Way WWTS	Duwamish Waterway	12/8/15 2:35 PM	12/9/15 10:29 AM	19.92	6,010,000	4.49	94.02
		Total Volume				**1,021 MG**		

Appendix C
Alki Wet Weather Treatment Station
Annual Report

January–December 2015

Executive Summary

This 2015 annual report summarizes performance of King County's Alki Wet Weather Treatment Station (Alki WWTS). The Alki WWTS came online for CSO treatment in 1998; it operates under the NPDES permit for the West Point Treatment Plant (WA-0029181-1).

A total of 37.67 inches of rain fell in calendar year 2015, as measured at the rain gauge located at the Chelan Avenue Pump Station, the nearest gauge to the Alki WWTS. The annual rainfall recorded at Sea-Tac was 44.83 inches for 2015 compared to the historical annual average measured at Sea-Tac of 37.49 inches.

There were twelve filling events and four discharge events during 2015. The Alki WWTS received 182.3 MG and discharged 160.1 MG. The annual average TSS removal was 33.8 percent for the year thereby not meeting the NPDES permit limit of 50 percent for annual removal. Alki WWTS met its annual average settleable solids (SS) limit with the average measured as 0.10 milliliters/liter/hour (mL/L/hr) with the NPDES permit limit being 0.3 mL/L/hr. The Alki WWTS met all remaining NPDES permit limits. The performance for 2015 has been summarized below in Table C-1.

Table C-1. Alki WWTS Permit Performance in 2015

Parameter	Performance	Permit Conditions
Discharge events (number)	4	29 [a]
Discharge volume (MG)	160.1	108 [a]
Annual average SS (mL/L/hr)	0.1	0.3
Annual average TSS removal- including all discharge events (%)	33.7	50
Instantaneous minimum effluent pH	6.2	6.0
Instantaneous maximum effluent pH	7.3	9.0
Total residual chlorine, maximum of daily averages (µg/L)	40	234
Monthly fecal coliform geomean, maximum of monthly geomeans (#/100 mL)	94	400

[a] Compliance assessed over a 5-year average.
Numbers in red indicate a permit exceedance.

Suspended and Settleable Solids

The annual TSS removal was calculated to be 33.7 percent, which did not meet its annual average TSS removal permit level of 50 percent. The annual average SS was 0.1 mL/L/hr.; therefore, meeting the annual average NPDES permit level of 0.3 mL/L/hr.

Solids removal at Alki WWTS has also been below 50 percent TSS in the past; a few operational changes were implemented to improve the removal. The set point to start the solids flights in the sedimentary tanks has been set to start earlier so that as solids settle the flights will move the solids to the sump to be removed sooner and avoid any potential solid wash out or carry over to the effluent flow. In addition, King County operators cleaned out and removed accumulated solids and debris from the effluent channel as part of the summer dry-weather work. As part of the CSO control program, King County will bring in consultants in early 2016 to evaluate plant performance and make recommendations on how to improve solids removal. The consultant review and recommendations should be available by late summer 2016.

Fecal Coliform Bacteria

The maximum monthly geomean value for the fecal coliform was 94 counts/100 mL occurring in December; thereby meeting the NPDES permit's monthly limit for geomean of 400 counts/100 mL. The annual average of the monthly fecal coliform geomean was 37 counts.

Total Residual Chlorine

The maximum daily average effluent TRC during was 40 µg/L which is well below the permit limit of 234 µg/L. The dechlorination improvement project was completed in fall 2014. This project included two new sodium bisulfite (SBS) feed pumps with chemical flow meters, the addition of carrier water, and increased SBS storage capabilities. The new SBS chemical storage is in a heated contained room to minimize the chance of SBS freezing. Results from the 2015 events indicate that this dechlorination project performed well in preventing TRC permit exceedances. King County staff will continue monitoring CSO treatment including the dechlorination process. The annual TRC average was 17 µg/L.

Instantaneous Minimum and Maximum Effluent pH

The daily instantaneous minimum and maximum pH during the 2015 reporting period was 6.2 and 7.3, respectively, which met the NPDES permit limits for both daily instantaneous pH minimum equal to or greater than 6.0 and the maximum pH equal to or less than 9.0.

Operation and Maintenance

There were major upgrades made by King County staff in 2014 and in 2015; staff evaluated and made adjustments as needed. Highlights of O&M activities during 2015 include:

- Conducted annual CSO refresher training for the operators in September 2015.
- Received shipments of both sodium hypochlorite and sodium bisulfite treatment chemicals.
- Evaluated and made adjustments to the completed improvements to the influent sampling system.
- Continued to conduct debriefings with O&M staff after discharge events to review and discuss the discharge and treatment performance and make any needed operational adjustments for subsequent events.
- Cleaned out the effluent channel of accumulated solids and debris to improve solids removal.

- Set the solids flights set point to start sooner in the treatment process so that solids can be removed and pumped to prevent potential wash out and carry over to the effluent.
- Continued quarterly testing the treatment chemicals strength concentration (sodium hypochlorite and sodium bisulfite solutions) and made necessary changes to the feed programs or ordered fresh chemicals.
- Continued a preventive maintenance practice to exercise the chemical feed pumps on a monthly basis.
- Continued to monitor and evaluated the new dechlorination system improvement.

Dechlorination System Improvements Project

The project to improve the dechlorination system started construction in 2013 and was completed by the end of summer 2014. The project comprised of increasing the storage capacity of SBS from the old storage volume of 1,000 gallons to 3,000 gallons and installing new, larger capacity feed pumps and a chemical feed flow meter. In addition, the project included two SBS feed control "modes" – a flow-paced feed mode based on Alki WWTS flow and automatic pre-dechlor chlorine residual mode in which SBS feed is controlled by both plant flow and pre-dechlor chlorine residual. Operators will be able to select between these feed control modes based on the operating circumstance. During 2015 events, the dechlorination system performed well as there were no permit exceedances for final effluent TRC and minimum pH limits.

Near Future Operation

As with all wet weather treatment stations, opportunities to operate and then to optimize are very limited. Challenges may be identified during an event in the wet season, but any major projects to address the challenge would likely have to occur during the following dry season. Then, after the completion of these projects, the opportunities to test the improvements would likely occur in the following wet season. WTD staff will continue to investigate, make any necessary adjustments in the O&M. In addition, WTD staff responding to Alki WWTS will:

- Continue to evaluate and make any necessary adjustments to the dechlorination system as part of the Dechlorination System Improvement Project.
- Continue with the project for new Variable Frequency Drives for the 63rd Street pumps.
- Follow up with a project work request initiated to evaluate hypochlorite feed pump capacity size and make recommendations on the replacement of the current oversized hypochlorite feed pumps.
- Follow up and review consultant recommendations to improve Alki CSO treatment performance.

Table C-2. Alki WWTS Annual Event Data Summary

Month	Day/ Parameter	Inflow Event (#)	Inflow Volume (MG)	Discharge Event (#)	Discharge Volume (MGD)	Total Inf. TSS (lbs)	Total Eff. TSS Discharged @ Alki + WP (lbs)	Removal (%)	Eff. Daily SS (ml/l/hr)	Eff. SS Event Max Average (ml/l/hr)	Average Daily Eff. Fecal Coliforms (#/100 ml)	Eff. TRC Daily Average (ug/l)	Daily Min/Max pH
January	No Inflow/No Disch.												
	Instant. Min/Max pH												ND
	Event/Daily Max									ND		ND	
	MonthlyTotal/Avg/ GeoMean	0	0.00	0	0.00	ND	ND	ND			ND		
February	6	1a	0.04	ND	ND	37	4						
	7	1b	0.48	ND	ND	404	48						
	Instant. Min/Max pH												ND
	Event/Daily Max									ND		ND	
	MonthlyTotal/Avg/ GeoMean	1	0.52	0	0.0	441	52	88%			ND		
March	15	1	32.74	1	30.45	22,663	16,589		0.10	0.1	110/80	0	6.4/6.8
	Instant. Min/Max pH												6.4/6.8
	Event/Daily Max									0.10		0	
	MonthlyTotal/Avg/ GeoMean	1	32.74	1	30.45	22,663	16,589	27%			93.81		
April	No Inflow/No Disch.												
	Instant. Min/Max pH												ND
	Event/Daily Max									ND		ND	
	MonthlyTotal/Avg/ GeoMean	0	0.0	0	ND	ND	ND	ND			ND		
May	No Inflow/No Disch.												
	Instant. Min/Max pH												ND
	Event/Daily Max									ND		ND	

Month	Day/ Parameter	Inflow Event (#)	Inflow Volume (MG)	Discharge Event (#)	Discharge Volume (MGD)	Total Inf. TSS (lbs)	Total Eff. TSS Discharged @ Alki + WP (lbs)	Removal (%)	Eff. Daily SS (ml/l/hr)	Eff. SS Event Max Average (ml/l/hr)	Average Daily Eff. Fecal Coliforms (#/100 ml)	Eff. TRC Daily Average (ug/l)	Daily Min/Max pH
	MonthlyTotal/Avg/ GeoMean	0	0.0	0	ND	ND	ND	ND			ND		
June	No Inflow/No Disch.												
	Instant. Min/Max pH												ND
	Event/Daily Max									ND		ND	
	MonthlyTotal/Avg/ GeoMean	0	0.0	0	ND	ND	ND	ND			ND		
July	No Inflow/No Disch.												
	Instant. Min/Max pH												ND
	Event/Daily Max									ND		ND	
	MonthlyTotal/Avg/ GeoMean	0	0	0	ND	ND	ND	ND			ND		
August	14	1	2.25	ND	ND	375	89						
	29	2	0.42	ND	ND	88	4						
	Instant. Min/Max pH												ND
	Event/Daily Max									ND		ND	
	MonthlyTotal/Avg/ GeoMean	2	2.7	ND	ND	463	93	80%			ND		
September	17	1	0.7	ND	ND	817	96						
	Instant. Min/Max pH												ND
	Event/Daily Max									ND		ND	
	MonthlyTotal/Avg/ GeoMean	1	0.7	ND	ND	817	96	88%			ND		
October	10	1	1.04	ND	ND	503	57						
	30	2	1.62	ND	ND	1,202	57						
	Instant. Min/Max pH												ND
	Event/Daily Max									ND		ND	

Month	Day/ Parameter	Inflow Event (#)	Inflow Volume (MG)	Discharge Event (#)	Discharge Volume (MGD)	Total Inf. TSS (lbs)	Total Eff. TSS Discharged @ Alki + WP (lbs)	Removal (%)	Eff. Daily SS (ml/l/hr)	Eff. SS Event Max Average (ml/l/hr)	Average Daily Eff. Fecal Coliforms (#/100 ml)	Eff. TRC Daily Average (ug/l)	Daily Min/Max pH
	MonthlyTotal/Avg/ GeoMean	2	2.7	ND	ND	1706	114	93.3%			ND		
November	14	1	39.46	1	37.96	25,340	21,523		0.10	0.1	150	0	6.5/6.9
	15	1	3.98	1	3.98	1,992	1,028		0.10		1	10	6.6/6.9
	Instant. Min/Max pH												6.5/6.9
	Event/Daily Max									0.1		10	
	MonthlyTotal/Avg/ GeoMean	1	43.4	1	41.9	27,332	22550	17.5%			12		
December	7	1	19.85	1	17.04	13,078	8,433		0.1	0.10	1/1	0	6.15/6.78
	8	1	47.68	1	47.63	21,076	14,607		0.1		1	0	6.5/7.0
	9	1	9.96	1	8.94	6,230	4,034		0.0		1	0	6.7/7.3
	10	1	12.86	1	10.93	8,366	3,637		0.1		8,000	10	6.68/7.02
	12	2	0.27	ND	ND	153	20		ND				
	17	3	4.65	2	2.49	3,607	1,302		0.1	0.10	20	40	6.65/6.87
	18	3	1.24	2	0.69	962	498		0.1		1	0	6.65/6.69
	21	4	3.01	ND	ND	2,335	389		ND				
	Instant. Min/Max pH												6.15/7.3
	Event/Daily Max									0.1		40	
	MonthlyTotal/Avg/ GeoMean	4	99.5	2	87.7	55,806	32,920	41.0%			6		
Total		12	182.27	4	160.11	109,227	72,415						
Inst. pH Min/Max													6.15/7.3
Max (GEM, SS, TRC)										0.10	94	40	
Annual Average							by mass:	33.7%		0.10	37	17	

Notes:
ND= No discharge.
Red= NPDES permit exceedance.

	Inflow Volume (MGD)	Discharge Volume (MGD)	Total TSS Inf. (lbs)	Total TSS Eff. (lbs)	Annual Avg. TSS Removal (%)	Max of Event Avg. SS (mL/L/lhr)	Annual Avg. SS (mL/L/hr)	Max Monthly Geomean Fecal Coliform Eff. (#/100 mL)	Annual Avg. of Monthly Geomean Fecal Coliform Eff. (#/100 ml)	Max of Daily Avg. TCR Eff. (ug/L)	Instantaneous Min/Max pH
Includes all events	182.3	160.1	109,227	72,415	33.7%	0.10	0.10	94	37	40	6.15/7.3

Appendix D
Carkeek Wet Weather Treatment Station
Annual Report

January–December 2015

Executive Summary

This 2015 report summarizes the performance of Carkeek Wet Weather Treatment Station (Carkeek WWTS). The Carkeek WWTS began to operate as a CSO treatment facility on November 1, 1994. The Carkeek WWTS operates under the NPDES permit for the West Point Treatment Plant, Washington State Department of Ecology permit number WA-0029181-1.

The total rainfall for the reporting period was 38.12 inches, as measured by the Ballard Station rain gauge. The annual rainfall recorded at Sea-Tac was 44.83 inches for 2015 compared to the historical annual average measured at Sea-Tac of 37.49 inches.

Carkeek WWTS performed well in 2015 with only one NPDES permit violation for the year. On November 14, 2015, the first day of a two-day discharge event the final effluent daily average total residual chlorine (TRC) permit exceeded the permit limit. This exceedance occurred as a result of dechlorination system not feeding sodium bisulfite solution (SBS) to dechlorinate the effluent flows. The annual average solids removal, as measured by the total suspended solids (TSS) percent removal, was 51.3 percent, and the annual settleable solids (SS) averaged 0.1 mL/L/hr. All remaining parameters met NPDES permit limits.

Performance in 2015

In 2015, there were 10 inflow events and 3 resulted in discharges to Puget Sound. The total inflow and discharge volumes for the reporting period were 12.6 MG and 9.9 MG, respectively. There was one NPDES permit exceedance during 2015 and that was for daily average TRC. The 2015 performance is summarized below in Table D-1.

Table D-1. Carkeek WWTS Permit Performance in 2015

Parameter	Performance	Permit Conditions
Discharge events (number)	3	10[a]
Discharge volume (MG)	9.9	46[a]
Annual average SS (mL/L/hr)	0.10	0.3
Annual average TSS removal- including all discharge events (%)	51.3	50
Instantaneous minimum effluent pH	6.6	6.0
Instantaneous maximum effluent pH	7.9	9.0
Total residual chlorine, maximum of daily averages (µg/L)	2,218	490

Parameter	Performance	Permit Conditions
Monthly fecal coliform geomean (#/100 mL)	106	400

[a] Compliance assessed over a 5-year average.
Numbers in red indicate a permit exceedance.

Suspended and Settleable Solids

TSS removal averaged 51.3 percent, thereby meeting the annual TSS removal NPDES permit limit of 50 percent. The annual SS for the year averaged 0.10 ml/L/hr, thereby meeting the NPDEES Permit limits annual average.

Fecal Coliform Bacteria

The maximum monthly geomean during the 2015 reporting period occurred in March and was 316 counts/100 ml, thereby meeting the monthly NPDES permit limit of 400 counts/100ml. The annual average of the monthly geomean was 106 counts/100ml. None of the months with discharges exceeded the NPDES permit limit.

Instantaneous Minimum/Maximum pH

The instantaneous minimum and maximum pH during the 2015 reporting period was 6.6 and 7.9, respectively, thereby meeting the NPDES permit limits for instantaneous minimum pH equal to or greater than 6.0 and for the maximum pH permit limit of equal to or less than 9.0.

Total Residual Chlorine

The maximum daily average effluent TRC during the 2015 reporting year was >2,200 µg/L, thereby not meeting the NPDES permit limit of 490 µg/L. On November 14, 2015, the first day of discharge, the SBS feed pump failed to automatically start when the flows reached the level in the second sedimentation tank to trigger the feed pumps, and it was noticed that the SBS feed pumps and feed lines were clogged with SBS crystals. The air supply for the bubbler system level sensor had detached resulting in a false low level in the sedimentation tank. Maintenance staff secured the air supply to the bubbler system to reestablish level monitoring and control. In addition, the SBS crystals were cleared out of the feed pumps and lines to establish feed. By the second day of treatment and discharge, dechlorination was working properly and the second daily TRC met the permit limit. The resolution to prevent crystallization of the SBS was to turn up the heating system in the SBS storage room and staff increased the frequency of the automatic recirculation pump within the SBS storage tank. In addition, the SBS feed pump intake point was moved above the bottom of the storage tank to minimize the potential of the feed pump from drawing in any crystals that may have accumulated on the bottom of the tank.

Operation and Maintenance

In December 2015, WTD staff made the above-mentioned modifications to the SBS feed system to prevent crystallization and improve the reliability of the system. A new shipment of SBS was received in

December 2015 and sodium hypochlorite was replaced with fresh hypochlorite in October 2015. Annual CSO refresher training for the off-site operations staff was provided in September 2015.

Near Future Operation

- As with all wet weather treatment stations, opportunities to operate and then to optimize are very limited. Challenges may be identified during an event in the wet season, but any major projects to address the challenge would likely have to occur during the following dry season. Then, after the completion of these projects, the opportunities to test the improvements would likely occur in the following wet season. Given the "normal" challenges of an intermittently operated facility, WTD has essentially had to make improvements continuously, and a number of improvements have been identified to be addressed during subsequent dry seasons. Conducted annual CSO refresher training for the operators in September 2015.
- Received shipments of both sodium hypochlorite and sodium bisulfite treatment chemicals.
- Continued to conduct debriefings with O&M staff after discharge events to review and discuss the discharge and treatment performance and make any needed operational adjustments for subsequent events.
- Continued quarterly testing the treatment chemicals strength concentration (sodium hypochlorite and sodium bisulfite solutions) and made necessary changes to the feed programs or ordered fresh chemicals.
- Continued a preventive maintenance practice to exercise the chemical feed pumps on a monthly basis.
- Continued to monitor and evaluated the completed flow measurement improvements

Table D-2. Carkeek WWTS Annual Plant Performance 2015

Month	Day/ Parameter	Inflow Event (#)	Inflow Volume (MG)	Discharge Event (#)	Discharge Volume (MGD)	Total Inf. TSS (lbs)	Total Eff. TSS Discharged @ Carkeek + WP (lbs)	Removal (%)	Eff. Daily SS (ml/l/hr)	Eff. SS Event Max Average (ml/l/hr)	Average Daily Eff. Fecal Coliforms (#/100 ml)	Eff. TRC Daily Average (ug/l)	Daily Min/Max pH
January	No Inflow/No Disch.												
	Instant. Min/Max pH												ND
	Event/Daily Max									ND		ND	
	Monthly Total/Avg/GeoMean	0	0.0	ND	ND	ND	ND	ND			ND		
February	7	1	0.20	ND	ND	160	19		ND		ND	ND	
	Instant. Min/Max pH												ND
	Event/Daily Max									ND		ND	
	Monthly Total/Avg/GeoMean	1	0.2	ND	ND	160	19	88.1%			ND		
March	15	1	2.68	1	2.17	1,206	651		0.10	0.1	5000 /20	40	6.6/6.9
	31	2	0.04	ND	ND	69	2		ND			ND	ND
	Instant. Min/Max pH												6.6/6.9
	Event/Daily Max									0.10		40	
	Monthly Total/Avg/GeoMean	2	2.68	1	2.17	1,275	653	48.8%			316		
April	No Inflow/No Disch.												
	Instant. Min/Max pH												ND
	Event/Daily Max									ND		ND	
	Monthly Total/Avg/GeoMean	0	0.0	ND	ND	ND	ND	ND			ND		
May	No Inflow/No Disch.												
	Instant. Min/Max pH												ND
	Event/Daily Max									ND		ND	
	Monthly Total/Avg/GeoMean	0	0.0	ND	ND	ND	ND	ND			ND		

Month	Day/ Parameter	Inflow Event (#)	Inflow Volume (MG)	Discharge Event (#)	Discharge Volume (MGD)	Total Inf. TSS (lbs)	Total Eff. TSS Discharged @ Carkeek + WP (lbs)	Removal (%)	Eff. Daily SS (ml/l/hr)	Eff. SS Event Max Average (ml/l/hr)	Average Daily Eff. Fecal Coliforms (#/100 ml)	Eff. TRC Daily Average (ug/l)	Daily Min/Max pH
June	No Inflow/No Disch.												
	Instant. Min/Max pH												ND
	Event/Daily Max									ND		ND	
	Monthly Total/Avg/GeoMean	0	0.0	ND	ND	ND	ND	ND			ND		
July	No Inflow/No Disch.												
	Instant. Min/Max pH												ND
	Event/Daily Max									ND		ND	
	Monthly Total/Avg/GeoMean	0	0.0	ND	ND	ND	ND	ND			ND		
August	14	1	0.13	ND	ND	335	80						
	29	2	0.05	ND	ND	28	1						
	Instant. Min/Max pH												ND
	Event/Daily Max									ND		ND	
	Monthly Total/Avg/GeoMean	2	0.2	ND	ND	362	81	77.6%			ND		
September	No Inflow/No Disch.												
	Instant. Min/Max pH												ND
	Event/Daily Max									ND		ND	
	Monthly Total/Avg/GeoMean	0	0.0	ND	ND	ND	ND	ND			ND		
October	10	1	0.3	ND	ND	323	36						
	Instant. Min/Max pH												ND
	Event/Daily Max									ND		ND	
	Monthly Total/Avg/GeoMean	1	0.29	ND	ND	323	36	88.8%			ND		
November	14	1	1.52	1	1.0	152	122.68		0.10	0.1	1	2,218	7.1/7.4
	15	1	0.16	1	0.2	16	7.27		0.10		1	230.0	7.0/7.1

Month	Day/ Parameter	Inflow Event (#)	Inflow Volume (MG)	Discharge Event (#)	Discharge Volume (MGD)	Total Inf. TSS (lbs)	Total Eff. TSS Discharged @ Carkeek + WP (lbs)	Removal (%)	Eff. Daily SS (ml/l/hr)	Eff. SS Event Max Average (ml/l/hr)	Average Daily Eff. Fecal Coliforms (#/100 ml)	Eff. TRC Daily Average (ug/l)	Daily Min/Max pH
	Instant. Min/Max pH												7.0/7.4
	Event/Daily Max									0.1		2,218	
	Monthly Total/Avg/GeoMean	1	1.68	1	1.17	168	130	22.6%			1		
December	7	1	1.09	1	0.4	719	329.45		0.10	0.10	1/1	240	6.9/7.0
	8	1	5.29	1	5.3	1280	867.47		0.10		1	40.0	6.7/7.0
	9	1	0.65	1	0.6	296	170.29		0.01		1	10	7.0/7.1
	10	1	0.38	1	0.1	120	35.32		0.10		40	260	6.9/7.9
	12	2	0.04	0	0.0	23	3.03						
	17	3	0.18	0	0.0	59	4.72						
	Instant. Min/Max pH												6.7/7.9
	Event/Daily Max									0.1		260	
	Monthly Total/Avg/GeoMean	3	7.62	1	6.54	2497	1410.3	43.5%			2		
Total		10	12.65	3	9.88	4,785	2,330						
Inst. pH Min/Max													6.6/7.9
Max (GEM, SS, TRC)										0.10	316	2,218	
Annual Average								51.3%		0.10	107	433	

ND= No discharge.
Red= NPDES permit exceedance.

	Inflow Volume (MGD)	Discharge Volume (MGD)	Total TSS Inf. (lbs)	Total TSS Eff. (lbs)	Annual Avg. TSS Removal (%)	Max of Event Avg. SS (mL/L/lhr)	Annual Avg. SS (mL/L/hr)	Max Monthly Geomean Fecal Coliform Eff. (#/100 mL)	Annual Avg. of Monthly Geomean Fecal Coliform Eff. (#/100 ml)	Max of Daily Avg. TCR Eff. (ug/L)	Instantaneous Min/Max pH
Includes all events	12.6	9.88	4,785	2,330	51.3%	0.10	0.10	316	107	2,218	6.6/7.9

Appendix E
Elliott West Wet Weather Treatment Station
Annual Report

January–December 2015

Executive Summary

This 2015 annual report summarizes the performance of the Elliott West Wet Weather Treatment Station (Elliott West WWTS). Elliott West WWTS began operating in July 2005. The facility operates under the permit for the West Point Treatment Plant, Washington State Department of Ecology permit number WA-0029181-1. The permit went into effect on February 1, 2015.

Total rainfall recorded in 2015 was 38.45 inches as measured at the Denny Way rain gauge station which is located at 3165 Alaskan Way in Seattle. The annual rainfall recorded at Sea-Tac was 44.83 inches for 2015 compared to the historical annual average measured at Sea-Tac of 37.49 inches.

There were 27 inflow events and 14 discharge events in 2015. Elliott West WWTS received a total of 491.4 MG out of which 251.6 MG was treated and discharged through the Elliott West Outfall at the Denny Way Regulator Station Overflow located in Myrtle Edwards Park. Nearly 40 percent of the total discharged CSO volume occurred in December 2015. The average total suspended solids (TSS) removal for all events during the year was 57.7 percent.

Performance in 2014

Table E-1 summarizes NPDES permit performance in 2015.

Table E-1. Elliott West WWTS Permit Performance in 2015

Parameter	Performance	Permit Conditions
Annual average SS (mL/L/hr)	2.60	0.3
Annual average TSS removal- including all discharge events (%)	57.7	50
Instantaneous minimum effluent pH	4.9	6.0
Instantaneous maximum effluent pH	8.2	9.0
Total residual chlorine, maximum of daily averages (µg/L)	352	109
Monthly fecal coliform geomean, maximum of monthly geomeans (#/100 mL)	11,033	400

Numbers in red are permit exceedances.

Suspended and Settleable Solids

In 2015, the annual TSS removal was calculated to be 57.7 percent; therefore it met the NPDES permit limit of 50 percent.

The renewed NPDES permit effective February 1, 2015 removed the SS event maximum limit and kept the annual average of 0.3 ml/L/hr. Meeting the SS NPDES permit limit continues to be a challenge. The annual SS concentration for the 2015 discharge events averaged 2.60 mL/L/hr, exceeding the NPDES permit limit of 0.3 mL/L/hr. The event maximum in 2015 was 10.0 mL/L/hr during an event on December 17, 2015. With the ongoing challenges of meeting the NPDES permit limits, King County has started a project with consultant engineers to help determine the issues with solids removal and SS compliance. An extensive sampling plan has been established to monitor flows and solids entering the Mercer Street Treatment Tunnel and Elliott West WWTS pipeline (wet well inputs from the west flows). The solids sampling and monitoring project started in late 2015.

Fecal Coliform Bacteria

In 2015, Elliott West WWTS did not meet the fecal coliform NPDES permit limit of 400/100 mL monthly geomean three out of seven discharge months. The maximum monthly geomean for fecal coliform bacteria was calculated as 11,033 counts/100 mL. The annual average of monthly geomeans was 1,734/100 mL. In 2015, the highest fecal coliform count was 2,400,000/100 mL, and it occurred during the December 5, 2015 discharge. There has been a noticeable increase in frequency of high fecal coliform counts during 2015 treatment events compared to events in 2014. A corrective measure is planned for early 2016 to clean and shock dose the sample line including fecal coliform sample tap. In addition, mid-season refresher training for the operators on proper bacteriological sampling technique was scheduled for January – February 2016.

Total Residual Chlorine

During 2015, there were 14 discharge days out of 23 that exceeded the maximum daily average total residual chlorine (TRC) NPDES permit level of 109 µg/ml. Please refer to Table E-2 for the discharge events that have exceeded the TRC limits. There are several potential causes for the TRC permit limit exceedances. Several of the discharge events had intermittent flows and many events had wide pumping fluctuations by the main pumps causing challenges to the chemical systems to respond quickly enough to the changes in the discharge flows. In addition, the TRC exceedances may have been caused by inadequate sodium bisulfite (SBS) feed and mixing and the continuous adjustments made to the SBS feed in direct response to the minimum pH excursions. It is possible that SBS under feeding contributed to the TRC exceedances. In addition, from examining event data trends, it is possible the SBS mixing may be inadequate. The current SBS mixing is accomplished by using carrier water and two induction mixers located at the base of the 96-inch diameter effluent pipe. It is thought that the mixing efficiencies may have been impacted by insufficient carrier water flow when water service to the Denny Regulator Station was inadequate. The Denny Way Regulator Station is where dechlorination occurs for Elliott West WWTS. The water service was repaired and upgraded to provide higher flows and pressures at Denny Way Regulator Station in July 2014. A continuous minimum water flow and higher water pressure is needed, not only for the source of SBS carrier water, but also for back-flushing sample pumps and lines. WTD staff is continuing to adjust the chemical feed controls as well as the monitoring equipment (i.e., the online chlorine analyzers and pH meter).

Instantaneous Minimum and Maximum Effluent pH

Instantaneous minimum and maximum effluent pH in 2015 was measured as 4.9 and 8.2, respectively. There were a total of 23 discharge days in 2015, and 9 of those discharge days had the instantaneous minimum effluent pH measured below the NPDES permit level of 6.0, while there were no events exceeding the maximum pH limit of 9.0. Typically, a drop in the effluent pH during discharge and treatment indicates a potential overdosing of SBS or overdosing of sodium hypochlorite. The dechlorination reaction with SBS consumes alkalinity, and high pre-dechlor chlorine residual requires additional SBS feed, which in turn results in the consumption of alkalinity. In response to these incidents of depressed effluent pH values, staff has been fine-tuning the SBS feed control program, reducing SBS feed, and reducing hypochlorite feed; however, these actions did not prevent all exceedances in 2015. Further analysis of the data trends of discharge events is on-going.

Staff has continued to gather additional information for the investigation into these pH exceedances. This includes the additional sampling and testing that started in 2012, which was for supplemental alkalinity sampling of the wet well, pump discharge channel, pre-dechlor sample and final effluent sample streams. The alkalinities of the inflow and final effluents have been determined to be in the range 12 to 40 milligrams per liter (mg/L) as $CaCO_3$. These very low alkalinity values are contributing to the pH challenges. Staff have also been using a portable pH meter as an independent measurement throughout the treatment process, starting with the flows entering the wet well at Elliott West WWTS, then proceeding to measure the pH of the pump discharge flows, pre-dechlorination, and final effluent. The inflows have a pH measurement around 7.0. From the data collection during discharges, it has been suggested that the low alkalinity values measured from the inflows at Elliott West WWTS, along with high hypochlorite feed, were causing the dechlorination reaction to consume alkalinity and to cause the pH depression in the final effluent. WTD staff will continue to respond to Elliott West WWTS discharges in order to adjust the chlorination and dechlorination controls.

Operation and Maintenance

Highlights of O&M activities at Elliott West WWTS during 2015:

- Conducted annual CSO refresher training for the operators in September 2015.
- Continued to provide an on-site response team in anticipation of a treatment and discharge event, and during the event. The members of the multi-disciplinary response team work together to troubleshoot and adjust the chlorination-dechlorination feed controls, sampling, and process control.
- Replaced one of the two SBS flash mixers and the pre-dechlor sample pump in August 2015.
- Continued the automated Mercer Street Treatment Tunnel flushing program at the East Portal flushing gate as an attempt to flush and capture the solids settled in the Mercer Tunnel.
- Continue to monitor the effectiveness of the automated Mercer Tunnel flushing by taking additional samples from the return flows and running laboratory solids analyses on the those samples.
- Continued to run the dewatering pumps during discharges in order to remove additional solids, which takes advantage of the turbulence and re-suspension of solids in the wet well caused by the larger main pumps and increases the amount of solids in the return flows to the West Point

Treatment Plant.

- Continued to conduct debriefings with O&M staff after discharge events to review and discuss the discharge and treatment performance and make any needed operational adjustments for subsequent events.
- Continued with additional procedures to the post-discharge event routines including equipment testing, cleaning and de-ragging within the dechlor and final effluent vaults/structures. Equipment includes both pre-dechlor and final effluent sample pumps and sample intakes and SBS mixers.
- Continued to exercise the chemical feed pumps on a monthly basis as a preventive maintenance measure.
- Made changes to main pump control program with the goal to minimize large pump flow swings impacting treatment and impacts to upstream conveyance.

Chlorination-Dechlorination System Improvements Project

2015 marks the fourth year of operation for the chlorination-dechlorination system controls, part of the Chlorination-Dechlorination System Improvement Project. This project was completed in November 2011. The response team was tasked with troubleshooting and adjusting the feed controls, and they responded to each treatment and discharge event when the wet well was filling, prior to the start of the main discharge pumps. It was decided to switch to Mode 3 for hypochlorite feed. Use of Mode 3 allows for better hypochlorite feed control which should reduce the potential of over feeding of hypochlorite, and therefore, could also reduce the over feeding of SBS. To adjust the new system, station performance was evaluated during the operations debriefing held after each discharge event. This continuous improvement process is ongoing.

Instrumentation and Sampling Equipment Relocation and Improvements Project

Instrumentation and Sampling Equipment Relocation project work including the design phase and necessary construction permitting was carried out by King County Capital Projects team in 2015. This project is to relocate and improve sample delivery and to relocate the process instrumentation and monitoring equipment at Denny Way Station (the location of Elliott West WWTS dechlorination and final effluent monitoring). The instrumentation and sampling equipment will be relocated to a separate dedicated room out of the SBS day tank room. The current configuration of having sensitive instrumentation (chlorine residual analyzers, pH and dissolved oxygen meters and samplers) is incompatible with SBS day tank chemical storage. In addition to relocating the instrumentation, the pre-dechlorination and final effluent amperometric chlorine residual analyzers will be replaced with newer models that will be programed to enter a “sleep-mode” during non-discharge days, thus, saving instrument wear, reduce city water and reagent chemical use. As part of this project, the current sample lines and copper flushing water lines will be replaced with non-metal materials that will meet the standards for priority pollutant sampling and eliminate the non-compatible material contamination of samples. The design phase of this project started in early 2015, and it is projected to be completed by fall of 2017.

Near Future Operation

During the ten years of operation, opportunities to operate and then to optimize have been very limited. Challenges may be identified during an event in the wet season, but any major projects to address the challenge would likely have to occur during the following dry season. Then, after the completion of these projects, the opportunities to test the improvements would likely occur in the following wet season. Given the complexity of Elliott West WWTS's design and operation and the "normal" challenges of an intermittently operated facility, WTD has essentially had to make improvements continuously, and a number of improvements have been identified to be addressed during subsequent dry seasons. WTD staff will continue to fine-tune the chlorination-dechlorination controls and assess and improve the facility performance using these additional tools.

In addition, WTD staff responding to Mercer Street Treatment Tunnel will:

- Continue to investigate and correct the cause(s) of the instantaneous minimum pH exceedances.
- Continue to implement the response team to Elliott West WWTS as the wet well fills and in anticipation of a discharge.
- Continue evaluation and fine-tuning of the chlorination and dechlorination controls.
- Implement the project to relocate instrumentation and sampling equipment into a separate room out of the SBS day tank room. The design team met throughout the 2015 year and the final design is under review.
- A new pump control strategy has been incorporated into the pump controls in late 2015 and evaluation of the pumping controls will continue.
- Continue to monitor copper and dissolved oxygen of Elliott West WWTS flow.
- Continue with laboratory solids analyses on all flows sampled at Elliott West WWTS as part of the monitoring of the automated Mercer Tunnel flushing program.
- Continue evaluation and fine-tuning of changes in the main pump control program.

Table E-2. Elliott West Annual Plant Performance 2015

Month	Day/ Parameter	Inflow Event (#)	Inflow Volume (MG)	Discharge Event (#)	Discharge Volume (MGD)	Total Inf. TSS (lbs)	Total Eff. TSS Discharged @ EWCSO + WP (lbs)	Removal (%)	Eff. Daily SS (ml/l/hr)	Eff. SS Event Max Average (ml/l/hr)	Average Daily Eff. Fecal Coliforms (#/100 ml)	Eff. TRC Daily Average (ug/l)	Daily Min/Max pH
January	9	1.00	0.32	#ND	ND	233	6						
	10	1.00	0.04	ND	ND	139	4						
	15	2.00	1.44	ND	ND	816	14						
	16	2.00	0.96	ND	ND	2,313	46						
	17	2.00	19.67	1	7.68	40,958	5,802		0.10		230	221	6.3/7.9
	18	2.00	15.46	1	2.80	21,364	2,580		0.10	0.1	1	84	6.5/7.9
	19	2.00	1.27	ND	ND	8,157	235						
	Instant. Min/Max pH												6.3/7.9
	Event/Daily Max									0.10		221	
	Monthly Total/Avg/GeoMean	2	39.17	1	10.48	73,980	8,687	88%			15.2		
February	2	1	2.97	ND	ND	2,006	70						
	4	2	1.47	ND	ND	2,310	74						
	5	2	7.25	ND	ND	3,904	304						
	6	2	15.14	1	6.51	5,840	3,914		*NM		500,000 / 80	324	6.1/6.9
	7	2	16.17	1	7.79	8,033	4,277		0.6	0.6	3,000	95	5.2/7.0
	8	2	2.78	ND	ND	7,881	394						
	9	2	0.88	ND	ND	3,527	167						
	10	2	0.17	ND	ND	285	10						
	26	3	1.68	2	0.89	3,834	996		0.8		123,500	0	6.0/6.3
	27	3	8.85	2	0.27	14,861	819		0.8	0.8	^ED	0	6.1/6.2
	28	3	0.45	ND	ND	2,976	83						
	Instant. Min/Max pH												5.2/7.0
	Event/Daily Max									0.8		324	
	Monthly Total/Avg/GeoMean	3	57.84	2	15.46	55,457	11,108	80%			11,033		
March	13	1	0.60	ND	ND	734	14						

Month	Day/ Parameter	Inflow Event (#)	Inflow Volume (MG)	Discharge Event (#)	Discharge Volume (MGD)	Total Inf. TSS (lbs)	Total Eff. TSS Discharged @ EWCSO + WP (lbs)	Removal (%)	Eff. Daily SS (ml/l/hr)	Eff. SS Event Max Average (ml/l/hr)	Average Daily Eff. Fecal Coliforms (#/100 ml)	Eff. TRC Daily Average (ug/l)	Daily Min/Max pH
	14	1	2.96	ND	ND	2,736	101						
	15	1	47.57	1	45.86	69,038	67,523		3.10		40 /20	148	5.9/8.2
	16	1	8.25	1	0.33	4,320	993		3.10	3.1	40	0	6.0/6.3
	17	1	0.94	ND	ND	12,380	433						
	24	2	1.66	ND	ND	1,369	52						
	25	2	0.07	ND	ND	115	3						
	31	3	1.02	ND	ND	722	21						
	Instant. Min/Max pH												5.9/8.2
	Event/Daily Max									3.1		148	
	Monthly Total/Avg/GeoMean	3	63.05	1	46.19	91,414	69,140	24%			40.0		
April	10	1	1.2	ND	ND	822.9	31.1						
	11	1	0.7	ND	ND	1,339.8	24.7						
	Instant. Min/Max pH												ND
	Event/Daily Max									ND		ND	
	Monthly Total/Avg/GeoMean	1	1.90	ND	ND	2,163	56	97%			ND		
May	No Inflows/No Disch.												
	Instant. Min/Max pH												ND
	Event/Daily Max									ND		ND	
	Monthly Total/Avg/GeoMean	0	0.00	ND	ND	ND	-	ND		ND	ND		
June	No Inflows/No Disch.												
	Instant. Min/Max pH												ND
	Event/Daily Max									ND		ND	

Month	Day/ Parameter	Inflow Event (#)	Inflow Volume (MG)	Discharge Event (#)	Discharge Volume (MGD)	Total Inf. TSS (lbs)	Total Eff. TSS Discharged @ EWCSO + WP (lbs)	Removal (%)	Eff. Daily SS (ml/l/hr)	Eff. SS Event Max Average (ml/l/hr)	Average Daily Eff. Fecal Coliforms (#/100 ml)	Eff. TRC Daily Average (ug/l)	Daily Min/Max pH
	Monthly Total/Avg/GeoMean	0	0.0	ND	ND	ND	0.00	ND			ND		
July	No Inflows/No Disch.												
	Instant. Min/Max pH												ND
	Event/Daily Max									ND		ND	
	Monthly Total/Avg/GeoMean	0	0.00	ND	ND	ND	0	ND			ND		
August	14	1	19.32	1	11.32	92,055	35,225		2.50	2.5	0	2,630	6.5/7.8
	15	1	1.88	ND	ND	219	19						6.3/8.0
	29	2	14.5	2	10.29	27,802	25,516		2.00	2.0	0	517	
	30	2	6.68	ND	ND	1,012	138						
	31	2	0.78	ND	ND	2,238	74						
	Instant. Min/Max pH												6.3/8.0
	Event/Daily Max									2.5		2,630	
	Monthly Total/Avg/GeoMean	2	43.00	2	21.61	123,326	60,972	51%			1.0		
September	5	1	6.53	ND	ND	6,835	399						
	6	1	0.74	ND	ND	289	9						
	17	2	2.34	ND	ND	5,184	610						
	22	3	1.40	ND	ND	1,483	76						
	Instant. Min/Max pH												ND
	Event/Daily Max									ND		ND	
	Monthly Total/Avg/GeoMean	3	11.01	ND	ND	13,792	1,095	92%			ND		
October	7	1	0.54	ND	ND	431	51						

Month	Day/ Parameter	Inflow Event (#)	Inflow Volume (MG)	Discharge Event (#)	Discharge Volume (MGD)	Total Inf. TSS (lbs)	Total Eff. TSS Discharged @ EWCSO + WP (lbs)	Removal (%)	Eff. Daily SS (ml/l/hr)	Eff. SS Event Max Average (ml/l/hr)	Average Daily Eff. Fecal Coliforms (#/100 ml)	Eff. TRC Daily Average (ug/l)	Daily Min/Max pH
	10	2	16.38	1	6.33	13,587	10,618		2.0	2.0	20 / 0	787	5.9/7.8
	11	2	3.25	ND	ND	1,106	54						
	12	2	5.95	ND	ND	3,291	186						
	13	2	2.90	ND	ND	2,225	160						
	14	2	0.14	ND	ND	4,544	220						
	25	3	0.72	ND	ND	1,050	63						
	26	3	0.06	ND	ND	233	16						
	30	4	4.65	2	3.52	20,239	10,887		9.0	9.0	20	995	4.9/7.8
	31	4	7.93	ND	ND	2,081	330						
	Instant. Min/Max pH												4.9/7.8
	Event/Daily Max									9.0		995	
	Monthly Total/Avg/GeoMean	4	42.52	2	9.85	48,788	22,586	54%			4		
November	1	1	1.68	ND	ND	8,005	579						
	2	1	0.39	ND	ND	203	9						
	7	2	1.73	ND	ND	2,278	124						
	8	2	1.66	ND	ND	2,885	233						
	13	3	12.49	1	10.50	18,063	12,252		2.5	1.17	80	580	6.1/6.9
	14	3	51.96	1	49.29	17,348	17,043		0.5		80 /30000	737	6.0/7.1
	15	3	9.15	1	1.01	1,117	422		0.5			4	6.2/6.9
	16	3	1.30	ND	ND	239	14						
	17	3	5.02	ND	ND	3,217	431						
	18	3	1.28	ND	ND	728	34						
	24	4	0.39	ND	ND	335	26						
	Instant. Min/Max pH												6.0/7.1
	Event/Daily Max									2.50		737	
	Monthly Total/Avg/GeoMean	4	87.06	1	60.80	54,421	31,167	43%			577		
December	2	1	0.91	ND	ND	4,309	359						
	3	1	2.06	ND	ND	1,458	295						
	4	1	0.77	ND	ND	1,553	109						

Month	Day/ Parameter	Inflow Event (#)	Inflow Volume (MG)	Discharge Event (#)	Discharge Volume (MGD)	Total Inf. TSS (lbs)	Total Eff. TSS Discharged @ EWCSO + WP (lbs)	Removal (%)	Eff. Daily SS (ml/l/hr)	Eff. SS Event Max Average (ml/l/hr)	Average Daily Eff. Fecal Coliforms (#/100 ml)	Eff. TRC Daily Average (ug/l)	Daily Min/Max pH
	5	1	3.38	1	1.24	7,456	2,771		0.10	0.1	2,400,000	0	6.0/6.6
	6	1	8.54	1	0.71	2,045	1,598		0.10			0	5.5/6.4
	7	1	23.34	2	20.70	20,346	19,233		2	1.1	3000 /500	232	5.4/7.2
	8	1	45.93	2	43.18	13,374	12,443		0.4		230	212	5.7/7.0
	9	1	8.45	2	2.97	5,878	4,236		0.8		120	153	6.2/6.8
	10	1	14.32	3	7.71	13,320	11,639		2.5	2.5	500/1	46	6.0/6.9
	11	1	3.15	ND	ND	3,517	360						
	12	1	2.17	ND	ND	3,432	456						
	13	1	3.03	ND	ND	543	53						
	14	1	0.73	ND	ND	449	23						
	17	2	11.03	4	8.99	19,477	17,975		10.00	10	220/70	221	5.8/6.9
	18	2	6.45	ND	ND	622	183						
	19	2	1.68	ND	ND	2,599	252						
	21	3	6.46	5	1.72	2,797	1,458		0.00	0	700	111	5.8/6.8
	22	3	2.08	ND	ND	110,461	9,129						
	25	4	0.28	ND	ND	3,002	246						
	27	5	0.89	ND	ND	186	14						
	28	5	0.10	ND	ND	242	15						
	Instant. Min/Max pH												5.4/7.2
	Event/Daily Max									10.0		232	
	Monthly Total/Avg/GeoMean	5	145.7	5	87.2	217,065	82,847	61.8%			471		
Total		27	491.4	14	251.6	680,405	287,657						
Inst. pH Min/Max													4.9/8.2
Max (GEM, SS, TRC)										10.00	11,033	2,630	
Annual Average								57.7%		2.60	1,734	352	

Notes:

* NM= Not measured due to the FE sample pump failed
Red= NPDES permit exceedance

	Inflow Volume (MGD)	Discharge Volume (MGD)	Total TSS Inf. (lbs)	Total TSS Eff. (lbs)	Annual Avg. TSS Removal (%)	Max of Event Avg. SS (mL/L/lhr)	Annual Avg. SS (mL/L/hr)	Max Monthly Geomean Fecal Coliform Eff. (#/100 mL)	Annual Avg. of Monthly Geomean Fecal Coliform Eff. (#/100 ml)	Max of Daily Avg. TCR Eff. (ug/L)	Instantaneous Min/Max pH
Includes all events	491.4	251.6	680,405	287,657	0.58	10.00	2.6	11033	1734	2,630	4.9/8.2

Appendix F
Henderson/MLK Jr. Way Wet Weather Treatment Station Annual Report

January–December 2015

Executive Summary

This 2015 annual report summarizes the performance of King County's Henderson/Martin Luther King Junior Way Wet Weather Treatment Station (Henderson/MLK Jr. Way WWTS). The Henderson/MLK Jr. Way WWTS came online in 2005 and operate under the NPDES permit for the West Point Treatment Plant (WA-0029181-1).

A total of 35.79 inches of rain fell in 2015 as measured at Henderson Street Pump Station. Sea-Tac recorded 48.5 inches for 2015 compared to the historical annual average measured at Sea-Tac of 37.49 inches (20 year average).

There were four filling events and three discharge events during 2015. The Henderson/MLK Jr. Way WWTS received a total inflow of 26.6 MG and discharged 15.0 MG of treated water through the Norfolk Street Overflow to the Duwamish Waterway. The Henderson/MLK Jr. Way WWTS operated well in 2015. All NPDES permit performance conditions were met except for maximum daily chlorine limit on March 15 and monthly fecal coliform geomean on December 8. TSS removal averaged 59.8 percent.

Performance in 2015

Table F-1 summarizes NPDES permit performance in 2015.

Table F-1. Henderson/MLK Jr. Way WWTS Permit Performance in 2015

Parameter	Performance	Permit Conditions
Annual average SS (mL/L/hr)	<0.12	0.3
Annual average TSS removal- including all discharge events (%)	59.8	50
Instantaneous minimum effluent pH	6.1	6.0
Instantaneous maximum effluent pH	6.6	9.0
Total residual chlorine, maximum of daily averages (µg/L)	1,100	39
Monthly fecal coliform geomean (#/100 mL)	>400	400

Numbers in red indicate a permit exceedance.

Suspended and Settleable Solids

TSS removal averaged 59.8 percent, thereby meeting the annual TSS removal NPDES permit limit of 50 percent. The annual SS for the year averaged <0.12 ml/L/hr, thereby meeting the Permit limit of 0.3 ml/L/hr.

Fecal Coliform Bacteria

The maximum monthly geomean during the 2015 reporting period was >400 counts/100 ml, thereby not meeting the monthly NPDES permit limit of 400 counts/100ml.

Instantaneous Minimum/Maximum pH

The instantaneous minimum and maximum pH during the 2015 reporting period was 6.1 and 6.6, respectively, thereby meeting the NPDES permit limits for instantaneous minimum and maximum pH of 6.0 and 9.0, respectively.

Total Residual Chlorine

The maximum daily average effluent Total Residual Chlorine (TRC) during the 2015 reporting year was 1,100 µg/L, which is above the NPDES permit limit of 39 µg/L.

Operation and Maintenance

The equipment and facilities of the Henderson/MLK Jr. Way WWTS were fully functioning and available during 2015. Preventive maintenance was performed routinely. Routine O&M activities not directly associated with an event included weekly operator inspections, checklists, equipment and sampler testing, alarm checks, weekly analyzer preventive maintenance and calibrations, quarterly lubrication and preventive maintenance of mechanical equipment, annual training and preparation for winter wet weather operation, post-event cleaning of the CSO facilities, and post-event debriefs and corrective work orders as appropriate. More details are available in the monthly discharge monitoring reports.

In order to improve on-line chlorine monitoring of the CSO effluent, an activated carbon cartridge was installed on the City of Seattle water supply used to keep the outlet chlorine analyzer continuously wetted. The carbon dechlorinates the City water so the resulting chlorine level is close to the permitted maximum limit of 39 ug/L. Supplying wetting water with a chlorine level near the permit limit should improve the reliability and accuracy of the instrument during events. Without dechlorination, the chlorine residual of the city water is well above the instrument's span and about 30 times higher than the chlorine limit, i.e., about 0.5-mg/L.

Dissolved oxygen and pH meters were installed this year at the Henderson/Martin Luther King Junior Way Tunnel Outlet Regulator Station (Henderson/MLK Jr. Way Tunnel Outlet RS) to provide NPDES Permit required quality data. The resulting data is recorded in the South Treatment Plant's Distributed Control System Plan and data historian. WTD developed a new "Cold Start" Operator checklist included in the revised O&M Manual.

Near Future Operation

No major projects are currently in progress. However, in 2016, action will begin on some of the improvements recommended by a consultant in 2015 to address problems associated with consistently meeting disinfection and dechlorination requirements. Proposed upgrades being considered:

- Henderson/MLK Jr. Way Treatment Tunnel level measurement
    - Henderson/MLK Jr. Way Tunnel Inlet RS — Install a new fine-range bubbler sensor. The new fine-range pressure sensor would be retrofitted into the existing bubbler panel. The existing bubbler sensor would be retained for measuring the full depth of the tunnel and for redundancy. A new small receiver tank would be provided and an air dryer and a pressure regulator would supply instrument air to the existing full range bubbler and the new fine-range bubbler. The existing compressor system would directly feed the existing sampler and would charge the new receiver tank when little or no purge air was being supplied to the sampler. The local programmable logic controller (PLC) would send an alarm for any unacceptable difference in readings between the sensors. The ongoing accuracy of the sensors would be monitored and logged.
    - Henderson/MLK Jr. Way Tunnel Outlet RS — Installation of a new fine-range bubbler sensor. The existing sonic level sensor would be retained for measuring the full depth of the tunnel and for redundancy. A new bubbler air panel, compressor, and air receiver to supply air for the bubbler sensor would be installed. The PLC would be set to send an alarm for any unacceptable difference in readings between the sensors. The ongoing accuracy of the sensors would be monitored and logged.
- Weir flow measurement — Reconfiguration of the existing weirs (at both the inlet and outlet regulator) to gradually inclined weirs.
- Chemical dosage control
    - Gas binding—Installation of new automated degassing valve on the sodium hypochlorite and SBS chemical pumps. Strainers to remove crystals and other solids would be installed.
    - SBS dose control — Provide a new chlorine analyzer system upstream of the overflow weir at the outlet regulator. Data from this analyzer would be tied to the PLC and would be used for feed-forward dosing of SBS.
    - Turndown for chemical pumps — Provide flow meters for the SBS and sodium hypochlorite chemical pumps. The flow meter data would be monitored and logged to confirm the chemical feed pumps are pumping correctly and for future reference to evaluate system performance.
- Equipment redundancy — Alarm signals to PLC to indicate if the sodium hypochlorite and/or SBS chemical pumps are not pumping would be provided.
    - Effluent on-line residual chlorine monitoring — A solenoid valve would be set to automatically close when the sample pump is turned on and open after the end of overflow events.

Table F-2. Henderson/MLK Jr. Way WWTS Annual Plant Performance 2015

Month	Day/Parameter	Inflow Event (#)	Inflow Volume (MG)	Discharge Event (#)	Discharge Volume (MGD)	Total Inf. TSS (lbs)	Total Eff. TSS Discharged @ MLK + WP (lbs)	Removal (%)	Eff. Daily SS (ml/l/hr)	Eff. SS Event Max Average (ml/l/hr)	Average Daily Eff. Fecal Coliforms (#/100 ml)	Eff. TRC Daily Average (ug/l)	Daily Min/Max pH
January	No Inflow/No Disch.												
	Instant. Min/Max pH												ND
	Event/Daily Max									ND		ND	
	Monthly Total/Avg/GeoMean	0	0.0	ND	ND						ND		
February	6	1	0.44	ND	ND	55.0	6.0	89.1%	ND	ND	ND	ND	ND
	Instant. Min/Max pH												
	Event/Daily Max												
	Monthly Total/Avg/GeoMean	1	0.44	ND	0.0	55	6	89.1%	ND	ND	ND	ND	ND
March	15	1	9.13	1	5.45	7,005	3,074	56.1%	<0.1	<0.1	0	1,100	6.3/6.5
	Instant. Min/Max pH									<0.1	0	1,100	6.5/6.6
	Event/Daily Max									<0.1			
	Monthly Total/Avg/GeoMean	1	9.13	1	5.45	7,005	3,074	56.1%			0.0	1,100	
April	No Inflow/No Disch.												
	Instant. Min/Max pH												ND
	Event/Daily Max									ND		ND	
	Monthly Total/Avg/GeoMean	0	0.0	ND	ND						ND		
May	No Inflow/No Disch.												
	Instant. Min/Max pH												ND

Month	Day/Parameter	Inflow Event (#)	Inflow Volume (MG)	Discharge Event (#)	Discharge Volume (MGD)	Total Inf. TSS (lbs)	Total Eff. TSS Discharged @ MLK + WP (lbs)	Removal (%)	Eff. Daily SS (ml/l/hr)	Eff. SS Event Max Average (ml/l/hr)	Average Daily Eff. Fecal Coliforms (#/100 ml)	Eff. TRC Daily Average (ug/l)	Daily Min/Max pH
	Event/Daily Max									ND		ND	
	Monthly Total/Avg/GeoMean	0	0.0	ND	ND						ND		
June	No Inflow/No Disch.												
	Instant. Min/Max pH												ND
	Event/Daily Max									ND		ND	
	Monthly Total/Avg/GeoMean	0	0.0	ND	ND						ND		
July	No Inflow/No Disch.												
	Instant. Min/Max pH												ND
	Event/Daily Max									ND		ND	
	Monthly Total/Avg/GeoMean	0	0.0	ND	ND						ND		
August	No Inflow/No Disch.												
	Instant. Min/Max pH												ND
	Event/Daily Max									ND		ND	
	Monthly Total/Avg/GeoMean	0	0.0	ND	ND						ND		
September	No Inflow/No Disch.												
	Instant. Min/Max pH												ND
	Event/Daily Max									ND		ND	
	Monthly Total/Avg/GeoMean	0	0.0	ND	ND						ND		
October	No Inflow/No Disch.												
	Instant. Min/Max pH												ND
	Event/Daily Max									ND		ND	

Month	Day/Parameter	Inflow Event (#)	Inflow Volume (MG)	Discharge Event (#)	Discharge Volume (MGD)	Total Inf. TSS (lbs)	Total Eff. TSS Discharged @ MLK + WP (lbs)	Removal (%)	Eff. Daily SS (ml/l/hr)	Eff. SS Event Max Average (ml/l/hr)	Average Daily Eff. Fecal Coliforms (#/100 ml)	Eff. TRC Daily Average (ug/l)	Daily Min/Max pH
	Monthly Total/Avg/GeoMean	0	0.0	ND	ND						ND		
November	13	1	0.16	ND	ND	77	21	72.7%	ND				
	14	1	6.45	1	2.93	3228	1133	64.9%	<0.1	<0.1	3	36.0	6.1/6.5
	15	1	0.60	1	0.60	300	133	55.7%	<0.1	<0.1	0	36.0	6.1/6.5
	Instant. Min/Max pH												6.1/6.5
	Event/Daily Max									<0.1		36	
	Monthly Total/Avg/GeoMean	1	7.21	ND	3.53	3605	1287	64.3%			2	36	
December	7	1	1.64		0.00	1,641	217.00		ND				ND
	8	1	7.79	1	5.60	1,234	923.00		<0.1		>400	0	6.3/6.4
	9	1	0.41	1	0.41	226	75.00		0.20	0.20	>400	0	6.1/6.4
	Instant. Min/Max pH												6.1/6.4
	Event/Daily Max								0.2	0.2		0	
	Monthly Total/Avg/GeoMean	1	9.84	ND	6.0	3101	1215.0	60.8%			>400	0	
	Total	**4**	**26.62**	**3**	**15.00**	**13,767**	**5,532**						
	Inst. pH Min/Max												**6.1/6.6**
	Max (GEM, SS, TRC)									**<0.1**	**>6**	**1,100**	
	Annual Average							**59.8%**		**<0.1**		**13**	

Notes:
N/A= Not applicable
ND= No discharge
Red= NPDES permit exceedance

	Inflow Volume (MGD)	Discharge Volume (MGD)	Total TSS Inf. (lbs)	Total TSS Eff. (lbs)	Annual Avg. TSS Removal (%)	Max of Event Avg. SS (mL/L/lhr)	Annual Avg. SS (mL/L/hr)	Max Monthly Geomean Fecal Coliform Eff. (#/100 mL)	Annual Avg. of Monthly Geomean Fecal Coliform Eff. (#/100 ml)	Max of Daily Avg. TCR Eff. (ug/L)	Instantaneous Min/Max pH
Includes all events	26.6	15.00	13,767	5,532	59.8%	0.20	<0.12	>400	>7	1100	6.1/6.6