2003/2004 ANNUAL

COMBINED SEWER OVERFLOW REPORT

Department of Natural Resources and Parks
Wastewater Treatment Division

October 2004

King County

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Section 1 - Overview and Status of CSO Control Program

1.1 Introduction

This report is prepared and submitted to the Department of Ecology (Ecology) in accordance with the requirements established within the West Treatment Plant NPDES Permit, Number WA-002918-1 and in WAC 173-245-090. As outlined in the WAC, this report includes:

- An overview and status of King County Department of Natural Resources Wastewater Treatment Division's CSO Control Program.
- 2003/04 CSO volume and frequency information.
- The formal submission of the annual reports for the Alki (Appendix 1) and Carkeek
- (Appendix 2) CSO treatment plants.

1.2 Background

King County Wastewater Treatment Division (WTD) provides wholesale wastewater conveyance and treatment for flows from the City of Seattle and thirty-four other cities and sewer districts. Only the City of Seattle collection system contains combined sewers that collect both sanitary sewage and stormwater. Seattle's wastewater collection system conveys flow to County trunks and interceptors, which then convey flows to the County's West Treatment Plant located in Discovery Park. When medium to large storm events occur, flows may exceed the capacity of the collection system pipes, resulting in combined sewer overflows (CSOs) into Lake Washington, Lake Union, the Ship Canal, the Duwamish River, Elliott Bay and Puget Sound (Figure 1-1). CSOs are a recognized source of water pollution that can result in temporary increases in bacterial counts, aesthetic degradation of shorelines during CSO events, and an adverse effect on sediment quality at discharge points. CSOs may raise public health concerns in areas where there is potential for public contact. King County currently has 38 CSO locations (Figure 1.1).

Since the 1960s, King County has been conducting overflow control projects to improve water quality in the Seattle-King County area. The County first formalized its CSO control program with the development of its *1979 CSO Control Program (1979 Program).* The 1979 Program identified nine projects to control CSO events into freshwater areas (Lake Washington, Lake Union, and the Ship Canal).

In 1985, new requirements were introduced with the Washington State Water Pollution Control Act (RCW 90.48) requiring all municipalities with CSOs to develop plans for "...the greatest reasonable reduction at the earliest possible date." The County's *1986 Plan for Secondary Treatment Facilities and Combined Sewer Overflow Control (1986 Plan)* was intended to meet this requirement.

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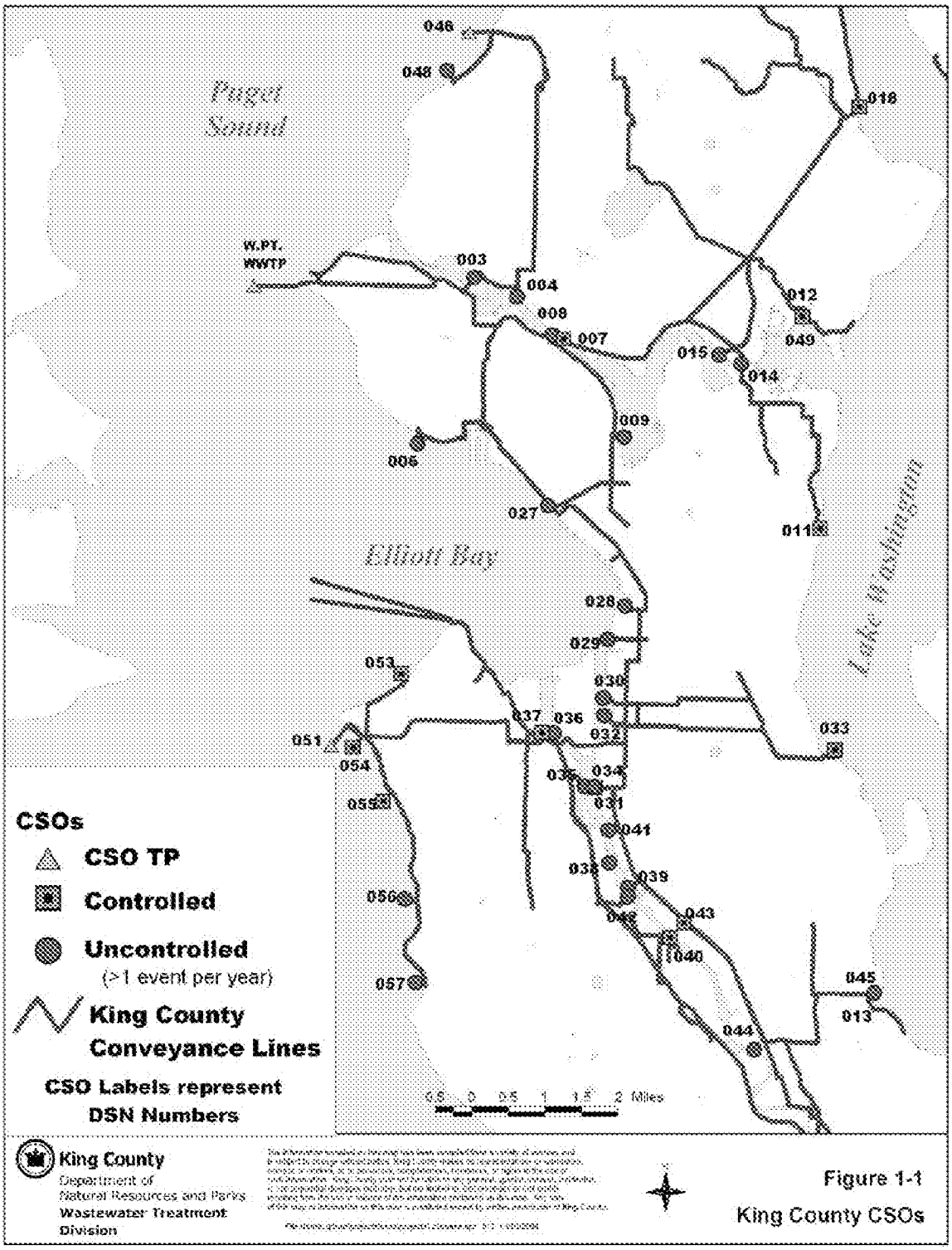
FIGURE 1-1 KING COUNTY CSOs



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Before the *1986 Plan* was implemented, new regulations were promulgated by Ecology. The new regulations (WAC 173-245-020) defined "greatest reasonable reduction" to mean, "control of each CSO such that an average of one untreated discharge may occur per year." The County worked with Ecology to develop an interim goal of 75 percent reduction of CSO volumes system wide by the end of 2005. The County's *Final 1988 Combined Sewer Overflow Control Plan (1988 Plan)* identified eleven CSO control projects designed to meet this interim goal. This interim goal was later withdrawn by Ecology, allowing the County to prioritize control projects for their protection of human health rather than volume reduction.

As part of the 1995 renewal process for the West Treatment Plant NPDES permit, King County prepared an update/amendment to the *1988 Plan*. The *1995 CSO Update* included an assessment of the effectiveness of CSO reduction efforts to date, a re-evaluation of priority for CSO sites, and identified 3 projects for completion within the 1995-2000 time frame.

In November 1999, the King County Council approved *The Regional Wastewater Services Plan (RWSP)*. The *RWSP* summarizes wastewater projects to be built up through 2030 to protect human health and the environment, serve population growth, and meet regulatory requirements. The *RWSP* includes the County's amended CSO Control Plan, outlining twenty-one projects to limit the County's remaining uncontrolled CSOs to an average of one untreated event per year at each CSO location by 2030 for a total cost of $566.6 million in 1998$. The *RWSP* also resulted in the removal of the *1988 Plan*'s interim goal of 75 percent reduction of CSO volumes by 2005.

An update of the *RWSP's* CSO Control Plan - the *Year 2000 CSO Control Plan Update* – was included in the June 2000 submission of the West Treatment Plant NPDES permit renewal application to Ecology. The *Year 2000 CSO Control Plan Update* documents King County's progress of its CSO control program, compliance with state and federal CSO control requirements as of 2000, and identified two large control projects – Denny Way and Henderson/MLK/Norfolk - for the next five year NPDES permit cycle.

As of August 2004, work is underway on the *Year 2005 CSO Control Plan Update*. The draft plan is expected to go to King County Council in August 2005 with a submission to WDOE in early 2006.

1.3 Status of CSO Control Projects

This section summarizes the past, present, and future efforts made by King County to comply with state CSO control requirements. Projects began in the late 1980's. Many of these earlier projects involved the separation of sewers, diversion of flows, and creating new tunnels. Most of the future projects, which are already planned up to the year 2030, involve construction of storage tanks and treatment facilities to manage combined and stormwater flows.

1.3.1 Completed CSO Control Projects

Tables 1-1 and 1-2 summarize CSO control and associated projects completed to date by King County.

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Table 1-1 Completed CSO Control Projects

Project	Description	Completion	Status
Diagonal Separation	Determined to be a City of Seattle Project	Early 1990s	Complete per City of Seattle
Ft. Lawton Tunnel	Parallel tunnel to West Treatment Plant providing greater transfer capacity	1991	Complete
CATAD	Computer control of flows to maximize storage in the pipelines	On going	Maintenance and improvement is on going. Anticipated completion in 2005/06 with upgrade of Interbay pump station and implementation of upgraded computer software
Hanford/Bayview/ Lander Separation & Storage	Joint City/County partial separation of the Lander and Hanford basins, and reactivation of Bayview tunnel.	1992	Remaining control will occur under RWSP projects in 2017 (Hanford), 2019 (Lander) and 2026 (Hanford at Rainier). Lander stormwater mgmt on going.
Carkeek Transfer/CSO Treatment	Flows up to 8.4 MGD from the Carkeek drainage basin are transferred to West Treatment Plant. Flows above 8.4 MGD are treated at the Carkeek CSO Plant.	Facilities on line in 1994, upgrades underway	The plant was found to receive more flow than anticipated. Final design for upgrading the pumping capacity to 9.2 MGD is near completion. Construction of improvements is estimated to be completed in 2004.
University Regulator/ Densmore Drain	Separation of Densmore & I-5 stormwater, as well as Greenlake drainage.	1994	Remaining control will occur under a RWSP project in 2015. Densmore stormwater mgmt on going.
Kingdome Industrial Area Storage & Separation	In 1994 a pipeline (used for storage) was laid in conjunction with Seattle and WashDOT street projects. In 1999, the Public Facilities District (PFD) completed 60% of the level 1 separation between Alaska Way and 3rd Ave. in conjunction with stadium construction	1994, 1999	Remaining control will occur under a RWSP project in 2026.
Harbor Pipeline	A pipeline conveys overflow from the Harbor regulator to the West Seattle Tunnel for storage.	1996 (activated in 2000/01)	Operational 2000/01
Alki Transfer/CSO Treatment	Flows up to 18.9 MGD from the Alki drainage basin are transferred to West Treatment Plant via the West Seattle Tunnel. Flows above 18.9 are treated at the Alki CSO plant.	1998	Additional CSO plant modifications were completed in 1999.
63rd Ave. Pump Station	The over flows diverted to West Seattle Tunnel or Alki plant	1998	Close to 1/yr. - Will monitor to check actual performance.

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Table 1-2 Completed Associated Projects

Project	Description	Completion	Status
Renton Sludge Force Main Decommissioning	Sludge was pumped to the Elliott Bay Interceptor to be conveyed to West Point Treatment Plant for processing until South Treatment Plant developed solids management capability; decommissioning decreased solids discharge from Interbay Pump Station at Denny during CSO events	1988	Complete
Denny Sediment Cap	Pilot sediment remediation project (Ten year data review of remediation project is due in early 2005)	1990	Remediation of remaining area of contamination is scheduled following overflow control. Overflow control and remediation is expected to be completed in 2005.
Ballinger and York pump stations	Construction of these pump stations allows the "diversion" of flows to and from the West Point collection system. Flows are currently diverted away from W. Pt during the wet season.	York P.S. completed in 1992, Ballinger P.S. completed in 1993	complete
West Point treatment plant expansion	Increased plant hydraulic capacity from 325 MGD to 440 MGD. Enables the conveyance and treatment of more flow from the combined sewer system.	1995	complete
Allentown Diversion/Southern Transfer	Designed to offset addition of Alki flows to Elliott Bay Interceptor. Side-benefit of significant volume reduction at Norfolk	1995	Complete
CSO Monitoring Program: NPDES Overflow & Sediments Sediment Baseline	Initial characterization monitoring to identify project priorities; sediment characterization to identify clean up needs	1995, 1997	Complete
CSO Water Quality Assessment of the Duwamish River & Elliott Bay	Complex study to determine existing environment and the relative contribution of CSO to pollution.	1999	Complete
North Creek pump station	Diverts flow away from the West Point to the South Plant collection system during wet weather	1999	Complete
Carkeek Overflow Reduction Study	Increase pump capacity from 8.4 to 9.2 MGD and improved operational controls	2003	Reliability and dechlorination improvements by 2006
Norfolk Sediment Remediation (1)	Source Control, dredging and capping	1999	Follow-up 5 yr. monitoring completed end of 2004.
Duwamish/Diagonal Sediment Remediation (1)	Source Control, dredging and capping	2004	

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Notes for Table 1-2
1) This project was done under the Elliott Bay/Duwamish Restoration Panel (EBDRP) under the consent decree settling the 1990 litigation by National Oceanic and Atmospheric Administration (NOAA) against the City of Seattle and King County (then Metro) for natural resource damages attributed to CSOs and storm drains.

1.3.2 Current CSO Projects

In the 2000 CSO Plan Update, two continuing projects for CSO control were identified, as constituting the County's control activities for the next NPDES permit cycle (approximately 5 years). They were:

- The Denny/Lake Union CSO Project
- The Henderson/Martin Luther King Jr. Way/Norfolk CSO Control Project

The Denny/Lake Union CSO project will reduce CSO discharges from approximately 50 untreated discharges at the Denny CSO per year on average to one untreated discharge per year on average. City and County CSOs to Lake Union (east and south sides) will also be controlled. At project completion, it is predicted there will be approximately 14 to 20 treated discharges per year through a new outfall at the Denny Regulator. This project's expected completion date is spring 2005.

The Henderson/Martin Luther King Jr. Way/Norfolk project aims to reduce CSOs at those three locations to one untreated discharge per year on average. Norfolk predicts to have approximately four treated discharges per year. This project is expected to be complete by March 2005.

1.3.2.1 Denny Way CSO Control Project

The *1986 Plan* identified a storage and treatment approach to controlling Denny Way overflows. In the *1988 Plan*, the Denny Way project was changed to include partial separation of 584 acres in the Denny/Lake Union and Denny Local drainage basins. Predesign for the project was scheduled to begin in 1993 with construction ending in 1999.

In late 1991, the Seattle Drainage and Wastewater Utility (now Seattle Public Utilities) requested that Metro (now King County Wastewater Treatment Division) participate in a joint analysis of alternatives to control CSO discharges into Lake Union from Seattle's system and into Elliott Bay from the County's system at the Denny Way regulator station. In 1992, a joint Denny Way/Lake Union CSO Control Project was submitted as a candidate for Federal Infrastructure Grant funds. During 1994, the City of Seattle and King County developed the details of a project to be jointly implemented and EPA awarded a $35 million Infrastructure Grant to the project.

The City completed construction of Phase 1 - a project to increase wet-weather capacity in the east and south Lake Union areas - in 1997. The City's Phase 2 project will connect their Phase 1 facilities to the County's Phase 3 and 4 facilities once these facilities are completed. Phase 3 (storage) and 4 (treatment) of the County's project were combined during the preliminary design phase so that at project completion, the CSOs to Elliott Bay and Lake Union in the project area

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will be controlled in compliance with state law. The Phase 3/4 project will control Lake Union and Denny Way CSOs by: (1) storing CSO flows during small to moderate storms and transferring them to the West Treatment Plant after the storm subsides; and (2) providing on-site treatment at the Elliott West site with discharge of treated flows through a new outfall during heavy rain conditions. This will reduce untreated discharges to Elliott Bay at the Denny CSO from approximately 50/yr to 1/yr. Facilities include:

- A 6,200 ft. long, 14'8" diameter tunnel under Mercer Street between Dexter Avenue North and Elliott Avenue West (for CSO storage, primary clarification and conveyance)
- CSO control facilities at the Elliott West site (with floatable removal, disinfection, and dechlorination)
- Piping and regulators to convey CSO flows from the existing County sewer system to the new facilities
- An outfall into Elliott Bay at Myrtle Edwards Park (to discharge treated flows from the Elliott West facilities)
- An extension of the existing outfall at the Denny regulator at Myrtle Edwards Park (to discharge untreated CSO flows, expected to occur about once per year)

A general milestone schedule for project implementation is shown below:

- Preliminary Design began — Spring 1997
- Facilities Plan approved by Ecology — Fall 1998
- Final Design began — Fall 1998
- Construction began — 2000
- Construction complete — Spring 2005

A joint final State Environmental Policy Act (SEPA) Environmental Impact Statement (EIS)/National Environmental Policy Act (NEPA) Environmental Assessment for Phases 2 and 3/4 was issued in July 1998. Construction of the project is underway and is scheduled to be completed by spring 2005. In 2002, construction was underway on all five construction contracts needed to implement the project. The Mercer Street Tunnel contract was substantially completed in fall 2002, including construction of the 6,200 ft. tunnel under Mercer Street and three tunnels under the railroad tracks west of the pump station site. The Marine Outfalls contract was also substantially complete as of 2002. This contract included construction of two new outfalls in Elliott Bay. Construction under the Elliott West Pipelines contract was substantially completed as of fall 2003 (excluding landscaping and restoration). The pipelines built under this contract will convey CSO flows to the new tunnel and treated flows to the new submerged outfall.

In late 2002, work began on the Elliott West CSO Control Facility and the South Lake Union Pipelines contracts. The pipelines contract constructed three new tunnels that connect the existing collection system to the new CSO tunnel. The CSO Facility is being built at the downstream end of the Mercer Street Tunnel. Depending on the mode of operation. It will pump stored flows to the Elliott Bay Interceptor for treatment at West Point, or pump treated CSO flows through the new outfall to Elliott Bay. It is designed to operate automatically, with minimal staffing.

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Construction of the South Lake Union Pipelines contract was scheduled to be complete in late 2003. However, due to unforeseen ground conditions encountered in construction of the shafts and tunnels, completion of this contract has been recently completed. Construction of the Elliott West CSO Facility has been delayed; commissioning is expected to begin in early 2005.

Construction of the entire project is expected to be complete in March 2005, with the commissioning phase complete by late spring 2005.

1.3.2.2 Henderson/Martin Luther King Jr. Way/Norfolk CSO Control Project

At the time of adoption of the *1988 Plan*, the County believed that all King County CSOs into Lake Washington, including the discharge from the Henderson Street pump station and Martin Luther King Jr. Way overflow, had been controlled to the one event per year level. However, subsequent monitoring data indicated that overflows occurred more frequently than once per year at these locations.

As a result, in 1995 the County developed an engineering evaluation of the basin tributary to the Henderson/Martin Luther King Jr. Way CSOs to determine the sources and causes of the overflows at these locations, and identified interim and permanent corrective measures to control overflows. The evaluation also considered the impact of these measures on the downstream Norfolk regulator station. Based on this evaluation, the recommended alternative was to construct a 3.2 MG storage tank/CSO treatment facility near the Norfolk regulator station along with associated conveyance and pumping improvements.

During the 1997 predesign evaluation of alternatives, it was determined that a storage/treatment tunnel was more cost effective than the storage/treatment tank alternative. In addition, the storage tunnel had a conveyance system benefit, lower operation and maintenance, less adverse community impacts and was consistent with the approach being used on the Denny project. Therefore, the storage/treatment tunnel emerged from predesign as the preferred alternative. A 3,105 foot, 14'8" diameter storage/treatment tunnel is being built to achieve the one untreated event per year on average level of control.

The project elements and construction schedule are as follows:

Construction	**Began**	**Complete**
Henderson Pump Station	November 2001	June 2004
Tunnel and Pipelines	July 2002	March 2005

The project will be completed in segments. The project begins near the Atlantic City boat launch at Seward Park Avenue South and South Henderson Street and terminates at the intersection of South Norfolk Street and East Marginal Way South. Construction of the pipeline is a combination of underground tunneling and open-cut trenches. The pump station began construction in November 2001 and is now complete. The tunnel/pipeline construction has been underway since July 2002 and is 88% complete as of August 2004.

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1.3.2.3 Carkeek Overflow Reduction Study

The Carkeek Overflow Reduction Study was initiated to investigate the causes of higher than anticipated flows to the Carkeek CSO treatment plant. This study supplements the work completed in the Facility Plan for the Carkeek Transfer/CSO Facilities Project issued for the Carkeek Facility in 1988. The study was a joint project with the City of Seattle (the local service provider in that area) and was completed in October 2001. The Carkeek study is associated with, but not a direct part of, the CSO Control Plan.

The Carkeek CSO Treatment Plant (on-line at the end of 1994 and fully operational by the following wet season) was receiving more influent flow than had been previously identified and planned. This placed the County in violation of the NPDES permit 5-year average volume limit of 14 million gallons per year of treated discharge. The study found three main reasons for the higher flows than originally predicted:

- Flow data used for modeling the design of the Carkeek transfer and CSO plant was taken (mid-1980s) in what was, in retrospect, unusually dry years.
- Construction in the conveyance system prevented some higher flows from reaching the Carkeek facility during the planning and predesign phases. These flows are now captured as a result of system improvements by Seattle and King County and are sent to the Carkeek Pump Station and Carkeek CSO Treatment Plant.
- The pumps were not performing to their specified ratings and thus the facility was not pumping the full 8.4 million gallons per day (MGD) design capacity.

Thus, the service area now sends more flow to the Carkeek Facility than was originally expected. The pumps transferring the flow to West Treatment Plant, were not designed to handle all of the area's base flow.

King County has determined that up to 9.2 MGD is the appropriate base flow transfer rate (2.25 x Average Wet Weather Flow [AWWF]). With this new pumping rate and increased automation of the treatment plant pumping startup, it is predicted that treated discharges could occur up to 10 times per year (maximum 5-year average), and that the volume discharged per year could be up to 46 million gallons per year (MGY), maximum 5-year average. Ecology has modified the Carkeek NPDES permit limits to the above limits. Since continuous pumping at this rate would increase overflows to the Ship Canal, the upgrade to the Carkeek facility also includes level monitoring and controls at the Ship Canal overflow weir that provides pump throttling capacity at the Carkeek pump station. By providing pump throttling capacity, the Carkeek pumping rate can be lowered based on pre-set criteria resulting from hydraulic modeling, so that no additional overflows at the Ship Canal occur because of the increased pumping flow from Carkeek from 8.4 MGD to 9.2 MGD. This throttling capability was completed in 2003.

King County initiated a new project in October 2003 to implement the remaining recommendations from the Overflow Reduction Study. Instrumentation has been installed at the 11th Avenue weir, and a pump control program has been developed to operate the pumps at up to 9.2 MGD. Repairs of the raw sewage pumps at Carkeek are currently planned to improve their reliability of pumping at 9.2 MGD. These repairs are scheduled to occur in two phases during the

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dry season of 2006. Also, work to add in dechlorination will be completed by January 2006. This will be in time to meet the NPDES final permit limits, which require bacterial limits and a reduced chlorine concentrations starting January 1, 2006.

1.3.3 Future RWSP Projects

Table 1-3 lists all the CSO projects that comprise the CSO element of the RWSP. The table includes a brief description of the facilities to be constructed, and a projected completion date. King County reserves the option to modify this schedule.

Table 1-3 RWSP CSO Control Projects

CSO Project	Project Description	Year Controlled
S. Magnolia	1.3 MG storage tank	2010
SW Alaska St.	0.7 MG storage tank	2010
Murray	0.8 MG storage	2010
Barton	Pump station upgrade	2011
North Beach	Storage tank and pump station upgrade	2011
Univ+Montlake	7.5 MG storage	2015
Hanford	3.3 MG storage/treatment tank	2017
West Treatment Plant Improvements	Primary/secondary enhancements	2018
Lander	1.5 MG storage/treatment @ Hanford	2019
Michigan	2.2 MG storage/treatment tank	2022
Brandon	0.8 MG storage/treatment tank	2022
Chelan	4 MG storage tank	2024
Connecticut	2.1 MG storage/treatment tank	2026
King St.	Conveyance to Connecticut treatment	2026
Hanford@Rainier	0.6 MG storage tank	2026
8th Ave S	1.0 MG storage tank	2027
West Michigan	Conveyance upgrade	2027
Terminal 115	0.5 MG storage tank	2027
3rd Ave. W.	5.5 MG storage tank	2029
Ballard	1.0 MG storage tank (40% King County)	2029
11th Ave. West	2.0 MG storage tank	2030

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1.3.4 On-going Program Elements

This section discusses three ongoing program elements: the CATAD system, the Lander and Densmore Stormwater Management Program, and the CSO Notification Program.

1.3.4.1 CATAD Modifications

The Computer Augmented Treatment and Disposal System (CATAD) controls the West Point Treatment Plant collection system. Control system improvements were developed and brought online in 1992 to improve utilization of storage capacity in existing sewers. The control system improvements included three components:

- Raising storage levels behind regulator stations
- Lowering the wet well level at Interbay Pumping Station when rainfall was detected upstream, moving flow to West Treatment Plant sooner, vacating valuable storage space in the interceptor
- Incorporating an optimization program (Predictive Control), which monitors rainfall and conditions in the major trunks and interceptors, predicts inflows to the sewer system, and optimizes the regulation of flow through the regulators to minimize CSOs.

These modifications to the system were estimated to reduce CSO volumes by 150 MG per year when all were operating as designed. All three elements of the project were developed and underwent testing to assure reliability and effectiveness. However, problems at the Interbay Pump Station and problems with the computer SCADA system hardware at the West Point Treatment Plant have prevented the use of the second and third components (pumping down the Interbay wet well and use of the Predictive Control program).

It has been determined that the control program for the existing pumps and wet well configuration at the Interbay pump station can not be modified in a manner that will enable the wet well to be pumped down safely and reliably in advance of a storm. Air entrainment and cavitation, that can damage the pumps and limit pumping capacity, result when the wet well level is operated below the anti-vortexing tubes. A strategy of operating the wet well just above the anti-vortexing tubes has been proposed and is being tested. Such a strategy will provide most of the benefit that the CSO drawdown mode would have accomplished, because the peak flow rate is attained just 0.5 feet higher than it was proposed for CSO mode. The county is investigating the timing needs for upgrading the pumps and drives.

King County replaced the SCADA computer hardware and software at West Point that monitors and displays the off-site station information. The new system is still being tested and modified as necessary. This upgrade will bolster the reliability of data acquisition and supervisory control of the regulator and pump stations. It will also provide adequate hardware for the CSO Predictive Control computer model to be updated so that it accurately represents the West Section conveyance system in order to optimize control of the collection system. Model updates and calibration will occur in 2004 – 2005, with a new updated control program expected in 2006-2009.

1.3.4.2 Lander and Densmore Stormwater Management Program

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As a result of County sewer separation projects creating stormwater-only discharges, King County and the City of Seattle now jointly conduct a stormwater management program in the Lander and Densmore drainage basins under the NPDES municipal stormwater permit. This is an on-going program that includes the following elements: source control, baseline sampling of stormwater discharges, and inspections. The maintenance of the stormwater system, the development of compliance schedules, and enforcement actions are to be managed by the City of Seattle as specified in a local agreement between the City of Seattle and King County.

The Lander diversion gate is operated by the SCADA system at West Point. Due to an upgrade of the SCADA control system in May 2004, the stormwater diversion gate has not been in operation. There is also a project to replace the diversion gate in the near future since the existing gate is corroding.

The Densmore drain system runs from Green Lake to Lake Union with a discharge just west of the I-5 bridge. It began running in 1995, but has encountered occasional problems due to surges, pressure buildup, and pumping capacity. This has prevented the ability to operate the third pump (19 mgd) during storm events, thereby increasing the volume of overflows at primarily the University Regulator outfall. In addition, the Densmore storm water pump station (45 MGD), is currently out of service due to failure of the electrical cable and cable support system. Moisture entered the motors of pumps #3 (January) and #2 (April). Pump #1 has an electrical problem with its motor contacts in MCC and has been out of service since June 2004. There is currently a work order contract to address the cable support and cable replacement, and plans to have the MCC issue resolved under the MCC upgrade/replacement project. It is estimated that the pump station will be brought back on line by Dec. 2004 and a hydraulic fix to the overall system by late 2005.

1.3.4.3 CSO Notification Program

In order to meet state and federal requirements for public notification and to provide information to the community regarding the possible health impacts of CSOs, King County Department of Natural Resources & Parks (KCDNR&P), the Seattle-King County Health Department (SKCHD), and the City of Seattle Public Utilities (SPU) have collaborated on the development of a CSO Public Notification/Posting Program. Ecology was briefed on the program and accepted its development and components. This program includes posting warning signs at King County and City of Seattle CSOs, an information phone number for the public to contact the Seattle-King County Health Department (SKCHD) on questions concerning CSOs, a brochure, website, and other outreach efforts.

The CSO signs include a graphic and explanation of what a CSO is, the SKCHD information phone number, as well as a CSO number assigned to each site, which corresponds to its NPDES discharge serial number. A routine inspection of the signs was performed in the last year, and any signs that were vandalized or missing were replaced.

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Due to the low volume of calls (only ten in the first six months, half of which were unrelated to CSOs) to the CSO Notification Information line to date, it was instead decided to employ a message recorder that would be checked routinely.

1.3.4.4 CSO Management Program

As part of the annual review of the data from the CSO program, two projects were identified and started in 2004 and the ongoing assessments of the Duwamish PS has resulted in evaluating different operational strategies.

With an average of 27 overflows per year, the Brandon CSO has the distinction of the greatest number of overflows per year of any CSO. A review of the overflow data showed Brandon overflowed even though there was capacity in the Elliot Bay Interceptor, EBI. The reason for this is the result of having only a 12 inch diameter pipe leading from the regulator to the EBI. The rationale for choosing this size pipe was to ensure that no one drainage basin would be allowed to fill the EBI. A project has been initiated in 2004 with an expected completion date of Aug. 2005 which will replace the 12 inch pipe with a 30 to 36 inch pipe. This should significantly reduce the frequency of overflows.

The second project was initiated when it was observed that Montlake's frequency had risen from a one per year frequency for the years 1999 -2002 to eleven and six for the 2002/03 and 2003/04 years respectively. An investigation of the line showed that the Montlake siphon was obstructed with large rocks and debris. A cleaning effort is currently underway with an expected completion date by November 2004.

Four incidents of street flooding immediately downstream of the Duwamish pump station, (PS) occurred between the time the Alki flows began entering the EBI in 1998 and 2001. Changes in the pump station's operation were instituted to prevent the backups. Ongoing review raised concerns that existing monitors were not accurately capturing the resulting system changes. Investigation indicated that computerized signals from the monitors had been lost and that values of "no overflow" being reported actually meant "no data". The replacement of the SCADA computer hardware and software at West Point (see 1.3.4.1 CATAD Modifications), should correct this, but portable monitors were placed to help the county better characterize conditions at the pump station and siphons.

Starting in 2004-2005, KC will be evaluating a slightly different strategy for running the West Seattle Pump Station (WSPS) to address the impacts at the Duwamish PS. The county had taken advantage of the opportunity presented by the tunnel's capacity to send less flow to the Alki CSO treatment plant and more to West Point than was to occur under its original design. It appears this inadvertently adversely impacted the Duwamish Pump Station – possibly putting this formerly controlled CSO out of control. To remedy this, the flow split between the Alki plant and the tunnel will be adjusted back closer to its original design to operate the CSO treatment plant more often than of late, but still within permit limits. The new strategy will be based on backing down the WSPS when untreated CSOs start to occur at Duwamish PS, and storing those flows in the tunnel. This will be an ongoing project.

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Section 2 – 2003/04 CSO Volume and Frequency Summary

2.1 Introduction

The County's CATAD System monitors the volume and frequency of CSOs at King County regulator and pump stations in the West Treatment Plant system. Figure 1-1, on page 2, shows the location of existing permitted King County CSO discharges and the discharge serial number, (DSN) used in Tables 2-2 & 2-3. The area south of the Ship Canal is referred to as the Southern Service Area, and the area north of the Ship Canal (including the Montlake and Dexter regulator stations) is referred to as the Northern Service Area. The County deploys portable flowmeters at the following eight CSO locations not currently monitored by CATAD: 11th Ave. NW, Alaska Street (SW), Hanford at Rainier, Henderson Street, Magnolia (South), Martin Luther King Jr. Way, North Beach Pump Station (PS), and Terminal 115. The portable flow meter at Henderson Street was removed at the end of March due to construction of the Henderson/Martin Luther King Jr. Way CSO project. Upon completion of software programming, overflows from the upgraded Henderson Pump Station will be monitored in CATAD. In 2004, portable flowmeters were also placed at the forebay and discharge sides of the Duwamish siphon overflows to supplement monitoring of the Duwamish Pump Station/Siphon overflows.

2.2 Rainfall

As shown on Table 2-1, rainfall measured by county rain gauges at regulator and pump stations for the 2003/04 year averaged 29.10 inches. This is 13 percent lower than the baseline average of 33.5 inches per year. [*Please note that starting with this year's annual report, the baseline average rainfall value is 33.5 inches per year, which is the 35 year (1965-2003) average for the Seattle area. In previous years' reports, the baseline number used was 37 inches per year, the long term average rainfall measured at SeaTac Airport. As the Annual Report has been and currently uses rain gauges located in the Seattle area for Table & Figure 2-1, it was decided to use these rain gauges to derive the "average" annual rainfall amount for comparative purposes.*]

Table 2-1 2003/2004 Rainfall Data

2003/2004 Rainfall at Pump and Regulator Stations (in inches)													
Station	Jun-03	Jul-03	Aug-03	Sep-03	Oct-03	Nov-03	Dec-03	Jan-04	Feb-04	Mar-04	Apr-04	May-04	2003/04 Total
Ballard	0.52	0	0.24	0.53	6.38	4.87	3.99	5.54	1.79	1.65	0.32	1.52	27.35
Denny Local	0.72	0.04	0.23	0.45	7.07	5.75	3.82	5.65	1.62	1.05	0.25	0.93	27.58
Denny Way Lake Union	0.63	0	0.24	0.41	6.46	5.24	3.62	5.19	1.8	1.75	0.48	2.02	27.84
Kenmore	0.42	0	0.27	0.71	6.8	5.69	3.79	5.43	2.04	1.75	0.61	1.33	28.84
King Street	0.44	0	0.23	0.42	1.79	5.98	3.43	6.45	1.88	1.93	0.32	1.95	24.82
Marginal Way, E.	0.42	0.01	0.24	0.91	6.74	5.71	3.6	5.28	2.11	2	0.35	1.07	28.44
Matthews Park	0.81	0	0.31	1.47	7.03	5.99	4.05	6.62	2.29	1.83	0.74	1.46	32.6
Pine Street, E.	0.66	0	0.32	0.63	8.45	5.14	3.68	5.64	2.12	1.98	0.5	2.52	31.64
Rainier Avenue	0.41	0	0.31	0.69	7.44	6.27	3.96	6.66	2.29	2.24	0.39	1.16	31.82
University	0.8	0	0.25	0.79	7.48	5.75	4.49	5.79	2.18	2.05	0.31	0.15	30.04
Average	0.58	0.01	0.26	0.70	6.56	5.64	3.84	5.83	2.01	1.82	0.43	1.41	29.10

*Notes for cells in yellow:
1. Denny Way Local RS and University RS rain gauges were not working properly in May 2004.
2. New SCADA system was brought online in May 2004 and some data was lost during the transition.
3. King Street RS rain gauge was not working properly in Oct. 2003.

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2.3 CSO Volumes

The total conveyance system overflow volume for 2003/04 was 1258 (MG), compared to the 1981-83 baseline of 2339 MG. The monthly numbers are shown in Table 2-2. The total CSO volume for 2003/04 represents a 54 percent total volume reduction over baseline conditions.

Figure 2-1 illustrates the progress King County has made in CSO volume reduction along with total annual rainfall over time. While a somewhat reasonable relationship between total rainfall and total CSO volume can be computed (R^2=0.41), because of system improvements over time, a better relationship is computed using just the last ten years (R^2 =0.72). Even with this relationship large and/or intense storms can dramatically impact the volume of combine sewage overflow. For example, one thing to notice in this graph is the last two years of data. While very similar total rainfall values (28.1 and 29.1 inches) fell, the CSO volume this year was more than twice that of two years ago (1258 MG this year vs. 548 MG two years ago). A large part of this year's high overflow volume was due to two larger than normal storm events (a once-per-year storm is one greater than 2.4 inches of rain).

The fifth biggest and seventh most intense rainstorm of the last 25 years started on October 20th with downtown rainfall totaling 3.7 inches. This caused a total CSO volume of 557 MG. The sewer system filled up quickly because the rain fell over a relatively short period of time (33 hours). Comparing this storm to a storm of similar rainfall in March 1997 (3.6 inches in 70 hours, resulted in 313 MG of CSO), the 2003 storm's higher intensity is the primary reason why the CSO volume of the 2003 storm was significantly greater than the 1997 storm. This single storm accounted for about 45% of this year's CSO volume. In addition to the October storm, November 17-19 had the ninth largest total volume storm of the last 25 years (3.08 inches). Its smaller volume and average intensity resulted in 301 MG of CSO, which constituted almost 25% of this year's CSO volume. Combining the CSOs of the two greater than once per year storms accounted for approximately 70% of the total volume in a below average rainfall year.

2.4 CSO Event Frequency

Table 2-3 contains the monthly CSO frequencies and comparisons to baseline conditions for each station. There were a total of 161 CSO events, of which 117 were from the Southern Service Area and 44 were from the Northern Service Area. A comparison of these figures to last year's data (157 events - 121 South and 36 North) again shows that this year's high CSO volume was a function of the two storms - not of changes to the system.

The figure for total CSO events represents a 63 percent reduction in frequency over the 1981/83 Baseline period figure of 431 overflows.

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Table 2-2 2003/04 CSO VOLUME SUMMARY

(in million gallons)

Station	DSN	Service Area	Jun-03	Jul-03	Aug-03	Sep-03	Oct-03	Nov-03	Dec-03	Jan-04 (4)	Feb-04 (4)	Mar-04	Apr-04	May-04 (4)	2003/04 Total (MG)	1983 Baseline (MG) (2)
8th Ave./W. Marginal Way	040	South	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	**<0.01**	8
Brandon St.	041	South	<0.01	<0.01	<0.01	0.06	22.35	13.21	2.09	12.62	0.24	0.3	<0.01	0.49	**51.36**	64
Chelan	036	South	<0.01	<0.01	<0.01	<0.01	2.49	1.25	<0.01	0.19	<0.01	<0.01	<0.01	<0.01	**3.93**	61
Connecticut	029	South	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	**<0.01**	90
Connecticut			*<0.01*	*<0.01*	*<0.01*	*<0.01*	*<0.01*	*<0.01*	*<0.01*	*<0.01*	*<0.01*	*<0.01*	*<0.01*	*<0.01*	***<0.01***	
Kingdome			*NM*	*NM*	*NM*	*NM*	*NM*	*NM*	*NM*	*NM*	*NM*	*NM*	*NM*	*NM*	***NM***	
Denny Way	027	South	<0.01	<0.01	<0.01	<0.01	141.44	117.11	6.1	131.72	13.29	14.14	<0.01	5.41	**429.21**	502
Denny Way Lake Union			*<0.01*	*<0.01*	*<0.01*	*<0.01*	*63.97*	*48.24*	*4.27*	*58.58*	*6.3*	*3.98*	*<0.01*	*2.71*	***188.05***	
Denny Way Local			*<0.01*	*<0.01*	*<0.01*	*<0.01*	*29.24*	*18.28*	*0.68*	*15.81*	*1.05*	*0.97*	*<0.01*	*0.89*	***66.92***	
Interbay			*<0.01*	*<0.01*	*<0.01*	*<0.01*	*48.23*	*50.59*	*1.15*	*57.33*	*5.94*	*9.19*	*<0.01*	*1.81*	***174.24***	
Duwamish P.S.	034	South	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	**<0.01**	<1
Hanford	031/2	South	<0.01	<0.01	<0.01	<0.01	15.71	26.8	0.77	47.14	3.19	1.31	<0.01	2.44	**97.36**	644
Hanford #1 (Hanford @ Rainier) (1)			*<0.01*	*<0.01*	*<0.01*	*<0.01*	*15.71*	*10.77*	*<0.01*	*9.1*	*<0.01*	*<0.01*	*<0.01*	*0.71*	***36.29***	
Hanford #2			*<0.01*	*<0.01*	*<0.01*	*<0.01*	*<0.01*	*16.03*	*0.77*	*38.04*	*3.19*	*1.31*	*<0.01*	*1.73*	***61.07***	
Harbor Ave.	037	South	<0.01	<0.01	<0.01	<0.01	8.46	4.49	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	**12.95**	36
Henderson (1)	045	South	<0.01	<0.01	<0.01	0.01	4.7	<0.01	<0.01	<0.01	<0.01	<0.01	NM	NM	**4.71**	15
King Street	028	South	<0.01	<0.01	<0.01	<0.01	12.93	8.89	0.3	7.12	0.37	0.34	<0.01	1.17	**31.12**	55
Lander II St.	030	South	<0.01	<0.01	<0.01	<0.01	180.68	34.94	<0.01	20.96	0.01	0.1	<0.01	<0.01	**236.69**	143
Magnolia, S. (1)	006	South	<0.01	<0.01	<0.01	0.22	20.39	14.93	3.19	6.63	0.382	<0.01	<0.01	<0.01	**45.742**	14
Marginal, E.	043	South	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	**<0.01**	<1
Michigan St.	039	South	<0.01	<0.01	<0.01	<0.01	30.33	17.85	<0.01	9.63	<0.01	0.03	<0.01	<0.01	**57.84**	190
Michigan, W.	042	South	<0.01	<0.01	<0.01	<0.01	0.81	0.71	<0.01	0.32	<0.01	<0.01	<0.01	<0.01	**1.84**	2
MLK Jr. Way (1)	013	South	NM	NM	NM	NM	25.48	20.71	<0.01	10.7	<0.01	<0.01	<0.01	<0.01	**56.89**	60
Norfolk St.	044	South	<0.01	<0.01	<0.01	<0.01	0.26	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	**0.26**	39
Rainier Ave.	033	South	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	**<0.01**	<1
Terminal 115 (1)	038	South	<0.01	<0.01	<0.01	<0.01	2.58	1.95	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	**4.53**	2
11th Ave. NW (1)	004	North	<0.01	<0.01	<0.01	<0.01	4.21	2.2	<0.01	0.26	<0.01	<0.01	<0.01	0.035	**6.705**	
30th Ave. NE	049	North	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	**<0.01**	<1
3rd Ave. W.	008	North	<0.01	<0.01	<0.01	<0.01	1.21	0.1	<0.01	0.12	<0.01	<0.01	<0.01	<0.01	**1.43**	106
Ballard	003	North	<0.01	<0.01	<0.01	<0.01	0.64	0.22	<0.01	0.01	<0.01	<0.01	<0.01	<0.01	**0.87**	95
Belvoir	012	North	<0.01	<0.01	<0.01	<0.01	0.32	0.79	<0.01	0.2	<0.01	<0.01	0.03	<0.01	**1.34**	<1
Canal St.	007	North	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	**<0.01**	1
Dexter	009	North	<0.01	<0.01	<0.01	<0.01	24.24	7.2	0.36	0.14	<0.01	0.04	<0.01	<0.01	**31.98**	24
Matthews Park	018	North	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	**<0.01**	<1
Montlake	014	North	<0.01	<0.01	<0.01	<0.01	37.11	26.46	<0.01	6.77	<0.01	<0.01	<0.01	0.3	**70.64**	32
North Beach (1)	048	North	<0.01	<0.01	<0.01	0.13	4.7	0.03	0.01	1.1	<0.01	<0.01	<0.01	<0.01	**5.97**	6
Pine, E St.	011	North	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	**<0.01**	<1
University	015	North	<0.01	<0.01	<0.01	<0.01	61.62	28.93	<0.01	4.45	<0.01	<0.01	<0.01	<0.01	**95**	126
53rd Ave. SW	052	Alki	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	**<0.01**	<1
63rd Ave. PS	054	Alki	<0.01	<0.01	<0.01	<0.01	1.23	0.24	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	**1.47**	10
Alaska St. SW (1)	055	Alki	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	**<0.01**	<1
Barton	057	Alki	<0.01	<0.01	<0.01	<0.01	2.07	0.3	0.02	0.09	<0.01	<0.01	<0.01	<0.01	**2.48**	8
Murray	056	Alki	<0.01	<0.01	<0.01	<0.01	3.01	2.19	0.28	0.16	<0.01	<0.01	<0.01	0.07	**5.71**	6
TOTAL			**0**	**0**	**0**	**0.42**	**608.97**	**331.5**	**13.12**	**260.33**	**17.482**	**16.26**	**0.03**	**9.915**	**1258.027**	**2339**
CSO PLANTS																
Alki Plant	051	Alki					25.4	11.5		8.6					**45.5**	108 (3)
Carkeek Plant	046	North					11.3	11.86		4.03					**27.19**	14 (3)
West Point							118.72	94.09	11.89	139.41	2.95	2.1	7.05		**376.21**	
**Notes listed on next page*																

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* Notes for CSO Volume table
(1) Portable flow meters; Not currently monitored by SCADA; NM indicates that the site was not monitored.
Some data loss was experienced at portable flow meter sites during the monitoring period.
(2) Baseline for both CSO frequency and volumes have been revised since the 1988 final CSO Plan due to improvements made to the computer modeling system that provided more accurate projections on historical and future conditions
(3) NPDES Permit Limit
(4) SCADA computers failed on 1/31/04-2/2/04 resulting in data loss. Data loss also occurred in May 2004 due to transition to a new SCADA system.
(5) Belvoir overflow on 4/27/04 was likely caused by a loss of instrument air due to a contractor working at the station.

FIGURE 2-1 ANNUAL CSO VOLUME VS TOTAL RAINFALL

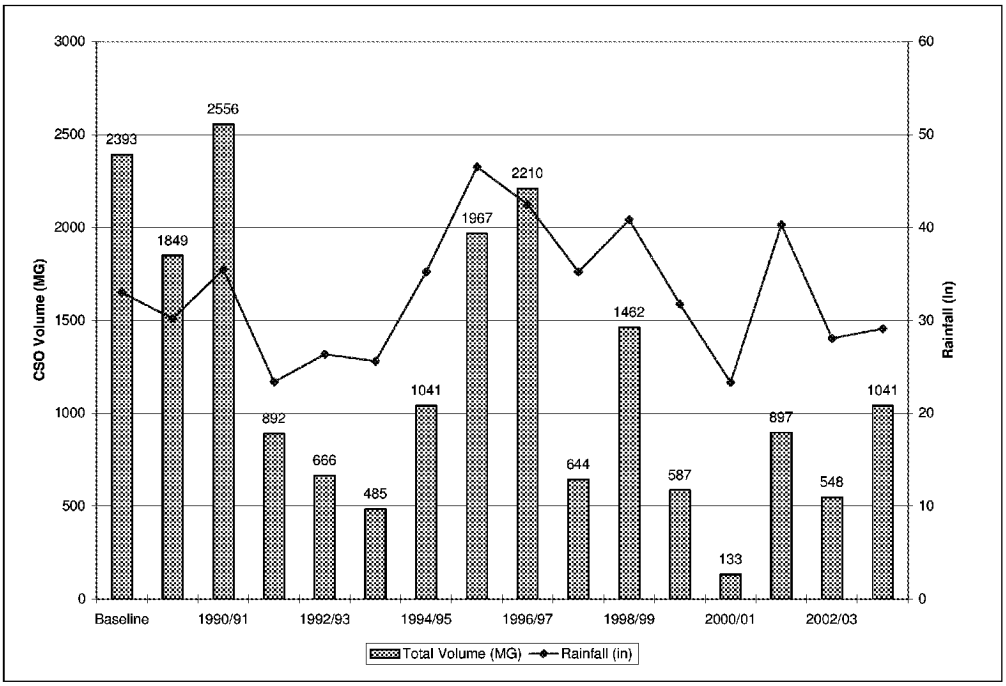

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Table 2-3 2003/2004 CSO EVENT FREQUENCY SUMMARY

(Based on 24-hour Inter-Event Interval-Baseline Calculated on 48 hr. Interval)

Station	DSN	Service Area	Jun-03	Jul-03	Aug-03	Sep-03	Oct-03	Nov-03	Dec-03	Jan-04 (4)	Feb-04 (4)	Mar-04	Apr-04	May-04 (4)	2003/04 Total (MG)	1983 Baseline (MG) 48 hr.
8th Ave./W. Marginal Way	040	South	0	0	0	0	0	0	0	0	0	0	0	0	0	6
Brandon St.	041	South	0	0	0	1	4	4	5	5	1	1	0	1	22	32
Chelan	036	South	0	0	0	0	1	1	0	1	0	0	0	0	3	7
Connecticut	029	South	0	0	0	0	0	0	0	0	0	0	0	0	0	23
Connecticut			*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	
Kingdome			*NM*	*NM*	*NM*	*NM*	*NM*	*NM*	*NM*	*NM*	*NM*	*NM*	*NM*	*NM*	*NM*	
Denny Way	027	South	0	0	0	0	3	3	4	3	1	1	0	2	17	25
Denny Way Lake Union			*0*	*0*	*0*	*0*	*3*	*3*	*4*	*3*	*1*	*1*	*0*	*2*	*17*	
Denny Way Local			*0*	*0*	*0*	*0*	*3*	*3*	*2*	*3*	*1*	*1*	*0*	*2*	*15*	
Interbay			*0*	*0*	*0*	*0*	*2*	*3*	*1*	*2*	*1*	*1*	*0*	*1*	*11*	
Duwamish P.S.	034	South	0	0	0	0	0	0	0	0	0	0	0	0	0	<1
Hanford	031/2	South	0	0	0	0	1	3	1	5	1	1	0	4	16	63
Hanford #1 (Hanford @ Rainier) (1)			*0*	*0*	*0*	*0*	*1*	*1*	*0*	*2*	*0*	*0*	*0*	*2*	*6*	
Hanford #2			*0*	*0*	*0*	*0*	*0*	*2*	*1*	*3*	*1*	*1*	*0*	*2*	*10*	
Harbor Ave.	037	South	0	0	0	0	1	1	0	0	0	0	0	0	2	26
Henderson (1)	045	South	0	0	0	1	3	0	0	0	0	0	NM	NM	4	11
King Street	028	South	0	0	0	0	3	3	1	2	1	1	0	2	13	14
Lander II St.	030	South	0	0	0	0	2	2	0	2	1	1	0	0	8	22
Magnolia, S. (1)	006	South	0	0	0	1	3	3	5	5	4	0	0	0	21	21
Marginal, E.	043	South	0	0	0	0	0	0	0	0	0	0	0	0	0	<1
Michigan St.	039	South	0	0	0	0	2	1	0	2	0	1	0	0	6	32
Michigan, W.	042	South	0	0	0	0	1	1	0	1	0	0	0	0	3	5
MLK Jr. Way (1)	013	South	NM	NM	NM	NM	1	1	0	1	0	0	0	0	3	15
Norfolk St.	044	South	0	0	0	0	1	0	0	0	0	0	0	0	1	18
Rainier Ave.	033	South	0	0	0	0	0	0	0	0	0	0	0	0	0	1
Terminal 115 (1)	038	South	0	0	0	0	1	1	0	0	0	0	0	0	2	3
11th Ave. NW (1)	004	North	0	0	0	0	3	2	0	2	0	0	0	1	8	14
30th Ave. NE	049	North	0	0	0	0	0	0	0	0	0	0	0	0	0	<1
3rd Ave. W.	008	North	0	0	0	0	2	1	0	1	0	0	0	0	4	15
Ballard	003	North	0	0	0	0	1	1	0	1	0	0	0	0	3	13
Belvoir	012	North	0	0	0	0	1	1	0	1	0	0	1	0	4	<1
Canal St.	007	North	0	0	0	0	0	0	0	0	0	0	0	0	0	1
Dexter	009	North	0	0	0	0	2	2	2	1	0	1	0	1	9	15
Matthews Park	018	North	0	0	0	0	0	0	0	0	0	0	0	0	0	<1
Montlake	014	North	0	0	0	0	2	2	0	1	0	0	0	1	6	5
North Beach (1)	048	North	0	0	0	1	1	2	1	2	0	0	0	0	7	17
Pine, E St.	011	North	0	0	0	0	0	0	0	0	0	0	0	0	0	<1
University	015	North	0	0	0	0	1	1	0	1	0	0	0	0	3	12
53rd Ave. SW	052	Alki	0	0	0	0	0	0	0	0	0	0	0	0	0	<1
63rd Ave. PS	054	Alki	0	0	0	0	1	1	0	0	0	0	0	0	2	1
Alaska St. SW (1)	055	Alki	0	0	0	0	0	0	0	0	0	0	0	0	0	1
Barton	057	Alki	0	0	0	0	1	1	1	1	0	0	0	0	4	8
Murray	056	Alki	0	0	0	0	1	1	1	1	0	0	0	1	5	5
TOTAL			**0**	**0**	**0**	**4**	**43**	**39**	**21**	**39**	**9**	**7**	**1**	**13**	**176**	**431**
CSO PLANTS																
Alki Plant	051	Alki					1	1		2					4	29 (3)
Carkeek Plant	046	North					1	1		2					4	8 (3)
West Point							4	2	3	4	1	1		1	16	
**Notes listed on next page*																

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* *Notes for CSO Frequency table* (1) Portable flow meters; Not currently monitored by SCADA; NM indicates that the site was not monitored. (2) Baseline for both CSO frequency and volumes have been revised since the 1988 final CSO Plan due to improvements made to the computer modeling system that provided more accurate projections on historical and future conditions (3) NPDES Permit Limit (4) SCADA computers failed on 1/31/04-2/2/04 resulting in data loss. Data loss also occurred in May 2004 due to transition to a new SCADA system. (5) Belvoir overflow on 4/27/04 was likely caused by a loss of instrument air due to a contractor working at the station.

2.5 Activities Related to EPA's Nine Minimum Controls

King County has implemented a number of programs to satisfy the requirements of the Nine Minimum Controls, which are a part of EPA's CSO Control Policy. These programs are summarized in Table 2-4. Over the Spring of 2004 Ecology inspected all of the County CSOs, discussing their operation and plans for control. As a result the County's program was affirmed as being in compliance with EPA's Nine Minimum Controls. The one request was to document observations of floatables presence, reporting briefly on this in future annual reports.

Table 2-4: King County's Compliance with EPA's Nine Minimum Controls

Nine Minimum Controls	**King County Compliance Effort**
1.Proper operation and regular maintenance programs for the sewer system and CSOs	King County regularly maintains CSO outfalls, regulators, and pump stations through the West Treatment Plant, South Treatment Plant, and collection system maintenance divisions. Proper facility operation is managed by West Point staff using CATAD. Collection system staff inspect sewers on a specified schedule and perform corrective action when deficiencies are found. Maintenance schedules and records of visits are available for inspection upon request.
2.Maximize use of collection system for storage	CATAD manages regulator stations to maximize flows in interceptors and store excess flows in large trunk sewers.
3.Review and modification of pretreatment requirements to ensure that CSO impacts are minimized	King County's Industrial Waste Program issues permits that set limits on the chemical contents of industrial discharges. The program also includes monitoring and permit enforcement, education and technical assistance to businesses on appropriate waste pretreatment and disposal techniques. King County also helps fund the Local Hazardous Waste Management Plan. Current water quality assessment and sediment management plan data indicate no need for CSO specific pretreatment program modifications.
4.Maximization of flow to secondary treatment plant for treatment	CATAD is used to maximize flow to the West Treatment Plant by operation of regulator and pump stations. All analysis for CSO control project alternatives include varying levels of storage and transfer to the secondary treatment plants.

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Table 2-4: King County's Compliance with EPA's Nine Minimum Controls	
Nine Minimum Controls	**King County Compliance Effort**
5.Elimination of CSOs during dry weather	King County's maintenance and operations are directed at preventing dry weather overflows. Dry weather overflows may occur as a result of equipment malfunction or loss of power. The conveyance system is monitored through CATAD, and corrective action is taken immediately if a problem occurs. Equipment problems are immediately reviewed, and repair or replacement activity is undertaken in a timely manner. Dry weather overflows are reported to Ecology as sanitary sewer overflows.
6.Control of solid and floatable materials in CSOs	City of Seattle street sweeping and catch basin maintenance limit introduction of floatable materials to sewers. During routine inspection and maintenance and after CSO events staff inspects stations and logs floatable observations.
7.Pollution prevention programs to reduce contaminants in CSOs	King County has implemented both the Industrial Waste Program and the Local Hazardous Waste Management Program to reduce discharge of chemicals and other substances that negatively impact the environment and the wastewater treatment process.
8.Public notification program to ensure that public receives adequate notice of CSO events and impacts	As a joint project with the City of Seattle and the Seattle King County Health Department, King County has developed a CSO Posting and Notification Program. This program includes posting signs at publicly accessible CSO locations, an information line, web site, brochure, telephone hotline, and other public outreach aspects.
9.Monitoring to effectively characterize CSO impacts and the efficacy of CSO controls	Under the *1988 CSO Plan*, King County's sampling program (now complete) included collecting data for five CSO sites per year. The King County 1999 *CSO Water Quality Assessment* found that 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. King County may undertake additional sampling upon completion of specific CSO control projects.

2.6 CSO Treatment Plant Performance

In addition to secondary treatment of base sanitary sewage, the West Point Treatment Plant provides CSO treatment (equivalent to primary treatment) when flows exceed 300 MGD. CSOs that would otherwise overflow at points around the combined system are transferred to the West Point Treatment plant. All influent flow exceeding 300 MGD receives CSO treatment and is then blended back into the secondary effluent for disinfection, dechlorination and discharged out the deep marine outfall. Thus, the resulting effluent from West Point is a combined flow. The value of 300 MGD is derived from the rated secondary capacity of the West Point Treatment Plant of 133 MGD. The NPDES permit requires all flows up to 300 MGD, (2.25 x 133 MGD), to receive secondary treatment. The peak flow rate for the primary facilities is 440 MGD.

Up through Dec. 31, 2003 the effluent limits for the blended flow was a monthly average of 30

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mg/L total suspended solids (TSS) and 30 mg/L five-day biochemical oxygen demand (BOD5), during the wet season the plant was released from the 85 percent removal limits for TSS and BOD5 in recognition of the reduced CSO treatment removal efficiency. On January 1, 2004 the NPDES permit changed to a monthly average of 30 mg/L of TSS and 25 mg/L of carbonaceous BOD5 (CBOD5) and 80 percent removal for both TSS and CBOD5 during the months November through April.

Table 2-5 shows the dates and volumes of flow that received just CSO treatment. For the 2003/04 CSO year there were 16 occurrences of treated CSO discharges from West Point totaling 376.21 million gallons.

Table 2-5 West Point Annual CSO Treatment Summary

Month	Date*	Treated CSO Volume (MG)
Oct	11	0.78
	15-16	9.34
	17	6.73
	20-21	101.87
Nov	16	7.83
	18-19	86.26
Dec	2	2.21
	5	9.67
	16	0.01
Jan	6-8.	63.47
	14	8.82
	29	62.60
	31	4.52
Feb	16	2.95
Mar	25	2.10
May	27	7.05
FY Total	**16 events**	**376.21**

*combined dates indicate a continuous storm and overflow

In addition to these CSO discharges from West Point, King County currently operates two CSO-only treatment facilities: the Alki and Carkeek CSO treatment plants. For the 2003/04 CSO year, Alki had 4 treated discharges with a total volume of 45.5 million gallons. Carkeek had 4 treated discharge events with a total volume of 27.2 million gallons. The following two appendices give a detailed report for each CSO treatment plant.

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Appendix 1 – Alki CSO Plant Annual Report

June, 2003– May, 2004

A1.1 Introduction

This document constitutes the fourth annual report of the Alki plant as a CSO facility. The facility currently operates under Washington State Department of Ecology permit number WA-0029181-1 issued to the West Point Treatment Plant, effective January 1, 2004 to December 31, 2008. Under this permit, there are interim and final permit criteria to be met. Interim permit parameters are effective January 1, 2004 through December 31, 2005. Starting Jan. 1, 2006, additional permit limits for total residual chlorine and fecal coliform go into effect.

Tables A1-1 and A1-2 summarize the interim and final permit limits for the Alki CSO facility.

Table A1-1. Interim Permit Limits (January 1, 2004 to December 31, 2005).

Parameter	Discharge Limitations (Monthly)	Discharge Limitations[a] (Yearly Average)	Discharge Limitations[b] (Long-term Average)
Total Suspended Solids Removal Efficiency[c]	NA	50%	NA
Settleable Solids, ml/L/hr	1.9 Maximum	0.3	NA
Number of Events per year	NA	NA	29/year
Average Volume per year, million gallons	NA	NA	108 million gallons/year

[a] The yearly limitations will be calculated using per-event data points. Data shall be collected and reported on a schedule concurrent with the annual CSO report, June 1 to May 31, to include the entire wet season for purposes of determining compliance with these limitations.

[b] Long-term average will be calculated using data collected over a full permit cycle. Data shall be collected and reported for the period of the permit cycle prior to permit renewal.

[c] The total removal efficiency for TSS is to be calculated on a mass balance basis as the percent of solids captured at the CSO Treatment Plant and then permanently removed at the West Point Treatment Plant based on the estimated removal efficiency at West Point.

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Table A1-2. Final Permit Limits (January 1, 2006 through the end of the permit).

Parameter	Discharge Limitations (Monthly)	Discharge Limitations[a] (Yearly Average)	Discharge Limitations[b] (Long-term Average)
Total Suspended Solids Removal Efficiency[c]		50%	
Fecal Coliform Bacteria	1700/100 ml geometric mean	NA	NA
Settleable Solids, ml/L/hr	1.9 Maximum	0.3	NA
Number of Events per year	NA	NA	29/year
Average Volume per year, million gallons	NA	NA	108 million gallons/year
Parameter	**Average Monthly**	**Maximum Daily[d]**	
Total Residual Chlorine	NA	290 μg/L	

[a] The yearly limitations will be calculated using per-event data points. Data shall be collected and reported on a schedule concurrent with the annual CSO report, June 1 to May 31, to include the entire wet season for purposes of determining compliance with these limitations.

[b] Long-term average will be calculated using data collected over a full permit cycle. Data shall be collected and reported for the period of the permit cycle prior to permit renewal.

[c] The total removal efficiency for TSS is to be calculated on a mass balance basis as the percent of solids captured at the CSO Treatment Plant and then permanently removed at the West Point Treatment Plant based on the estimated removal efficiency at West Point.

[d] The maximum daily effluent concentration determined from a continuous measurement is calculated as the average of the pollutant concentrations measured over the day.

As of January 1, 2004, Alki effluent limits are defined as follows:
Annual average total suspended solids removal is a minimum of 50%

- Maximum Settleable Solids is limited to 1.9 ml/L/hr or less as a monthly average
- Settleable solids is limited an annual average of 0. 3 ml/L/hr or less
- During the permit cycle, the facility must average less than 29 events per year or less and discharge less than a total of 108 million gallons per year.

A1.2 Plant Performance for reporting period June 01, 03 through May 31, 04

This report summarizes the performance and operation of the facility during June 2003 - May 2004. Table A1-3 summarizes the annual performance data for Alki Treatment Plant in the last 5 years (through May 31, 2003).

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Table A1-3. Alki Plant Operating Data, October 1999 through May, 2004

Year	Average TSS per Year mg/l	Average Settleable Solids per Year ml/L/hr	Discharge Flow per Year, MG	Discharge Events per Year	*once per year untreated event
Oct 99-Dec 03	**Limit = 60 mg/l**	**Limit = 0.3 ml/L/hr**	**Limit = 108**	**Limit = 29**	
Oct 99 – May 00	26	0.15	4.0	2	No events removed
The above information was sent with the NPDES Renewal Package					
Jun 00 – May 01	No filling or discharge events				
Jun 01 – May 02	36	0.26	59.8	6	12/13/02 removed from avg. TSS and settleable solids calculation.
Jun 02 – May 03	33	<0.1	9.8	2	No events removed
Jun 03 – Dec 03	44	0.14	36.9	2	No events removed
Jan 04-May 04	**Limit = 50% removal**	**Limit = 0.3 ml/L/hr**	**Limit = 108**	**Limit = 29**	
Jan 04 - May 04	41 %	0.15	8.6	2	No events removed
Jun 03 – May 04	40 %	0.13	34.0	3	Nov-03 event removed from TSS calculation

There were four (4) inflow and four (4) discharge events at the Alki CSO facility between June 2003 and May 2004. Four events produced 45.5 MG of Alki effluent. By comparison, only three events occurred in 2002-03 producing only 9.1-MG of Alki effluent.

The Alki facility easily met the settleable solids permit conditions during this reporting year. This limit did not change with the new permit. Alki's effluent settleable solids averaged 0.13 ml/L/hr during the reporting year, which easily meets the permit limit of 0.3 ml/L/hr. The highest monthly-average settleable solids concentration was 0.3 ml/L/hr, which also easily meets the permit limit of 1.9 ml/L/hr.

Until January 2004, Alki was operating under the previous permit limits of 60 mg/L annual average suspended solids limit. This was a surrogate standard for 50% removal based on historical plant performance. Alki events in the June – Dec. 2003 time range met this standard by averaging 44 mg/L suspended solids.

The two January 2004 events fall under the interim 50% removal requirement based on a mass balance calculation. Suspended solids captured at Alki and pumped to West Point are credited as being removed based on the secondary process average suspended solids removal efficiency. Alki did not meet the 50% removal limit for either the two storms in Jan-04, or for all the storms

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in the 03-04 season. Alki averaged 41% removal for the two events in January 2004. When accounting for all four storms in 2003-04, TSS removal only averaged 34%. When the Nov. 2003 event is dropped from the calculation, the percent removal is equal to 40%.

TSS removal in 2003-04 is notably lower than the 2002-03 TSS removal average of 53%. The high storm flows of 2003-04 help to explain most of the difference. For example, the %TSS removal at West Point during Alki events averaged 89% in 02-03 while it only averaged 74% in 03-04. The lower TSS removal at WP in 2003-04 was a direct result of the much higher flows.

One of the largest and intense storms of the last 25 years occurred October 20-21 when over 3.7 inches of rain resulted in the total Alki influent flow of 28.5 MG. This was nearly 50% of all the flow into Alki during this reporting period.

A second, greater than once per year storm event occurred November 18, 2003 when 3.1 inches of rain fell resulting in 13.4 MG of influent flow. These two storms accounted for 75 percent of the total flow into the Alki treatment facility.

All six primary tanks were in operation throughout all the events (and empty before each), along with their sludge collectors, sludge pumps and scum sprays. Hypochlorite was dosed to the influent flow in order to maximize disinfection while trying to minimize effluent chlorine residual.

It's important to note that Alki TSS removal, when discharging, was similar between 2003-04 and 2002-03. Specifically, TSS removal (across Alki only) averaged 39% in 2002-03 and 40% in 2003-04 when discharging. Considering that Alki only discharges when flows are very high, it's not unreasonable to expect such low percent TSS removal from Alki.

In light of these percent TSS removals at Alki, King County staff (KC) will be evaluating opportunities to improve TSS removal over the next year. Starting in 2004-2005, KC will be evaluating a slightly different strategy for running the West Seattle Pump Station (WSPS) and Storage Tank. The new strategy will be based on backing down the WSPS when untreated CSOs start to occur in the Elliot Bay interceptor. This new strategy will likely result in more events at Alki (specifically, more events during smaller storms). This new strategy should help improve the percent TSS removal at Alki. KC will also be evaluating the ability of the Alki plant itself to remove TSS. The evaluation will include an analysis of the influent wastewater to determine what percent TSS removals are achievable under ideal conditions.

In July 2004, King County staff met to discuss possible modifications to the disinfection system and the addition of dechlorination equipment at Alki. A pilot study is being developed for the fall 2004 to determine whether the proposed changes will result in consistent attainment of the new chlorine residual and fecal coliform limits, which go into effect January 2006. Alki can not currently meet both the new fecal coliform and chlorine residual limits consistently with the current disinfection process. The fecal coliform geometric mean for last year was 92 colony forming units/100 ml while the chlorine residual average was 570 μg/L.

Please review Table A1-4 for information on the performance of the plant during this period.

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Table A1-4 Alki CSO Annual TSS Treatment Performance

Year	Month	Day	Inflow Event #	Inflow Volume (MGD)	Infl TSS (mg/l)	Disch. Event #	Disch. Volume (MGD)	Disch. TSS (mg/l)	Alki Infl TSS (lbs)	Alki TSS discharged @ Alki (lbs)	Alki TSS % Rem	Alki TSS pumped to WPTP (lbs)	WPTP %TSS Recovery	**Alki TSS in WPTP effluent (lbs)**	% CSO Removal
2003	June														
	July														
	August														
	September														
	October	20-21	1	28.51	77	1	25.4	42	18309	8880	52%	9429	76.9	2178	40%
	November	19-20	2	13.43	66	2	11.5	45	7392	4316	42%	3076	76.8	714	32%
	December														
2004	January	8	3	2.3	38	3	0.6	24	729	120	84%	609	93	43	78%
		29-30	4	11.5	98	4	8	58	9399	3870	59%	5529	65	1935	38%
	All 4 events	**Total**	**4**	**55.7**		**4**	**45.5**		**35,829**	**17,185**		**18644**		**4870**	
		Avg			**70**			**42.25**			**52%**		**74%**		**38.4%**
	3 of 4 events	**Total**	**3**	**42.3**		**3**	**34.0**		**28,437**	**12,869**		**15567.1938**		**4156**	
		Avg			**70**			**42.3**			**55%**		**73.3%**		**40.1%**

Summary of 2002-2003

	All 4 events	**Total**	**3**	**16.3**		**2**	**9.8**		**7,370**	**2,706**		**34211**		**772**	
		Avg			**54**			**33.07**			**63%**		**89%**		**52.8%**

Notes:

In 2002-03, the average % removal TSS when Alki was discharging was 1-33.1/54 = 39%
Interstingly enough, the 2003-04 average % removal when Alki was discharging was 1-42.3/70 = 40%
Thus, the Alki facilities performed as well in 2003-04 as they did in 2002-03
So why is there such a large difference in overall % removals between the two years (38.4% vs. 52.8%)
The answer lies in the performance of West Point and the ovrall percentage of Alki influent that became Alki effluent
Storm events in 2002-03 produced much smaller flows than were produced in 2003-04.
For example, the total flow to Alki in 03-04 was nearly three times that of 02-03 (55.7 vs. 16.3-MG)
The lower flows of 2002-03 allowed a greater percentage of Alki flow to got to West Poiint. This tranlated into higher % removals at Alki (52% vs. 63%)
Also,. the larger storm flows - as expected - resulted in poorer % removals at West Point (74% vs. 89%)

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Appendix 2 - Carkeek CSO Annual Report

June, 2003– May, 2004

A2.1 Introduction

This document constitutes the ninth annual report of the Carkeek plant as a CSO facility. Carkeek began to operate as a CSO facility on November 1, 1994. During this CSO year the permit under which Carkeek operated was changed. The facility currently operates under Washington State Department of Ecology permit number WA-0029181-1, renewed for the West Point Treatment Plant, Alki CSO treatment facility and Carkeek CSO treatment facility on December 31, 2003, and expires on December 31, 2008. Under the new permit, there are interim and final permit criteria to be met. The interim permit parameters are effective for the period January 1, 2004, through December 31, 2005, after which additional permit limits for total residual chlorine, as a daily maximum, and fecal coliform, as a monthly geometric mean, go into effect for the rest of the permit period. The interim and final permit limits are summarized in the tables below.

Table A2-1 The interim permit limits apply from January 1, 2004 through December 31, 2005.

Parameter	Discharge Limitations (Monthly)	Discharge Limitations[a] (Yearly Average)	Discharge Limitations[b] (Long-term Average)
Total Suspended Solids Removal Efficiency[c]	NA	50%	NA
Settleable Solids, ml/L/hr	1.9 Maximum	0.3	NA
Number of Events per year	NA	NA	10
Average Volume per year, million gallons	NA	NA	46 million gallons/year

[a] The yearly limitations will be calculated using per-event data points. Data shall be collected and reported on a schedule concurrent with the annual CSO report, June 1 to May 31, to include the entire wet season for purposes of determining compliance with these limitations.

[b] Long-term average will be calculated using data collected over a full permit cycle. Data shall be collected and reported for the period of the permit cycle prior to permit renewal.

[c] The total removal efficiency for TSS is to be calculated on a mass balance basis as the percent of solids captured at the CSO Treatment Plant and then permanently removed at the West Point Treatment Plant based on the estimated removal efficiency at West Point.

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Table A2-2 The final permit limits are effective beginning January 1, 2006 through the end of the permit.

Parameter	Discharge Limitations (Monthly)	Discharge Limitations[a] (Yearly Average)	Discharge Limitations[b] (Long-term Average)
Total Suspended Solids Removal Efficiency[c]		50%	
Fecal Coliform Bacteria	2,800/100 ml geometric mean	NA	NA
Settleable Solids, ml/L/hr	1.9 Maximum	0.3	NA
Number of Events per year	NA	NA	10
Average Volume per year, million gallons	NA	NA	46 million gallons/year
Parameter	**Average Monthly**		**Maximum Daily[d]**
Total Residual Chlorine	NA		490 μg/L

[a] The yearly limitations will be calculated using per-event data points. Data shall be collected and reported on a schedule concurrent with the annual CSO report, June 1 to May 31, to include the entire wet season for purposes of determining compliance with these limitations.

[b] Long-term average will be calculated using data collected over a full permit cycle. Data shall be collected and reported for the period of the permit cycle prior to permit renewal.

[c] The total removal efficiency for TSS is to be calculated on a mass balance basis as the percent of solids captured at the CSO Treatment Plant and then permanently removed at the West Point Treatment Plant based on the estimated removal efficiency at West Point.

[d] The maximum daily effluent concentration determined from a continuous measurement is calculated as the average of the pollutant concentrations measured over the day.

The annual monitoring period is concurrent with the annual CSO reporting period, June 1 - May 31. This report summarizes the performance and operation of the facility during June 2003 - May 2004.

A2.2 Plant Performance for reporting period June 01, 03 through May 31, 04

During the June 1, 2003 - May 31, 2004 period, there were 14 inflow events and 4 discharge events at the Carkeek CSO facility. Part of the reporting period, June 1st through December 31st, 2003, the CSO facility operated under the previous permit. The old permit calls for an average of 8 discharges per year and an average of 14 MG per year, to be averaged over a 5-year period in contrast to the new permit requirements of 10 discharges and 46 MG/year. Also, the old permit calls for an annual average discharge TSS limit of 60 mg/l, as opposed to an annual TSS removal efficiency of 50% under the new permit. The settleable solids permit limits for each event and the annual average are the same under the old and the new permits. Since Carkeek CSO facility operated under different permits during the reporting period, the performance is analyzed separately and is summarized in the following paragraphs.

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A2.3 Performance based on the old permit for the reporting period June 1 - December 31, 2003:

As of July 1, 1998, Carkeek effluent limits are defined as follows:

- Discharge of suspended solids is limited to an annual average of events of 60 mg/l or less
- Settleable solids is limited to 1.9 ml/L/hr or less per event
- Settleable solids is limited an annual average of 0.3 ml/L/hr or less
- During the permit cycle, the facility flow limits are an average of 8 events and an average of 14 million gallons per year, to be averaged over 5 years
- Ecology allows one event per year to be excluded from the calculation of solids treatment performance as the one untreated (or poorly treated) event per year.

For calculation purposes, the discharge event on October 20th of 2003, was dropped as the " one untreated overflow per year". Applying the old permit limits for the period June 1 - December 31, 2003, Carkeek CSO facility had 4.2 discharges/year (refer to Table A2-3 below), as a 5-year average, meeting the annual number of discharges of 8 per year, as a 5-year average. The average annual discharge volume 14.2 MG/year, (refer to Table A2-4 below), as a 5-year average, exceeded the limit of 14 MG/year (as a 5-year average). The annual average discharge TSS of 29 mg/l (refer to Table A2-5), including all the discharges, met the permit limit of 60 mg/l. None of the discharge events exceeded the settleable solids limit of 1.9 ml/L/hr per event. The annual average for the settleable solids was 0.25 ml/L/hr, including all the events, meeting the permit limit of 0.30 ml/L/hr. Table A2-3 summarizes the 5-year averages:

Table A2-3 5-Year rolling average for the reporting period June 1 - December 31, 2003 with limits applicable during this period

Year	Average TSS per Year (mg/l)	Average SS per Year (ml/L/hr)	Discharge Flow per Year (MG)	Discharge Events per Year		"once per year untreated event"
	Limit = 60 mg/l	Limit = 0.3 ml/L/hr	Limit = 14 MG/year	Limit = 10/year	%TSS Removal	
June 99-May 00	34	<0.10	8.39	6	76	None
June 00-May 01	0	0	0.11	1	89	10/20/2000
June 01-May 02	32	0.29	35.26	8	51	11/27/2001
June 02– May 03	30	<0.10	3.88	4	73	None
June 03– Dec 03 *	29	0.25	23.16	2	48	10/20/2003
5-year average	**25**	**0.11**	**14.16**	**4.2**	**67**	

* 7 months of data

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A2.4 Performance based on the new interim permit for the entire reporting period of June 1, 2003 - May 31, 2004

As of January 1, 2004, Carkeek effluent limits are defined as follows:

- Annual average total suspended solids removal is a minimum of 50%
- Maximum Settleable solids is limited to 1.9 ml/L/hr or less as a monthly average
- Settleable solids is limited an annual average of 0. 3 ml/L/hr or less

During the permit cycle, the facility flow limits are an average of 10 events and an average of 46 million gallons per year, to be averaged over 5 years or the period of the permit if it were to be extended;

The average total suspended solids removal for this period was 53% meeting the new permit requirement of 50% minimum total suspended solids removal (refer to Table A2-5).

Maximum Settleable solids as a monthly average of 0.75 ml/L/hr easily met permit limit of 1.9 ml/L/hr. The average settleable solids concentration for this part of the reporting period was <0.1 ml/L/hr, below the permit limit of 0.3 ml/L/hr (refer to Table A2-5).

The average annual discharge volume 14.97 MGY, (refer to Table A2-4), as a 5-year average, meets the new limit of 46 MGY.

The total discharge for the reporting period was 27.19 MG, which is well below the permit limit of 46 MG per year. Table A2-4 summarizes the 5-year averages:

Table A2-4 5-Year rolling average for the reporting period June 1, 2003 - May 31, 2004

Year	Average TSS Removal Efficiency*** (%)	Average SS per Year (ml/L/hr)	Discharge Flow per Year (MG)	Discharge Events per Year	"once per year untreated event"
	Limit = Average of 50% or more	Limit = 0.3 ml/L/hr	Limit = 46 MG/year	Limit = 10/year	
June 99-May 00	76	<0.10	8.39	6	None
June 00-May 01	89	0	0.11	1	10/20/2000
June 01-May 02	51	0.29	35.26	8	11/27/01
June 02– May 03	73	<0.10	3.88	4	None
June 03 – May 04**	53	<0.10	27.19	4	10/20/2004
5-year average	68	<0.10	14.97	4.6	

*** Presented for comparison; New limits apply only to the period of January 1 - May 31, 2004*

**** Average TSS Removal Efficiency Limit of 50% or greater do not apply to the first 4 reporting periods listed in this table.*

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A2.5 Operation and Maintenance

The Carkeek pump station was originally designed to pump 8.4 million gallons per day (MGD). A recommendation was made as a result of the Carkeek Overflow Reduction Study in 1999 to increase the pump station capacity to 9.2 MGD. During this reporting period, the pump drives were modified so the Carkeek pump station could pump 9.2 MGD with two pump sets in operation. CSO events during last October and November verified that a pumping capacity of 9.2 MGD can be achieved.

Increasing the pumping capacity at Carkeek Pump Station has a potential of increase in the number of overflows at the 11th Ave Overflow Weir. To prevent such a problem, instrumentation was installed at the 11th Ave Overflow Weir to signal potential overflow so the pump station would automatically throttle back to 8.1 MGD. In October 2003, 11th Avenue Overflow Weir feed back loop control was incorporated into the programmable logic controller (PLC) controls for the raw sewage pumps at Carkeek Pump Station. The pumping capacity at Carkeek is reduced to prevent untreated CSO discharges at 11th Avenue (which is downstream of the pump station). When the 2nd follow pump is enabled (9.2 MGD max. flow), maximum flow will be reduced to 8.1 MGD if the 11th Ave. weir level reaches 117.96'. If the level drops below 117.96' for 10 minutes, the pumps will resume pumping 9.2 MGD. In such a flow scenario, if the flows at Carkeek pump station were to exceed 8.1 MGD, the sewage will likely enter the Carkeek CSO plant first and any subsequent CSO discharges from the plant will have received some treatment (grit and suspended solids removal, disinfection) before entering Puget Sound. All three pump sets at Carkeek pump station have been rebuilt.

A recent study done by the PACE engineering group suggested that the capacity of the forcemain, which runs from the pump station to the main interceptor, was reduced by three to five percent or 0.28 to 0.46 MGD. Grit accumulation in the force main was suspected to be the cause. In August 2003, TV inspection of 2600 feet section of the forcemain revealed little buildup, but some wear and tear on the lining of the forcemain. Other parts of the forcemain will be inspected or cleaned in the future, if necessary.

New hypochlorite solution was ordered prior to the wet season to optimize disinfection. The feedback control loop was programmed to ensure better control of final chlorine residuals. The sampling plan and procedures will be reviewed at the annual refresher training session to be held in October of each year. Both Influent and Effluent samplers are scheduled to be purged weekly to keep them clean, operable and ready for a discharge event.

The installation of the Automatic Transfer Switch (ATS) for the emergency standby generator has been completed and tested. There is a 900 kWatt emergency standby generator that provides backup power for the pump station and the treatment plant. In the event of a power outage, the ATS will detect the loss of city power and will start the generator and transfer the electrical load automatically to the generator. After the city power is restored, it will switch back automatically and shut off the generator. Power fail control programming was reconfigured in October 2003 so that the pumps will restart automatically after the ATS switches the power back to city power.

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HF-Controls (the new SCADA system for monitoring of the off-site facilities) installation was completed in May 2004. The Historian Data Acquisition system that collects pertinent data from the pump stations and regulator stations of West Point collection system was activated in June 2004. King County staff are continuing to work out the bugs in the new SCADA system. The report generation software package is being acquired under a separate bid. In the interim, the plant data is obtained on daily basis in Excel spreadsheet format from the Historian Database.

King County staff will be conducting a pilot test at Carkeek and Alki CSO storage facility in order to meet the new residual chlorine and coliform permit limits that will be going into effect on January 1, 2006. The pilot test involves increasing the hypochlorite dosage to ensure adequately disinfecting the CSO flows, followed by dechlorinating the flows using sodium bisulfite. The time frame for conducting the pilot test is October 2004 through early Spring 2005.

Staff will continue to make improvements in training, planning and documentation to maintain smooth operation of the Carkeek CSO Treatment Plant. Please review the attached Table A2-5 for information on the performance of the plant during the past reporting period.

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Table A2-5 Carkeek Annual Treatment Plant Performance

Year	Month	Day	CPTP Inflow Event #	CPTP Inflow Volume (MGD)	CPTP Infl TSS (mg/l)	CPTP Disch. Event #	CPTP Disch. Volume (MGD)	CPTP Effl. Settl Solids (ml/l/hr)	CPTP Disch. TSS (mg/l)	WPTP %TSS Recovery	CPTP Infl TSS (lbs)	CPTP TSS discharged @ CPTP (lbs)	CPTP TSS pumped to WPTP (lbs)	**CPTP TSS discharged @ WPTP (lbs)**	CPTP TSS recovered @ WPTP (lbs)
2003	June														
	July														
	August														
	September	16	1	0.12	244					91.3	244	0	244	21	223
	October	11	2	0.05	193					96.6	80	0	80	3	78
		17	3	0.13	58					93.3	63	0	63	4	59
		20	4a	8.33	141	1a	7.74	0.75	79	65.1	9796	5100	4696	1639	3057
		21	4b	3.56	141	1b	3.56		79	88.7	4186	2346	1841	208	1633
			Wt. Avg		141				79						
			Mon. Avg					0.75							
	November	16	5	0.13	211					94.6	229	0	229	12	216
		18	6a	6.5	76	2a	5.91	0.5	35	64.4	4120	1725	2395	854	1541
		19	6b	5.95	46	2b	5.95	<0.1	23	89.1	2283	1141	1141	124	1017
			Wt. Avg		62				29						
			Mon. Avg					0.25							
	December	3	7	0.16	191					93.9	255	0	255	16	239
		5	8	0.11	148					87.8	136	0	136	17	119
		12	9	0.04	263					91.5	88	0	88	7	80
2004	January	7	10a	1.58	87	3a	0.99	<0.1	34	85.1	1146	281	866	129	737
		8	10b	1.55	12	3b	1.55	<0.1	4	92.8	155	52	103	7	96
		24	11	0.3	120					91.7	300	0	300	25	275
		29	12a	1.1	107	4a	0.61		29	65.1	982	148	834	291	543
		30	12b	0.88	92	4b	0.88	<0.1	29	92.3	675	213	462	36	427
		31	12c	0.13	100					90.8	108	0	108	10	98
		Mon. Avg						<0.1							
	March	25	13	0.07	165					84.7	96	0	96	15	82
	May	27	14	0.007	107					88.3	6	0	6	1	6
(New Interim Permit)															
Incl all CSO events		**Total**	**14**	**30.62**		**4**	**27.19**				**24948**	**11004**	**13944**	**3419**	**10250**
		Avg			**129.04**			**0.18**	**34**						
Excl 10/20/03 event		**Total**	**14**	**30.62**		**4**	**27.19**				**10966**	**3559**	**7407**	**1572**	**5836**
		Avg			**131**			**0.08**	**21**						
		Max						**0.75**							

	CPTP TSS lbs-in	**CPTP TSS lbs Recov**	**CPTP %TSS Recovery**
Incl. All Discharge Events	**24948**	**10250**	**41.1%**
Excl. 10/20 Discharge event	**10966**	**5836**	**53.2%**

For the reporting period June 1 through December 31, 2003 (under previous permit)

Total number of Discharge events:	2	(October 20-21 & November 18-19)
Total number of Discharge Volume:	23.16	MG
Average Discharge TSS (mg/l), including all Discharge events:	53	mg/l (flow weighted average)
Average TSS removal efficiency, including all Discharge events:	38.5	%
Average Discharge settleable solids (ml/l/hr), including all Discharge events:	0.49	ml/l/hr
Average Discharge TSS (mg/l), excluding 10/20 Discharge event:	29	mg/l (flow weighted average)
Average TSS removal efficiency, excluding 10/20 Discharge event:	47.7	%
Average Discharge settleable solids (ml/l/hr), excluding 10/20 Discharge event:	0.25	ml/l/hr

For the reporting period January 1 through May 31, 2004 (under the new permit)

Total number of Discharge events:	2	(Jan 7-8 & Jan 29-30)
Total number of Discharge Volume:	4.03	MG
Average Discharge TSS (mg/l), including all Discharge events:	21	mg/l (flow weighted average)
Average TSS removal efficiency, including all Discharge events:	65	%
Average Discharge settleable solids (ml/l/hr), including all Discharge events:	<0.1	ml/l/hr

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