2001/02 ANNUAL COMBINED SEWER OVERFLOW REPORT

Department of
Natural Resources and Parks
Wastewater Treatment Division

October 2002

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, No. 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 (WTD's) CSO Control Program
- 2001/02 CSO overflow volume and frequency information
- The formal submission of the annual reports for the Alki (App.1) and Carkeek (App.2) CSO treatment plants

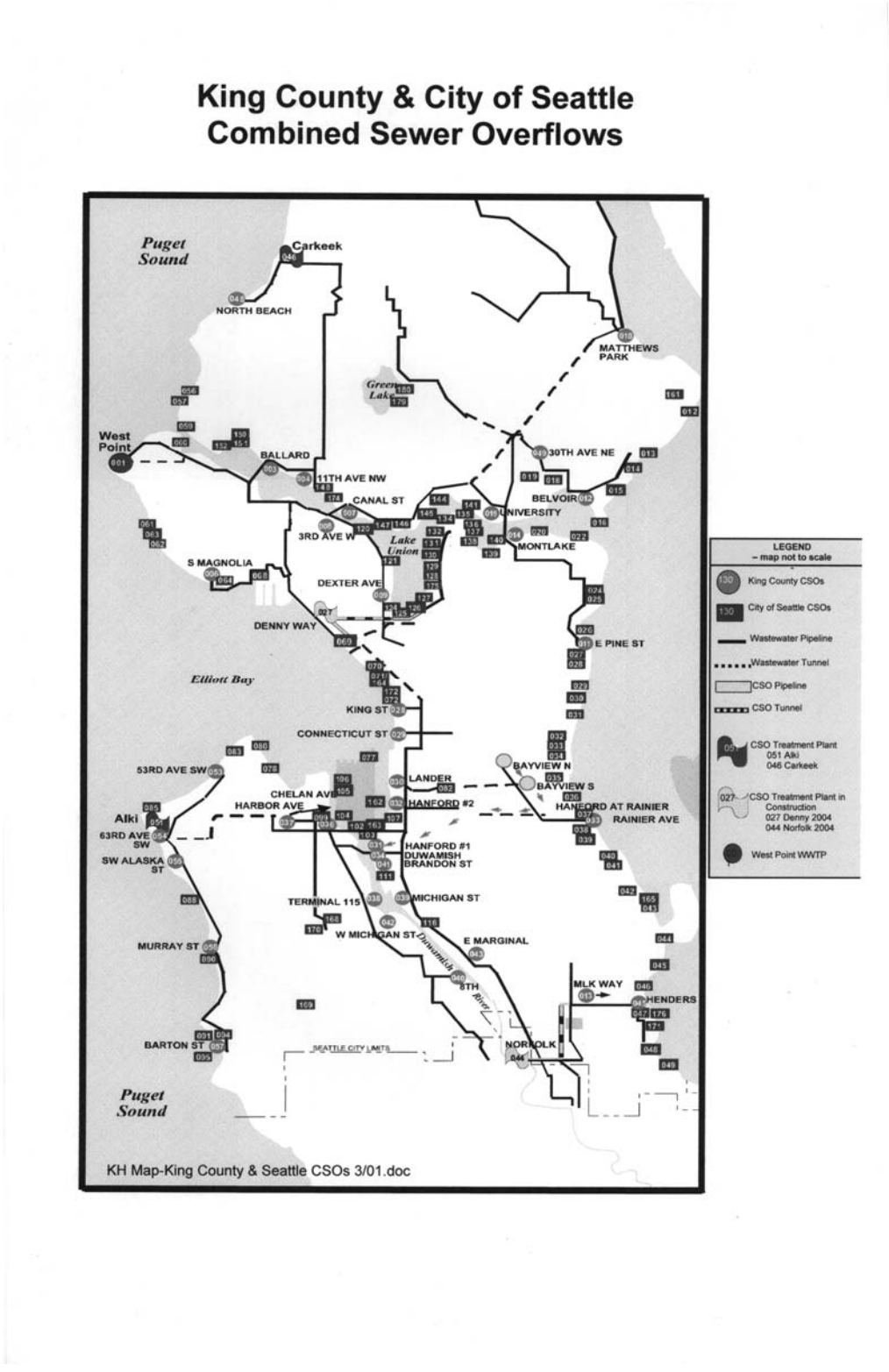
1.2 Background

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. 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 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, and 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 and aesthetic degradation of shorelines during CSO events as well as may adversely affect sediment quality at discharge points. CSOs may raise public health concerns in areas where there is potential for public contact. King County has 37 CSO locations and Seattle has 113 (Figure 1.1). This Annual Report focuses solely on King County CSOs.

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 fresh water 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 state requirement.

Figure 1.1


King County & City of Seattle
Combined Sewer Overflows
Puget Sound
Carkeek
NORTH BEACH
MATTHEWS PARK
Green Lake
West Point
BALLARD
11TH AVE NW
30TH AVE NE
CANAL ST
BELVOIR
UNIVERSITY
3RD AVE W
Lake Union
MONTLAKE
S MAGNOLIA
DEXTER AVE
DENNY WAY
E PINE ST
Elliott Bay
KING ST
CONNECTICUT ST
53RD AVE SW
LANDER
BAYVIEW N
BAYVIEW S
CHELAN AVE
HARBOR AVE
HANFORD #2
HANFORD AT RAINIER
RAINIER AVE
Alki
63RD AVE SW
SW ALASKA ST
HANFORD #1
DUWAMISH
BRANDON ST
TERMINAL 115
MICHIGAN ST
W MICHIGAN ST
E MARGINAL
Duwamish River
MURRAY ST
8TH
MLK WAY
HENDERS
BARTON ST
SEATTLE CITY LIMITS
NORFOLK
Puget Sound
KH Map-King County & Seattle CSOs 3/01.doc
LEGEND
– map not to scale
King County CSOs
City of Seattle CSOs
Wastewater Pipeline
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CSO Treatment Plant
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CSO Treatment Plant in Construction
027 Denny 2004
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West Point WWTP

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 a list of 3 projects for the next five years.

In November 1999, *the Regional Wastewater Services Plan (RWSP)* was approved by the King County Council. The *RWSP* outlines wastewater projects to be built over the next 30 years to protect human health and the environment, serve population growth, and meet regulatory requirements. The *RWSP* includes the County's new CSO Control Plan, with twenty-one projects to control the County's remaining uncontrolled CSOs to one untreated event per year on average at each CSO location.

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. Besides being required by state regulations, the *Year 2000 CSO Control Plan Update* documents King County's CSO control progress and compliance with state and federal CSO control requirements as of 2000, and commits to two very large control projects – Denny and Henderson/MLK/Norfolk - for the next five year NPDES permit cycle.

1.3 Status of CSO Control Projects

1.3.1 Completed CSO Control Projects

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

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	Phase 1 1992	Phase 1 completed; On-going maintenance and improvement
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.	1994	The plant was found to receive more flow than anticipated. Predesign for the correction is near completion. Construction of improvements is estimated to be completed by 2002 or 2003.
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.

Table 1-2 Completed Associated Projects

Project	Description	Completion	Status
Renton Sludge Force Main Decommissioning	Sludge was pumped via the Elliott Bay Interceptor to West Treatment Plant for processing until South Treatment Plant developed solids management capability; decommissioning decreased solids discharge from Interbay Pump Station at Denny	1988	Complete
Denny Sediment Cap	Pilot sediment remediation project	1990	Remediation of remaining area of contamination is scheduled following overflow control. Overflow control is expected to be completed in 2004 and remediation is expected to occur in the winter of 2004 or 2005.
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: 1. NPDES Overflow & Sediments 2. Sediment Baseline	1. Initial characterization monitoring to identify project priorities; 2. 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 conditions and the relative contribution of CSO to pollution.	1999	Complete
Norfolk Sediment Remediation (1)	Source Control, dredging and capping	1999	Follow-up monitoring underway

(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 are the:

- Denny/Lake Union CSO Project
- 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 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 is expected to be completed by late 2004. The Henderson/Martin Luther King Way/Norfolk project will reduce CSO at those three locations to one untreated discharge per year on average. Norfolk is predicted to have approximately four treated discharges per year. Completion for this project is expected by late 2004.

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 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 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 — 2004

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 City and County project is underway and is scheduled to be completed by the end of 2004. Three railroad crossing tunnels were completed in April 2001. In March 2002, after 10 months of boring, the 6,200 foot long Mercer Street Tunnel was completed. Boring started at the west tunnel entrance or "West Portal" located at 545 Elliott Avenue West and ended at the "East Portal" located at the intersection of Roy Street and 8th Avenue North in the south Lake Union area. Workers built about 40 to 50 feet of tunnel each day and installed concrete segments behind the tunnel-boring machine to form the permanent tunnel lining. This pipe is the largest pipe in King County's wastewater collection system.

Construction of the marine outfalls began in July 2001 and was completed in 2002. Construction of the CSO Control Facility will begin in Fall 2002.

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 will be built to achieve the one untreated event per year on average level of control.

The project elements and construction schedule are as follows:

Construction	Begins	Ends
Henderson Pump Station	June 2001 (advertised for bid)	November 2003
Tunnel and Pipelines	September 2001 (advertised for bid)	December 2004

The project will be completed in segments. The project begins near the Atlantic City boat launch at South Seward Park Avenue South and South Henderson Street and terminates at the intersection of S. Norfolk Street and East Marginal Way South. Construction of the pipeline is a combination of underground tunneling and open-cut trenches. The project is now under construction. The pump station has been under construction since November 2001 and is 25 percent complete.

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). It was completed in October 2001.

This study is not part of the CSO Control Plan, but is associated. The Carkeek CSO Treatment Plant (on-line the end of 1994 and fully operational by the following wet season) was found to be receiving more influent flow than had been previously identified and planned. This placed the County in violation of the NPDES permit volume limit of 14 MG/year of treated discharge. The study found three main reasons for the higher actual 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 pre-design 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 mgd design capacity.

Thus the service area now sends more flow to the Carkeek Facility than was originally expected and the pumps transferring the flow to West Treatment Plant, in combination with not pumping their own design capacity, were not designed to handle all 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 AWWF). With this new pumping rate and increased automation of the pumping startup, it is predicted that treated discharges could occur up to 10 times per year (5-year average), and that the volume discharged per year could be up to 46 MGY (5-year average). The County has requested and received a change to the NPDES permit limits to reflect corrections to the original design criteria. The County is presently moving forward on a contract that will result in upgrading the station's pumping capacity to 9.2 MGD. Since continuous pumping at this rate may increase overflows to the Ship Canal, the upgrade to the facility will also include increasing pump throttling capacity. By increasing pump throttling capacity, the Carkeek Facility pumping rate can be adjusted so that no additional overflows at the Ship Canal occur because of flow from Carkeek.

1.3.3 *Future RWSP Projects*

Table 1-2 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 proposed completion date. King County reserves the option to modify this schedule.

RWSP CSO Control Projects

Table 1-3

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

1.3.4 On-going Program Elements

1.3.4.1 CATAD Modifications

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

1) Raising storage levels behind regulator stations;
2) Lowering the wet well level at Interbay Pumping Station when rainfall was detected upstream, moving flow to West Treatment Plant sooner and vacating valuable storage space in the interceptor
3) 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 have been estimated to reduce CSO volumes by 150 MG per year, when all are operating as designed.

All three elements of the project were completed. However, problems at Interbay Pump Station and with the computer hardware at West Treatment Plant prevent the use of the second and third (Predictive Control) components (these controls remain available manually by the operators, though). Testing at the Interbay Pump Station was conducted this year and a report is being written recommending a new operating scheme that will eliminate air entrainment in the pumps and ensure successful operation of the pump station during storm events. This improved operation should allow the CSO benefits of lower wet well operating levels (#2 above) during wet weather to be achieved.

King County has signed a contract with a vendor for replacement of portions of the computer hardware and software system (to be installed in 2003). It is estimated that the Predictive Control Program will be up and running by 2004, once the replacement hardware and software are online and stable. However, by mid-2003, WTD may test simpler control schemes that may provide much of the CSO benefits that Predictive Control is expected to provide. The simpler control schemes are expected to be easier to keep operational.

CATAD will probably be continually modified over time. These continual modifications to the control program are needed to incorporate new flow transfers and storage projects and to improve the efficiency and robustness of the optimization program.

1.3.4.2 Lander and Densmore Stormwater Management Program

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 an interlocal agreement by and between the City of Seattle and King County.

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 (KCDNR), 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, some text, the SKCHD information phone number, as well as a CSO number assigned to each site, which corresponds to its NPDES discharge serial number.

Due to the low volume of calls to the CSO Notification Information line to date, King County, City of Seattle, and the Seattle-King County Department of Health have decided to employ a message recorder that will be checked routinely.

Section 2 – 2001/02 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 at the front of this report shows the location of existing King County and City of Seattle CSO discharges. 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, and North Beach PS. Many of these portable flowmeters have become unreliable due to their age, and they experienced some type of failure during the monitoring period. The County has purchased new meters, and all CSO locations monitored with portable flowmeters are expected to be operational by Fall 2002.

As shown on Table 2-1, rainfall measured by County rain gauges at pump and regulator stations for the 2001/02 reporting period averaged more than 40 inches. This is 8% above the average rainfall of 37 inches per year.

Table 2-1: 2001/02 Rainfall at Pump and Regulator Stations (in inches)

	Jun-01	Jul-01	Aug-01	Sep-01	Oct-01	Nov-01	Dec-01	Jan-02	Feb-02	Mar-02	Apr-02	May-02	2001/2002 Total
Station													
Ballard	2.88	0.62	1.94	0.43	3.51	8.84	5.46	5.85	3.56	2.48	2.33	0.86	38.76
Denny Local	2.5	0.62	1.74	0.33	3.56	8.62	5.29	5.9	3.29	2.23	2.45	0.82	37.35
Denny Way Lake Union	2.8	0.65	1.83	0.33	3.31	8.38	5.09	5.9	3.82	2.18	2.4	0.95	37.64
King Street	3.08	0.81	0.95	0.19	3.23	8.64	5.34	5.65	4.1	2.21	2.38	0.88	37.46
Marginal Way, E.	2.37	1.27	1.86	0.64	2.98	8.7	5.74	5.5	3.88	2.75	2.81	0.97	39.47
Matthews Park	2.83	1.09	2.03	0.48	4.23	9.26	5.8	6.59	4.64	3.01	2.61	1.12	43.69
Pine Street, E.	2.66	0.96	2.3	0.6	4.04	9.4	5.78	5.91	4.86	2.69	3.02	1.12	43.34
Rainier Avenue	2.14	1.11	2.15	0.67	4.17	9.59	6.66	6.22	4.42	3.23	1.11	1.1	42.57
University	2.75	0.92	1.92	0.42	4.08	8.91	5.79	6.27	4.54	3	3.02	0.84	42.46
Average	2.67	0.89	1.86	0.45	3.68	8.93	5.66	5.98	4.12	2.64	2.46	0.96	40.30

2.2 2001/02 CSO Volumes

The total system overflow volume for 2001/02 was 896.91 million gallons (MG), compared to the 1981-83 baseline of 2,339 MG. As stated previously, the data for the 2001-02 wet season includes partial data due to monitoring failures of portable flow meters (due to their age). Thus, the 2001/02 volumes could be higher due to only partial data being available at six of the CSO locations.

Of this, approximately 70.20 MG overflowed in the northern service area and approximately 826.62 MG in the southern service area (based on the data available). The 2002/03 Annual CSO Report should have more complete data because, as stated previously, the County has purchased new portable flowmeters. It is expected that all CSO locations that are monitored with portable flowmeters will be operational by Fall 2002.

2.2.1 2001/02 CSO Volume Control Progress

Table 2-2 contains the monthly overflow volumes and comparisons to baseline conditions for each station. As stated previously, the data for the 2001-02 wet season includes partial data at six CSO locations due to monitoring failures of portable flow meters (due to their age). Thus, the 2001/02 volumes could be higher.

Table 2-2
2001/2002 CSO Volume Summary
in Million Gallons (MG)

Station	DSN	Service Area	Jun-01	Jul-01	Aug-01	Sep-01	Oct-01	Nov-01	Dec-01	Jan-02	Feb-02	Mar-02	Apr-02	May-02	2001/2002 Total (MG)	1983 Baseline (MG) (2)
11th Ave. NW (1,5)	004	North	2.04 PD	<0.01 PD	2.66 PD	<0.01	0.32	1.45 PD	1.24	1.32	0.17 PD	2.07	3.21	<0.01	14.48 PD	
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	0.10	<0.01	0.02	<0.01	0.02	0.66	0.32	0.10	0.03	<0.01	0.01	<0.01	1.26	106
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	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	10
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
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
Ballard	003	North	<0.01	<0.01	0.15	<0.01	<0.01	<0.01	0.06	<0.01	<0.01	<0.01	<0.01	<0.01	0.21	95
Barton	057	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	8
Belvoir	012	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
Brandon St.	041	South	2.52	0.47	3.48	0.52	1.19	21.94	19.17	10.49	5.09	0.85	1.00	0.18	66.90	64
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
Chelan	036	South	0.17	<0.01	0.34	<0.01	<0.01	0.19	1.37	0.02	0.01	<0.01	<0.01	<0.01	2.10	61
Connecticut	029	South	<0.01	<0.01	<0.01	<0.01	1.34	<0.01	0.08	1.15	<0.01	<0.01	<0.01	<0.01	2.57	90
Denny Way	027	South	27.87	0.57	10.60	<0.01	8.99	125.58	74.57	56.12	42.71	10.46	10.95	0.01	368.43	502
Dexter	009	North	1.99	0.12	9.86	<0.01	1.71	0.90	2.38	1.59	0.08	<0.01	<0.01	0.02	18.65	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 PD	<0.01 PD	<0.01 PD	<0.01 PD	0.66 PD	49.11 PD	38.08 PD	28.79 PD	22.79 PD	5.48 PD	4.79 PD	<0.01 PD	149.7 PD	644
Harbor Ave.	037	South	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	9.49	<0.01	<0.01	<0.01	<0.01	<0.01	9.49	36
Henderson (1)	045	South	0.95	0.77 PD	5.81 PD	0.07 PD	<0.01 PD	0.98	12.46	0.35	0.01	<0.01	<0.01	<0.01	21.4 PD	15
King Street	028	South	1.69	<0.01	0.31	<0.01	0.42	15.71	9.47	6.38	4.23	0.92	0.57	<0.01	39.70	55
Lander II St.	030	South	0.77	<0.01	6.63	<0.01	0.02	57.13	21.52	30.22	4.65	1.85	0.94	<0.01	123.73	143
Magnolia, S. (1)	006	South	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	1.86	0.39	2.25 PD	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
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
Michigan St.	039	South	0.75	0.16	1.67	<0.01	0.02	10.29	17.79	3.10	3.13	0.07	0.71	<0.01	37.69	190

Table 2-2
2001/2002 CSO Volume Summary
in Million Gallons (MG)

Station	DSN	Service Area	Jun-01	Jul-01	Aug-01	Sep-01	Oct-01	Nov-01	Dec-01	Jan-02	Feb-02	Mar-02	Apr-02	May-02	2001/2002 Total (MG)	1983 Baseline (MG) (2)
Michigan, W.	042	South	<0.01	<0.01	0.02	<0.01	<0.01	0.56	1.31	0.09	0.07	<0.01	<0.01	<0.01	2.05	2
MLK Jr. Way (1)	013	South	<0.01	<0.01	<0.01	<0.01	<0.01 PD	<0.01 PD	<0.01 PD	<0.01 PD	NM	NM	NM	NM	<0.01 PD	60
Montlake	014	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	32
Murray	056	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	6
Norfolk St.	044	South	<0.01	<0.01	<0.01	<0.01	<0.01	0.43	<0.01	<0.01	<0.01	<0.01	0.18	<0.01	0.61	39
North Beach (1)	048	North	<0.01 PD	0.13 PD	<0.01 PD	<0.01 PD	0.11	0.77	1.11 PD	0.51 PD	0.12 PD	0.02 PD	0.01	0.01 PD	2.79 PD	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
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 (4)	038	South	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	2
University	015	North	1.87	<0.01	3.23	<0.01	<0.01	0.13	17.76	6.40	3.51	<0.01	<0.01	<0.01	32.90	126
Total Million Gallons (MG)			40.72	2.22	44.78	0.59	14.80	285.83	228.18	146.63	86.60	21.72	24.23	0.61	896.91 PD	2339.0
2001/02 Rainfall (in.)			2.67	0.89	1.86	0.45	3.68	8.93	5.66	5.98	4.12	2.64	2.46	0.96	40.30	37
CSO PLANTS																
Alki Plant	051	Alki						21.19	24.29	13.36	1				59.84	108 (3)
Carkeek Plant	046	North			0.31			10.58	14.32	7.83	2.22				35.26	14 (3)

Notes:

(1) Portable flow meters not currently monitored by CATAD; PD indicates partial data for the month. NM indicates that a monitor failure occurred.

(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 provide more accurate projections on historical and future conditions.

(3) NPDES Permit Limit.

(4) Terminal 115 is inaccessible for a placement of a monitor.

(5) No information for 1983 baseline data for 11th Avenue NW because at the time it was included with the Ballard CSO information.

Figure 2-1 graphically illustrates the relationship between rainfall and CSO volumes during this 2001/02 reporting period. Figure 2-2 illustrates the progress King County has made in CSO volume over time.

Figure 2-1 2001/02 CSO Volumes vs. Rainfall

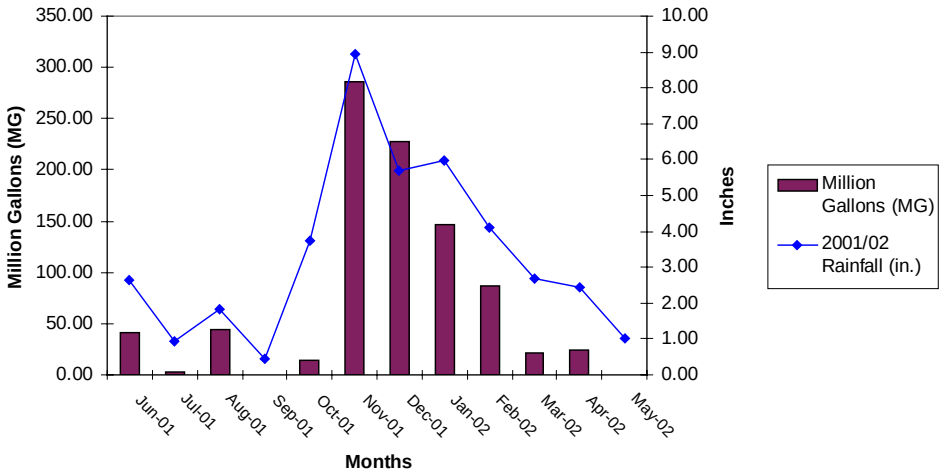
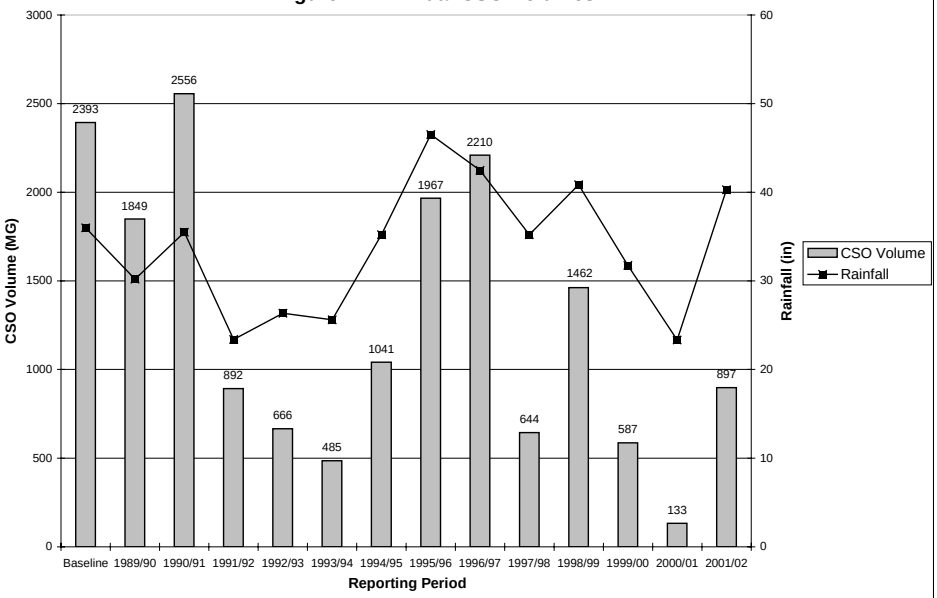


Figure 2-2. Annual CSO Volumes



2.3 2001/02 CSO Event Frequency

Approximately 232 overflow events occurred during 2001/02. As stated previously, the data for the 2001-02 west season includes partial data at six CSO locations due to monitoring failures of portable flow meters (due to their age). Thus, the 2001/02 frequencies could be higher.

When the County (then Metro) originally began CSO control planning we defined a CSO "event" as an overflow preceded and followed by 3 hours without overflow – 3 hours was the chosen "inter-event interval." Over time we noticed that many small overflow events were occurring during a single rainstorm – suggesting that our inter-event interval definition was incorrect. Statistical assessment indicated that a 40 - hour interval achieved the one storm/one overflow goal, so the County made the switch formally to a 48-hour interval (rounded up for reporting convenience) in our *Year 2000 CSO Plan Update*, submitted with the West Treatment Plant NPDES permit renewal in June 2000.

In 2000 and 2001 Ecology developed inter-event interval guidance requiring that a 24-hour interval be used. This is the second annual report using the new 24-hour inter-event definition. For this report, the CSO baseline has also been remodeled for the new 24-hour inter-event interval. Due to the large modeling effort required, we will not recalculate past years' frequency counts using this new definition, and so will have lost historical continuity with past data.

2.3.1 2001/02 CSO Event Frequency Control Progress

Table 2-3 contains the monthly frequencies and comparisons to baseline conditions for each station.

Table 2-3: 2001/02 CSO Event Frequency Summary
Based on 24 hour Inter-Event Interval [5]

Station	DSN	Service Area	Jun-01	Jul-01	Aug-01	Sep-01	Oct-01	Nov-01	Dec-01	Jan-02	Feb-02	Mar-02	Apr-02	May-02	2001/2002 Events Total	1983 Baseline Total Events (24 hr. interval)
11th Ave. NW (1)	004	North	3 PD	0 PD	1 PD	0	1	2 PD	2	4	1 PD	1	2	0	17 PD	16
30th Ave. NE	049	North	0	0	0	0	0	0	0	0	0	0	0	0	0	<1
3rd Ave. W.	008	North	2	0	1	0	1	3	2	1	1	0	1	0	12	17
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	0	0	0	0	0	0	0	0	0	2
8th Ave./W. Marginal Way	040	South	0	0	0	0	0	0	0	0	0	0	0	0	0	6
Alaska St. SW	055	Alki	0	0	0	0	0	0	0	0	0	0	0	0	0	1
Ballard	003	North	0	0	1	0	0	0	1	0	0	0	0	0	2	13
Barton	057	Alki	0	0	0	0	0	0	0	0	0	0	0	0	0	9
Belvoir	012	North	0	0	0	0	0	0	0	0	0	0	0	0	0	<1
Brandon St.	041	South	2	1	1	1	5	5	2	3	2	1	3	2	28	36
Canal St.	007	North	0	0	0	0	0	0	0	0	0	0	0	0	0	<1
Chelan	036	South	1	0	1	0	0	2	3	1	1	0	0	0	9	7
Connecticut	029	South	0	0	0	0	2	0	1	1	0	0	0	0	4	29
Denny Way	027	South	4	1	1	0	3	3	2	4	2	1	1	1	23	32

Table 2-3: 2001/02 CSO Event Frequency Summary
Based on 24 hour Inter-Event Interval [5]

Station	DSN	Service Area	Jun-01	Jul-01	Aug-01	Sep-01	Oct-01	Nov-01	Dec-01	Jan-02	Feb-02	Mar-02	Apr-02	May-02	2001/2002 Events Total	1983 Baseline Total Events (24 hr. interval)
Dexter	009	North	2	1	1	0	2	2	1	4	1	0	0	1	15	15
Duwamish P.S.	034	South	0	0	0	0	0	0	0	0	0	0	0	0	0	<1
Hanford	031/2	South	0 PD	0 PD	0 PD	0 PD	1 PD	3 PD	2 PD	3 PD	2 PD	1 PD	1 PD	0 PD	13 PD	58
Harbor Ave.	037	South	0	0	0	0	0	0	2	0	0	0	0	0	2	30
Henderson (1)	045	South	3	1 PD	2 PD	1 PD	0 PD	3	1	2	1	0	0	0	14 PD	12
King Street	028	South	3	0	1	0	1	3	2	3	2	1	1	0	17	16
Lander II St.	030	South	1	0	1	0	1	3	2	3	2	1	1	0	15	26
Magnolia, S. (1)	006	South	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	4	1	5 PD	25
Marginal, E.	043	South	0	0	0	0	0	0	0	0	0	0	0	0	0	<1
Matthews Park	018	North	0	0	0	0	0	0	0	0	0	0	0	0	0	<1
Michigan St.	039	South	2	1	1	0	1	2	2	2	2	1	1	0	15	34
Michigan, W.	042	South	0	1	1	0	0	2	3	2	2	0	0	0	11	5
MLK Jr. Way (1)	013	South	0	0	0	0	0 PD	0 PD	0 PD	0 PD	NM	NM	NM	NM	0 PD	16
Montlake	014	North	0	0	0	0	0	0	0	1	0	0	0	0	1	6
Murray	056	Alki	0	0	0	0	0	0	0	0	0	0	0	0	0	5
Norfolk St.	044	South	0	0	0	0	0	1	1	0	0	0	1	0	3	20
North Beach (1)	048	North	0 PD	1 PD	0 PD	0 PD	3	3	2 PD	4 PD	2 PD	1 PD	1	1 PD	18 PD	18
Pine, E St.	011	North	0	0	0	0	0	0	0	0	0	0	0	0	0	<1
Rainier Ave.	033	South	0	0	0	0	0	0	0	0	0	0	0	0	0	<1
Terminal 115 (4)	038	South	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	4
University	015	North	1	0	1	0	0	1	2	2	1	0	0	0	8	13
Events			24	7	14	2	21	38	33	40	22	8	17	6	232	471.0
2001/02 Rainfall Average			2.67	0.89	1.86	0.45	3.68	8.93	5.66	5.98	4.12	2.64	2.46	0.96	40.30	37
CSO PLANTS (5)																
Alki Plant	051	Alki						2	2	1	1				6	29 (3)
Carkeek Plant	046	North			1			3	1	1	2				8	8 (3)

Notes:

(1) Portable flow meters not currently monitored by CATAD; PD indicates partial data for the month. NM indicates that a monitor failure occurred.

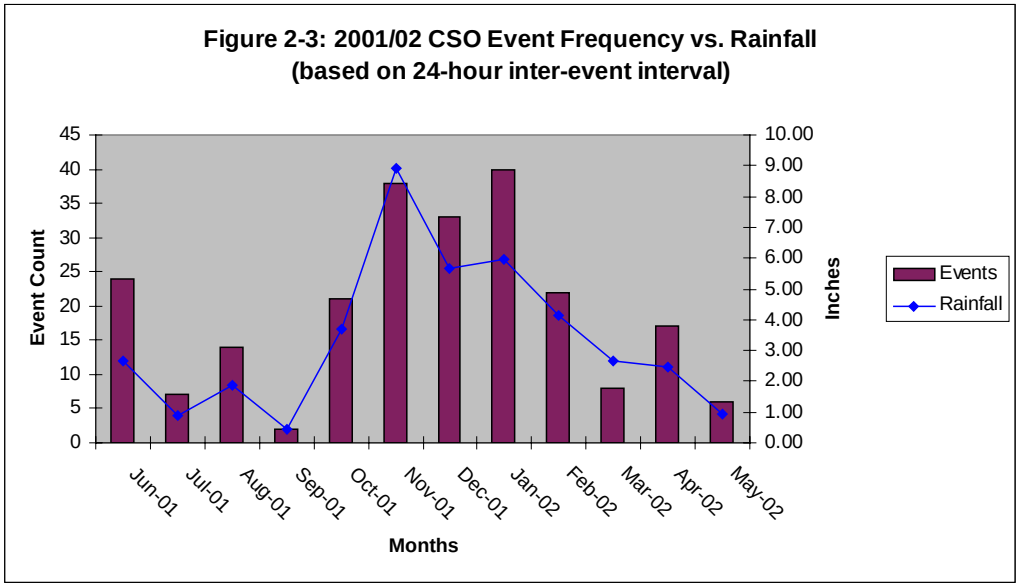
(2) Baseline for both CSO frequency and volumes have been revised since the 1988 Final CSO Plan due to improvements made to the computer modeling system that provide more accurate projections on historical and future conditions.

(3) NPDES Permit Limit.

(4) Terminal 115 is inaccessible for placement of a monitor.

(5) As per NPDES requirements, CSO Treatment Plants use a 48-hour inter-event interval.

Figure 2-3 graphically illustrates the relationship between rainfall and CSO frequency during this 2001/02 reporting period. No historical chart is presented due to changed inter-event interval from previous years.



2.4 CSO Treatment Plant Performance

In addition to secondary treatment of base sanitary sewage, the West Treatment Plant provides CSO treatment. CSO that would otherwise overflow at points around the combined system, is captured and transferred to the West Treatment plant, where it receives primary treatment. There is capacity for up to 140 mgd of CSO at the West Treatment Plant. These flows are then blended back into the secondary effluent for disinfection, dechlorination and discharge out the deep marine outfall. While the effluent limits to be met by the blended flow remain the typical secondary limits of 30 mg TSS and BOD_5, during the wet season the plant is released from the 85 percent removal limits for TSS and BOD_5 in recognition of the reduced primary treatment removal efficiency.

King County currently operates two CSO-only treatment facilities: the Alki and Carkeek Park CSO treatment plants.

2.4.1 Alki CSO Plant

See Appendix 1—the plant specific annual report.

2.4.2 Carkeek Park CSO Plant

See Appendix 2—the plant specific annual report.

Appendix 1 - Alki CSO Plant Annual Report
June 2001—May 2002

This document is the third annual CSO report for the Alki CSO Treatment Plant, located in West Seattle. It summarizes Alki's performance and operation during the period of June 2001 through May 2002.

Alki previously operated under NPDES permit WA-002901-7 as a primary treatment plant. Alki ceased operation as a primary facility on July 15, 1998. Though operated as a CSO treatment facility after October 1998, Alki was not incorporated into West Treatment Plant's NPDES permit as a CSO treatment facility until Oct. 25, 1999 (WA-0029181-1). The annual reporting period for the Alki CSO facility is concurrent with the annual CSO reporting period: June 1- May 31.

Performance

Rainfall in the area was more typical of a normal wet weather season. Discharge events from Alki did increase this year and are expected to increase as further tuning of the distribution of wet weather flows occurs, including the flow to and from pump stations in West Seattle and the operation of the Harbor Avenue Regulator. During the winter of 2000-2001, Harbor Avenue Regulator was activated to discharge storm flows into the West Seattle Tunnel. Discharging into the West Seattle Tunnel will help ensure that Harbor Avenue Regulator discharges no more than one untreated CSO per year. However, this discharge will contribute to increased treated discharges at Alki (as anticipated and permitted for in the original design).

The effluent limits for the Alki CSO facility are defined as follows:

- suspended solids (TSS) are limited to a yearly average of events of 60 mg/l or less;
- settleable solids are limited to 1.9 ml/l/hr or less per event;
- settleable solids are limited to a yearly average of 0.3 ml/l/hr or less;
- 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;"
- number of discharge events per year is limited to an average of 29 based on the 5-year permit cycle; and
- the discharge volume is limited to an average of 108 million gallons per year based on the 5-year permit cycle.

During the June 2001 – May 2002 reporting year, the Alki CSO facility operated eight times (between August 2001 and March 2002). Six discharge events occurred in November, December, January and February. The discharge effluent for the year was within the permit requirements for suspended solids. The plant also met the yearly limit for the number of discharges and total discharge volume (as shown in the following tables).

Settleable solids tests for all discharge events at the Alki CSO facility were done on the grab samplers taken at 5 minutes, 30 minutes, and 2 hour time intervals except for the February 22, 2002 event. The average of these results were reported in the monthly discharge monitoring reports. A composite sample was used for this test for the February 22, 2002 event. Results from grab samples yield valuable information about the plant's performance during the event. However, the results may be slightly different than the results from a test of the flow-composite sample. The annual average of the settleable solids is 0.28 ml/l/hr for this annual reporting period. Dropping the December 13, 2001 discharge event drops these averages to 0.26 ml/l/hr for a sample.

Table 1 summarizes the annual performance data for Alki since the time the plant has been incorporated into West Treatment Plant's NPDES permit.

Table 1: Alki Plant Operating Data October 1999 through May 2002					
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**
	Limit = 60 mg/l	Limit = 0.3 ml/l/hr	Limit = 108	Limit = 29	
Oct 99 – May 00[(1)]	26	0.15	4	2	No events removed
June 00 – May 01	No filling or discharge events				
June 01 – May 02	36	0.26	59.8	6	12/13/02 removed from average TSS and settleable solids calculation

[(1)]This information was sent with the NPDES Renewal Package.

Operational Issues

Operational changes were made during the past year to improve the disinfection, sampling proceedures, and performance related to solids removal. Changes made to improve solids removal should also help to address issues with the hydraulic capacity of the plant.

Hypochlorite is used to disinfect effluent from the plant, with a range in dose from 2 to 7 ppm during discharge events during this reporting year. To optimize the disinfection of the effluent, the strategy was altered to increase the dose of hypochlorite at the plant influent, increase the total dose of hypochlorite, and decrease or maintain the dose added at the contact channel. The goal of the strategy is to increase the contact time without having a high chlorine residual in the effluent. The setpoint for post- chlorination is currently 0.5 to 0.7 ppm. WTD had considered the option of adding the hypochlorite at the 63rd pump station to increase the contact time further, but this could limit WTD's ability to chlorinate any overflows at 63rd, given the existing configuration of the system. The sampling location for fecal coliforms was moved to a location down stream of the scum removal system in the chlorine contact channel. Test results from events in January and February show the maximum FC counts to be less than 200 cfus per 100 mls.

Changes to the pumping strategy at the 63rd Avenue Pumping Station strategy should contribute to improved solids removal at Alki. The strategy currently in-place is to have the three pumps that have variable speed drives come on first (one at a time) and control at progressively higher level setpoints. These three variable speed pumps have a capacity of approximately 12 to 14 MGD per pump. After these pumps have reached maximum capacity and the wet well continues to rise, the three single fix speed pumps will come on (one at a time). These fixed speed pumps have a capacity of 14 to 15 MGD per pump. The goal of the strategy is to smooth out the 60 to 80 MGD peak flows going through the Alki plant. The flow to the plant may start earlier in order to improve the performance of the sedimentation tanks and also avoid exceedance of the hydraulic capacity of the plant. This modification will not increase the number and volume of discharge events at Alki.

In addition to the change in the pumping strategy, the sequence for the filling of the primary sedimentation tanks was changed back to the original strategy. This strategy allows the two tanks to fill at a time as the flow to the plant increases and the tanks become full.

WTD plans to tune the scum removal system in the next year. WTD will make minor repairs to the sprays and test the automated strategy of the system to ensure the setpoints for pumps and sprays are appropriate so that they can come on automatically as the sedimentation tanks are filled. Improvements to the scum removal system should also increase the total solids removed.

Continual improvement in training, planning, and documentation should assist with improved operation of the CSO facility. Review and improvement of the current Operations and Maintenance Manual is in progress. The new manual should assist with remaining training issues. Issues related to sampling of filling events have been addressed. Staff are also working to verify and document the correct elevations of gates and weirs at 63rd . Operations and Maintenance staff are working together so that there is consistency in the display of level setpoints on documents, at the 63rd pump station panels, at the local panels at Alki, and at the SCADA system at South Plant. South and West Plant have made tentative plans are to review the strategy to optimize the pump stations close to Alki, Harbor Avenue, and the West Seattle Pump Station. Additional plans are being made to have offsite operations and maintenance staff meet together at the beginning of the next wet weather season to verify the automated strategies at Alki.

Maintenance and Construction Activities

Most of the major modifications to the chemical systems were completed during the previous year. Some modifications to the valves on the hypochlorite system were done this year with the addition of diaphragm valves. Additional work needs to be done to improve fittings for flushing hypochlorite pumps and to repair leaking fittings on the caustic tank and lines. Plant staff are also considering ways to optimize the maintenance of the chlorine analyzers.

WTD continued to work to improve the ability to locally and remotely monitor and control the Alki facility. As noted above, plans are in effect to have consistent display of level setpoints at Alki, 63rd, and the South Plant SCADA system.

Please see the following tables for the summary of the facility performance and operation for the period of June 2001 to May 2002.

The following information is important when reviewing Table 2 data:

- <0.1 is detection limit; bold type indicates value used for the day in the event (highest when multiple tests are run during the day).
- Calculation of average settleable solids values uses 0.0 when value is <0.1.
- NM means not measured; N/A means not applicable
- Settleable solids tests performed on grab samples during 2001 – 2002.
- Grab samples were taken at 5min (approximately), 30min, 2 hours, and 24 hours after discharge started. These times are simultaneous in time with the grab samples take for pH, chlorine, and Fecal Coliforms
- For the February 2002 event the settleable solids tests was also performed on the composite sample. Composite samples are taken from a flow-paced sample over the length of the event or each day if the event lasts longer than 24 hours.
- Event average = average of grab samples. Results of these are tests were reported in the monthly reports
- Annual event average = average of all event averages during the reporting year

Table 2: Settleable Solids Performance June 1, 2001 to May 31, 2002				
Date	**Inflow Event Number**	**Settleable solids (mls/L/hr)**	**Event Maximum (ml/L/hr)**	**Comments**
11/14/01	**1**	**0.3**	**0.3**	
11/28 – 29/01	**2**	**0.3**	**0.3**	
12/13/01	**3**	**(0.4)**	**(0.6)**	*Dropped from calculation as allowable " untreated event"*
12/16 – 17/01	**4**	**0.4**	**0.5**	
1/7-8/02	**5**	**0.3**	**0.35**	
2/22/02	**6**	**<0.1**	**<0.1**	
Annual Event Average		**0.26**	**N/A**	

The following information is important when reviewing Table 3 data:

- NM means not measured.
- Flow data is reported daily from 00:00 hours to 23:59 hours.
- Composite samples are taken from a flow-paced sample over the length of the event or each day if the event lasts longer than 24 hours. Influent sampler begins when the plant begins to fill.
- All of the discharge events in this reporting year lasted less than 24 hours,; therefore, only one composite sample was taken for each event for effluent and influent. When the event happened on two dates, the value of effluent TSS is repeated in the table to show the calculated lbs of TSS discharged for each day. .
- Discharge Event Eff TSS (mg/l)=the sum of the whole event (Eff TSS,mg/l*Eff flow,MG*8.34)/(the total flow of the event)/8.34
- Alki influent calculation (lbs.) = (influent flow, mg)*(influent TSS, mg/l)*8.34
- Effluent TSS lbs discharged at Alki outfall (lbs.) = (effluent flow, mg)*(effluent TSS, mg/l)*8.34
- If the 12/13/02 event is included, the Annual Average TSS would be 40.47 mg/l and the Effluent discharged TSS lbs would be 20,197 lbs.

Table 3: Total Suspended Solids (TSS) Performance June 1, 2001 through May 31, 2002								
INFLUENT				**EFFLUENT**				
Date	**Influent Event Number**	**Influent flow (MG)**	**Influent TSS (mg/L)**	**Discharge Event Number**	**Effluent flow (MG)**	**Effluent TSS (mg/L)**	**Effluent TSS lbs at Alki Discharged outfall**	**Comments**
8/22/2001	1	0.04	NM					
11/14/2001	2	21.56	76	1	17.28	32.4	4669	
11/28/2001	3	3.36	36.6	2	1.87	6.6	103	
11/29/2001	3	3.35	36.6	2	2.04	6.6	112	
12/13/2001	4	9.07	156	3	6.961	(74)	(4296)	Event removed from average TSS and TSS total lbs. discharged
12/16/2001	5	20.16	61	4	17.05	39	5546	
12/17/2001	5	1.15	61	4	0.28	39	91	
1/7/2002	6	16.09	76.8	5	12.83	45.8	4901	
1/8/2002	6	2.5	76.8	5	0.53	45.8	202	
2/22/2002	7	2.6	126	6	1	33.2	277	
3/11/2002	8	0.06	NM					
Annual Average			**79.49**			**36.06**		12/13/02 removed from average TSS calculation
Annual Totals	**8**	**79.94**		**6**	**59.84**		**15,901.34**	

Appendix 2– Carkeek CSO Plant Annual Report

June 2001 – May 2002

This document constitutes the seventh annual report of Carkeek plant as a CSO facility. Carkeek began to operate as a CSO facility on November 1, 1994. The facility currently operates under Washington State Department of Ecology permit number WA-0029181-1 issued to the West Treatment Plant. The permit has been administratively extended by Ecology beyond the original expiration date of December 31,2000 until the issuance of the new permit. The annual monitoring period was modified in October 1999 to be concurrent with the annual CSO reporting period, June 1, 2001 through May 31, 2002.

This report summarizes the performance and operation of the facility during June 2001 through May 2002.

Performance

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;
- 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;"
- 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.

This past reporting period, the facility operated 18 times and discharged 8 times. The discharge effluent was well below the permit requirements with 32 g/l total suspended solids. For the compliance calculations, the data from the November 28 – December 2 event was dropped as the "once per year untreated event." Only two days out of this five-day event were sampled. As the flows of the event portrayed, it was a very unpredictable event and consequently difficult to sample.

With one event dropped, the annual average for settleable solids met the permit limit with 0.29 ml/l/hr. All the events were in compliance of the settleable solids maximum limit of 1.9 ml/l/hr per event.

The Carkeek Overflow Reduction study, which was completed in 2001, indicated that due to the limitations of the equipment at the pump station, and the data used for the current permit limits being based on an unusual dry periods, the plant receives more flows than anticipated during design. Based on these factors, King County is currently requesting a change in the flow and frequency limits. The flow volumes from the eight discharge events of this reporting period totaled 35.26 MG. This is in range with the average annual flow figures for the last seven years (see the following table).

Table 1: Carkeek Plant Operating Data, 1996 through May 2002						
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/YR**	**Limit=8/yr**	**%TSS Removal**	
1996	45	1.2	144.6	10	54	12/29/96-1/5/97
1997	46	0.2	35.1	10	63	3/18/97-3/21/97
1998	29	0.1	45.1	7	59	12/12/98-12/14/98
1999	24	<0.1	42.2	10	61	none
Jun 99-May00	34	0.02	8.39	6	76	none
Jun 00-May 01	0	0	0.11	1	89	10/20/2000
Jun 01-May 02	31.55	0.29	35.26	8	51	11/27/01-12/2/01
5-year average	**23.71**	**0.10**	**26.21**	**7**	**67**	

Note: This table includes additional information that was not available at the time of the June 2000 NPDES Permit Renewal.

Operational Issues

On September 29, 2001 a leak was found along the North Beach force main. The leak was repaired on October 4, 2001 and reports providing details of the incident were sent to Department of Ecology. This event resulted in a Notification of Violation for King County. In response to the Notification of Violation, King County submitted a report describing the steps that were taken to control and monitor the leak. Since the cause of the leak was determined as nonsystematic or preventable, and the pipe is sound and in excellent condition at the repair point, King County does not expect any additional leakage at this line (and thus there is no need for preventive plans). King County also met with City of Seattle staff to discuss issues and plan procedures for responding to unauthorized discharges. On May 24, 2002, King County was issued an Order to pay a fine for this event as well as an Order requiring submission of our spill response manual. The fine was paid on June 19, 2002 and the manual was submitted to Ecology on June 21, 2002.

On October 9, 2001, there was a variable speed drive failure so only one pump was available for 20 minutes. There was also a one-hour power outage on October 12, 2001. Neither resulted in a discharge.

On November 1, 2001, a tree fell into the treatment plant. Branches plugged the suction of a grit drainage pump, and had to be removed by Operations staff. There was no direct impact on the plant's performance or operation.

King County plant operations, offsite operations and planning staffs met with Department of Ecology on November 6, 2001 to present the proposal to increase pumping rate at Carkeek so as to achieve the transfer of 2.25 x AWWF as required. Analysis of plant performance has led the County to conclude that some influent flows were not accounted for in the original design. The facility planning documents were provided to Department of Ecology in January. The plan includes a project, which will increase Carkeek pump station capacity to 9.2 MGD. Instrumentation will be installed at the 11th Ave Overflow weir enabling the pump station to adjust its pumping rate to prevent increased overflows at the ship canal. The project is expected to be complete within the next 12 months. Final control of the 11th Ave CSO will be achieved with a storage project in 2030.

The 24-hr and 48-hr acceptance testing for the new standby generator were completed in March and April of 2002. The generator is now available as the back-up power source to City power but currently it requires manual operation. An Automatic Transfer Switch (ATS) is tentatively scheduled to be installed and in service by the end of September 2002.

Please see the following tables for the summary of the facility performance and operation for the period of June 2001 to May 2002. The following information is important when reviewing the data in Table 2.

- Flow data is reported daily from 00:00 hours to 23.59 hours.
- Sample data is taken from 00:00 hours to 23.59 hours.
- Highlighted data points are conservatively assumed using the events' available data.
- Discharge event effluent TSS (mg/l) = the sum of the whole event (effluent TSS, Mg/l*effluent flow, MG*8.34)/(the total flow of the event)/8.34
- Effluent discharge-outfall (lbs.) = (effluent flow, mg) * (effluent TSS, mg/l)*8.34
- On 8/22/01 event, TSS for influent was 35mg/l and effluent was 279mg/l. King County believes the samples were switched. An addendum explaining the revision will be sent to DOE.
- Event #4 was dropped from the TSS calculation as an once/year untreated event due to insufficient samples collected.

Table 2: Total Suspended Solids (TSS) Performance
June 1, 2001—May 31, 2002

INFLUENT				EFFLUENT				
Date	**Inflow Event Number**	**Influent Flow (MG)**	**Influent TSS (mg/L)**	**Discharge Event Number**	**Effluent Flow (MG)**	**Effluent TSS (mg/L)**	**Discharge Event Effluent TSS (mg/L) "Flow Weighted"**	**Effluent TSS lbs of solids at Carkeek discharged outfall**
6/3/01	1	0.09	58					
6/11/01	2	0.13	177					
6/27/01	3	0.1	324					
8/22/01	4	0.72	279	1	0.31	35	35.00	90.5
10/30/01	5	0.04	250					
11/13/01	6	0.19	123					
11/14/01	6	3.08	40	2	2.65	33		729.3
11/15/01	6	0.11	92	2	0.11	41	33.32	37.6
11/19/01	7	0.29	136					
11/20/01	7	0.14	105					
11/21/01	7	0.05	88					
11/22/01	7	2.95	116	3	2.49	35		726.8
11/23/01	7	0.83	35	3	0.86	19	30.89	136.3
11/27/01	8	0.04	202					
11/28/01	8	1.16	180	4	1.15	33		316.5
11/29/01	8	1.77	53	4	1.58	25		329.4
11/30/01	8	0.32	53	4	0.16	29	28.62	38.7
12/1/01	8	1.67	53	4	1.49	29		360.4
12/2/01	8	0.09	53	4	0.09	29		21.8
12/3/01	8	0.08	102					
12/4/01	8	0.03	161					
12/13/01	9	2.71	165	5	2.11	63		1108.6
12/14/01	9	0.18	74	5	0.11	41		37.6
12/15/01	9	0.72	129	5	0.49	26	37.40	106.3
12/16/01	9	7.51	36	5	6.91	32		1844.1
12/17/01	9	4.1	59	5	3.72	41		1272.0
12/18/01	9	1.13	65	5	0.98	12		98.1
1/1/02	10	0.04	89					
1/6/02	11	0.3	108					
1/7/02	11	4.78	28	6	4.32	23		828.7
1/8/02	11	3.87	24	6	3.51	20	21.66	585.5
1/25/02	12	0.42	51					
2/7/02	13	0.03	120					
2/10/02	14	0.54	90	7	0.19	77	77.00	122.0
2/21/02	15	0.84	85	8	0.24	39		78.1
2/22/02	15	1.95	59	8	1.78	20	22.29	296.9
2/23/02	15	0.03	59	8	0.01	29.5		2.5
3/11/02	16	0.18	143					
4/13/02	17	0.17	239					
5/28/02	18	0.01	113					
Annual Totals	**18**	**43.21**		**8**	**35.26**			**9167.62**
Annual Average Excluding Event #4			**111.97**				**31.55**	

Table 3: Settleable Solids Performance June 1, 2000 through May 31, 2001					
Date	**Discharge Event Number**	**Settleable Solids (mls/L/hr)**	**Event Maximum (ml/l/hr)**	**Event Average (ml/l/hr)**	**Comments**
8/22/01	1	nm			see notes below
11/14/01	2	0.25			
11/15/01	2	0.1	**0.25**	0.18	
11/22/01	3	nm			
11/23/01	3	nm			
11/28/01	4	1.65			
11/29/01	4	0.1	**1.65**	0.88	dropped from calculation as "one untreated event"
12/13/01	5	0.1			
12/14/01	5	0.1			
12/15/01	5	<0.1	**0.8**	0.17	
12/16/01	5	<0.1			
12/17/01	5	0.8			
12/18/01	5	<0.1			
1/7/02	6	0.6	**0.6**		
1/8/02	6	<0.1		0.3	
2/10/02	7	0.8	**0.8**	0.8	
2/21/02	8	<0.1			
2/22/02	8		**<0.1**	<0.1	
Annual Average				0.29	

The following information is important when reviewing the data in Table 3.

- <0.1 is detection limit; bold type indicates value used for the day in the event (highest when multiple tests are run during the day).
- Calculation of average settleable solids values uses 0.0 when value is <0.1.
- Event average = average of daily values during an event.
- Annual event average = average of all event averages during the reporting year.
- Flow data is reported daily from 00:00 hours to 23:59 hours.
- Sample data is taken from 00:00 hours to 23:59 hours.
- nm means not measured; n/a means calculation not available.
- 8/22/01 event's influent and effluent samples were switched. SS was not measured on the influent composite (which is assumed to be the effluent sample). A revised report regarding this event will be sent to DOE.