Combined Sewer Overflow Program

Annual Progress Report to DEQ

ASFO WQ-NWR-91-75
Fiscal Year 01-02

June 30, 2002

ENVIRONMENTAL SERVICES
CITY OF PORTLAND
working for clean rivers

CITY OF PORTLAND
COMBINED SEWER OVERFLOW PROGRAM

ANNUAL CSO PROGRESS REPORT TO DEQ
FISCAL YEAR 2001-2002

As Required by the Amended Stipulated Final Order
(ASFO WQ-NWR-91-75)

CITY OF PORTLAND
BUREAU OF ENVIRONMENTAL SERVICES

JUNE 30, 2002

Annual CSO Progress Report to DEQ for FY 2001-2002

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I. Summary

Portland's Combined Sewer Overflow (CSO) Program continues to implement the array of projects required to meet the City's regulatory commitments. The City has initiated new CSO projects in the Willamette River basin while completing others in the Columbia Slough watershed. These projects and activities are designed to minimize and/or eliminate CSO discharges to the Columbia Slough and Willamette River.

The Annual CSO Progress Report, which is required under the Amended Stipulated and Final Order (ASFO), presents the activities completed during fiscal year that ends June 30. The highlights and note-worthy accomplishments from Fiscal Year 2001-2002 include:

- Completed implementation of projects to control 20 CSO outfalls by December 2001. Thirteen outfalls are on the Columbia Slough and seven are on the Willamette River.
- Developed, submitted and received approval from DEQ for the Update to the CSO Facilities Plan.
- Reported to the Environmental Quality Commission in a public forum on the progress for reducing CSO discharges.
- Submitted the engineering plans and specifications for controlling 16 additional CSO outfalls on the Willamette River.
- Initiated contracts to begin construction of the West Side CSO Tunnel and the large Swan Island Pump Station.
- Completed construction of Segment 2 of the Southwest Parallel Interceptor.
- Completed construction of Tanner Creek Phase 2 Tunnel for stream diversion.

The City of Portland has completed each of the 15 milestones required in the ASFO that have come due since August 1995 through June 30, 2002. In addition, Portland met the next ASFO requirement (Section 12.a-6) for beginning construction of the facilities required to control 16 additional Willamette Outfalls. This milestone was accomplished when the City began construction of the Southwest Parallel Interceptor in October 2001. The ASFO requires construction of these facilities to begin by May 1, 2003. In summary, Portland's CSO Program is on schedule and moving aggressively into the next phase of controlling the Willamette River CSO outfalls.

The significant activities we expect to complete next fiscal year ending June 30, 2003 include:

- Complete additional CSO improvements in the North Portland CSO Basins to increase the level of control on outfalls OF#54, #55 and #56 to the Columbia Slough.
- Complete Segment 1 of the Southwest Parallel Interceptor (Segment 2 completed earlier).
- Begin construction of the Westside CSO Tunnel and the Swan Island CSO Pump Station.
- Continue design and construction of Tanner Creek Stream Diversion Phases 3, and 4
- Complete California CSO Separation for CSO Outfall OF#01.

II. Introduction

Requirement for Annual Progress Report

This annual report to the Oregon Department of Environmental Quality (DEQ) is required under the Amended Stipulation and Final Order (ASFO) No. WQ-NWR-91-75 issued to the City of Portland (City) by DEQ on August 11, 1994. During the period that the ASFO is in effect, the City is required to submit (each year by September 1st) an annual progress report summarizing the City's efforts to eliminate CSO discharges. The report is to contain information on CSO control activities performed during the past fiscal year and identify the CSO Program work planned for the current fiscal year. This report covers the CSO Program activities performed under the Capital Improvement Program (CIP) as well as the planning, operation and maintenance activities performed by the Bureau of Environmental Services (BES) operating programs for the past and current fiscal year.

Portland's Capital Improvement Program (CIP)

The City of Portlands Bureau of Environmental Services manages the planning, design, construction, and implementation (startup) of all capital projects. The CIP is divided into specific functional categories which include: CSO, Maintenance and Reliability and Surface Water Management. The number of capital improvement projects, listed by program area, is shown in Table 1 below.

Table 1 : Projects in Current Capital Improvement Program

Category	Projects Listed at End of FY 01-02	Projects Open During FY01-02
Combined Sewer Overflow	259	14
Maintenance and Reliability	355	29
Mid-County Sewer	86	0
Sewage Treatment	306	22
Surface Water Management	130	12
Systems Development	209	13
Total	**1,345**	**90**

At the end of fiscal year 2001-2002, there were 1,345 individual projects listed in the CIP and 90 projects listed as "open projects" during the year. For the CSO Program, there were 259 CSO projects listed in the CIP (see Appendix A for the CSO Projects in the current five-year CIP). These 259 projects represent the CSO Management Plan in terms of CIP activities as it currently exists within the City of Portland. This report focuses primarily on the accomplishments of those projects. It should be noted, however, that there are projects in other CIP categories that have or will have a positive impact on water quality and the control and/or handling of CSO such as basement flooding control projects and improvements at Columbia Boulevard Wastewater Treatment Plant (CBWTP). These projects are not covered in this report but represent other work BES performs that results in improved control of CSO discharges.

III. CSO Program Background

In 1991, when the Stipulation and Final Order (SFO) was issued by DEQ, approximately 60% of Portland's population weres served by the combined sewer system. When a storm event occurred in the City that exceeded 0.10 inches in a few hours, stormwater runoff into the combined system would cause overflows to both the Columbia Slough and the Willamette River through up to 55 individual outfalls. Model simulations showed that the 1990 combined sewer system would discharge approximately 6.0 billion gallons of CSO to the Columbia Slough and Willamette River for an average year. CSO discharges are estimated to contain approximately 20% untreated municipal wastewater and 80% stormwater.

Since 1991, the City has implemented stormwater reduction facilities (the Cornerstone Projects), improved interceptor system performance, and completed large CSO conveyance, storage and treatment facilities. These activities have resulted in CSO discharges being reduced by more than half city-wide. In the Columbia Slough, CSO events have been eliminated for storms less than 5-year winter or 10-year summer return frequency. Willamette overflows have been reduced from 4.8 billion gallons per year (1990 estimate) to 2.8 billion gallons per year (based on average annual rainfall).

In 1994, the SFO was amended to allow a more cost-effective approach for obtaining appropriate water quality benefits for the Willamette River. The new agreement, the Amended Stipulated Final Order (ASFO) retained a similar schedule such that the CSO controls would be implemented across a 20-year period from 1991 through 2011. Portland has crossed the halfway point of the 20-year program initiated in 1991. The City has met or exceeded each of the regulatory requirements for CSO control identified in the ASFO. The ASFO contains the following major milestones:

- By December 1, 2000, the City must eliminate all CSO discharges to the Columbia Slough for storms equal to or less than the 5-year winter storm and 10-year summer intensities. [Milestone completed.]
- By December 1, 2001, the City must eliminate CSO discharges at 7 Willamette River outfalls for storms less than or equal to a 3-year summer storm and limit winter overflows to four or less per winter on average. [Milestone completed.]
- By December 1, 2006, the City must eliminate CSO discharges at 16 additional Willamette River CSO outfalls for storms less than or equal to a 3-year summer storm and limit winter overflows four or less per winter on average.
- By December 1, 2011, the City must eliminate CSO discharges at all remaining Willamette River outfalls for storms less than or equal to a 3-year summer storm and limit winter overflows to less than four per winter on average.

The ASFO also has a number of intermediate milestones, including submission of this annual CSO progress report to DEQ by September 1 of each year that the ASFO is in effect.

IV. Past Fiscal Year Activities

The CSO abatement activities performed during the period beginning July 1, 2001 and ending June 30, 2002 are categorized in five subsections:

- ASFO Milestones Achieved
- Program Planning Accomplished
- CSO Control Projects Planned, Designed, and/or Constructed
- CSO Operation and Maintenance Activities
- Public Involvement Activities

A. ASFO Milestones Achieved

This past fiscal year contained several significant ASFO milestones that marked the mid-point of Portland's 20-year CSO program. The FY 01-02 milestones and the specific ASFO section consisted of the following:

Required CSO Outfall Control:

- ASFO Section 12.a (4): "By no later than December 1, 2001, the Respondent [City] shall eliminate untreated CSO discharges, subject to the storm return frequencies specified in Paragraph 12.a. of this Amended Order, at 20 of the CSO discharge points, including discharges to Columbia Slough, consistent with the facilities plan approved by the Commission."

  Projects to control the thirteen CSO outfalls on the Columbia Slough were implemented by December 1, 2000 and were part of last year's Annual Report. The first seven Willamette River CSO outfalls were controlled and added to the thirteen from the Columbia Slough to meet the requirement for 20 outfalls controlled by December 2001. The seven Willamette River CSO outfalls and their basins are:

  1. OF08: Mill Basin
  2. OF08A: Jefferson Basin
  3. OF23: Glen Harbor Basin
  4. OF29: Division Basin
  5. OF32: Division Basin
  6. OF48: Fiske B Basin
  7. OF49: St Johns B Basin

- ASFO Section 12.a (6): "By no later than May 1, 2003, the Respondent [City] shall begin construction required to comply with Section 12.a.(7)."

Required Submittals to DEQ:

- ASFO Section 12.a (5): "By no later than December 1, 2001, the Respondent [City] shall submit final engineering plans and specifications for construction work required to comply with section 12.a.(7)" [Control of 16 additional outfalls on the Willamette.]

- ASFO Section 24: "Report to the Environmental Quality Commission (EQC) in a public forum its progress for CSO reductions as outlined in paragraph 23 (environmental improvements beyond the required storm frequency) at a time established by the Commission and the City in the years 2001 and 2010."
- ASFO Section 12.a (11): "By no later than September 1 of each year that this Amended Order is in effect, the City shall submit to the Department and to the Commission for review an annual progress report on efforts to eliminate untreated CSO discharges, subject to the storm return frequencies specified in Paragraph 12.a. of this Amended Order."

One ASFO milestone originally scheduled for December 1, 2001 (ASFO Section 12.d) was rescheduled by DEQ[1]. This milestone required the City to demonstrate that each CSO outfall on the Columbia Slough was controlled to the 5-year winter and 10-year summer storm frequency. Based on information provided by the City documenting the unusually low amounts of rainfall for the December 2000 to December 2001 period, the Department concluded that it would be more valuable to delay the compliance report for one year. The new milestone date of December 1, 2002 will coincide with the requirement to demonstrate the performance level for the first seven Willamette CSO outfalls controlled as of December 1, 2001.

B. Accomplishments in Program Planning

The CSO Program continues to develop and execute planning projects for facilities and activities that will cost-effectively control CSO and assure that the Program meets our regulatory obligations. Important planning activities accomplished during Fiscal Year 01-02 include the following:

Update to Portland's CSO Facilities Plan, December 2001

The City developed and submitted the 5-year report to update the 1994 CSO Facilities Plan recommended methods, schedule and approach to control CSO discharges in accordance with the ASFO requirements. The report documents the changes to the 1994 Plan as a result of new information on the effectiveness and feasibility of CSO control technologies as obtained from field investigation, construction, and overall implementation of the Program. Only the details and specifics of the implementation of the 1994 Plan changed. The recommended approach continues to be a combination of inflow control activities in coordination with large storage, conveyance and treatment facilities.

The Update to Portland's CSO Facilities Plan received DEQ written approval in a letter May 28, 2002 from Robert P. Baumgarnter, Manager of Water Quality at NWR-DEQ.

Portland's Clean River Planning Efforts

The Clean River Plan is a draft strategic approach addressing multiple regulatory requirements and provides the framework to integrate the activities of Environmental

[1] Letter to Virgil Adderley, CSO Program Manager, dated November 21, 2001, from Robert P. Baumgartner, Manager, Water Quality, NWR-DEQ

Services including: CSO control, watershed restoration, stormwater management, operations and maintenance, stewardship, coordination, and flood protection.

- Watershed Planning Efforts: The BES Planning Group is developing five comprehensive watershed plans that will further refine the Clean River Plan. BES staff and team members are developing Watershed plans for Tryon Creek and Fanno Creek the Willamette River, Johnson Creek and Columbia Slough Watersheds. The plans are all currently in the initial characterization stage. This characterization will provide an assessment of the current conditions of the ecological functions of the watersheds. Next steps include determination of the impacts of the built environment on the health of these functions; an analysis of problems and opportunities; and recommended solutions to address these issues. Watershed plans will provide direction and guidance to City-wide regulatory and development efforts aimed at restoring river and watershed health. Specific regulatory requirements that will be addressed include the Clean Water Act (ASFO, TMDLs, and NPDES permits), Endangered Species Act, and Safe Drinking Water Act (UICs).
- City-wide River Renaissance Efforts: The City of Portland is also working to integrate multiple efforts that impact watershed health under an “umbrella” process called “River Renaissance.” The focus of the River Renaissance is to develop common work plans that address watershed health, water quality, the City’s response to ESA-listings, Willamette Greenway, Portland Harbor Superfund efforts, and the Clean River Plan activities. The River Renaissance Management Team, consisting of management level representatives from all of the major city bureaus, is leading this effort.

C. Accomplishments in Predesign, Design and Construction

As noted in Section II, 14 of the 259 projects in the City's CIP directly related to the CSO Program were active during the fiscal year. To be "active" a project must have been in at least one of the following project phases:

- Predesign
- Design
- Advertise/Bid
- Construction
- Startup / Close Out

Appendix A provides a graphical status check for the 14 projects. The major projects are described in narrative summaries below.

Downspout Disconnections FY 01/02

During FY 01-02, the City implemented the Downspout Disconnection Program in the East Willamette Watershed. The Program focused on areas projected to be done in the 1994 CSO Facilities Plan (where sumps are installed) while also performing disconnections in neighboring combined sewer areas in addition to the original 1994 CSO Plan area.

In the East Willamette watershed, downspouts were disconnected at 3,406 homes. This activity is estimated to remove about 68 million additional gallons of stormwater per year from the combined sewer system. Of these homes, 1,529 were located in the original Cornerstone Project area defined in the 1994 CSO Plan. Disconnections in this area are removing about 31 million gallons of stormwater per year from the combined sewer system. The other homes disconnected are in the new Program area outside of the original Cornerstone area.. Finally, 1,274 homeowners (311 from sumped areas) signed up to disconnect downspouts but the work was not completed before the end of the fiscal year. Many homes were surveyed and found to have the roof area already disconnected from the combined sewer.

Since the beginning of the Downspout Disconnection Program through June 30, 2002, the Program has disconnected downspouts at over 16,350 homes removing about 330 million gallons of stormwater per year from the combined sewer system. Of these homes, 12,369 were located in the original Cornerstone area while the remaining are in the new Program area. Counting the homes surveyed and found to have roof area already disconnected from the combined sewer, a total of 34,720 homes are disconnected from the combined sewer system. A map of the downspout disconnections performed during the entire program period as well as during the past fiscal year is provided in Figure 1.

Eastside Inflow Controls Predesign Project

This new predesign project was initiated to specifically define the stormwater inflow control sites, technologies and activities that fulfill the charge of Portland's Clean River Plan. This project was initiated as a direct result of the Clean River Plan's Action #3: Reduce stormwater inflow to the Combined Sewer System. The initial tasks of the project are now complete, which includes a literature review of stormwater control technologies and development of a detailed modeling database with associated model toolsets. The database and toolsets allow staff to build an explicit hydraulic model to incorporate all system pipes - from individual service laterals down to each CSO outfall. It provides detailed simulation of stormwater movement on each property under existing and improved conditions that include inflow controls such as residential downspout disconnection and landscape infiltration.

Tanner Creek Stream Diversion

The Tanner Creek Stream Diversion project continued with construction of the main separation conduit and final design of the remaining segments. This stream separation project is divided into 5 phases. Phase 1 (from 11th & Lovejoy ot 17th & Johnson) and the Light Rail Segment were completed in previous fiscal years.

- Tanner Creek Phase 2: Completed construction of tunnel in NW Portland to connect the Light Rail Segment to Phase I. This work included the temporary closing of Burnside Avenue. Phase 2 was completed successfully near the end of the fiscal year.
- Tanner Creek Phase 3: This section of the project will collect stormwater from the upper reaches of the Tanner Creek Watershed in the Sylvan / Canyon Road area and remove it from the combined sewer system. The separated stormwater will be treated and conveyed to the Willamette. During the last fiscal year, the design effort continued and is about at the 60% stage. BES staff is re-evaluating how stormwater runoff from Highway 26 should be treated before being released to the river.

- Tanner Creek Phase 4: This phase will install a new storm pipe from the upper reaches of Tanner Creek in the Nicolai Basin (north side of Washington Park along Burnside) to connect with the Tanner Creek Phase 2 tunnel at NW Flanders and 17th. This phase consists of 11,000 feet of new storm sewer pipe, ranging in size from 24"-36" in diameter. Design was completed last fiscal year. The construction contract was awarded in June 2002. The Notice to Proceed on construction was issued to the contractor in early July, 2002.
- Tanner Creek Phase 5: Completed construction of 72" CSO pipe to connect existing combined system to the Westside CSO tunnel and preserve the outfall for the separated Tanner Creek flows. The final connection will be completed as part of the West Side Tunnel Startup Project.

West Side CSO Projects

With the completion of the Willamette River Predesign Project, BES created several new projects and immediately initiated design work on the facilities required to control the Westside Willamette CSO discharges. The specific projects and work accomplished include:

California Pump Station Upgrade

During the alternative analysis phase of the project, the project team examined separation alternatives compared against increases to pumping capacity. The analysis showed that the best solution to controlling overflows from the basin was a combination of sewer separation and pumping improvements. This was a change from the initial plan that relied solely on increased pumping capacity.

Following adoption of this preferred alternative, a phased approach was devised that consisted of construction of the separation improvements in 2002 and construction of pump station improvements in 2004. This phased approach allows for monitoring flows to the pump station during the winter of 2003 after the separation is completed and prior to designing final pump station improvements. The design of the sewer separation for California Basin was completed and submitted to DEQ on December 1, 2001.

Carolina Stream Diversion Project

BES continued the design to separate stream and stormwater from the Carolina Basin (OF#03 & 04) by providing stormwater treatment and conveyance of both the stream flows and treated stormwater runoff to the river. At the 30% design phase, the project team identified the need to verify the modeled flows and confirm the amount of flow the 30% design would remove from the CSO system. Therefore, flow monitors were installed at the locations where the streams enter the combined system to measure stream flows during the period of January to May 2002. The next phase will include refining and calibrating the models and revising the alternatives to determine the most cost-effective configuration for separating this stream system from the combined system.

SW Parallel Interceptor

This critical CSO control facility for the Southwest Portland CSO area will control discharges from Outfalls #01 through #07 and is divided into 3 distinct segments that generally parallel Macadam Boulevard. Segment 1 is aligned along SW Virginia from SW Taylors Ferry to SW Sweeney. Segment 2 stretches from Sweeney to Lowell primarily along the railroad right-of-way. Segment 3 will be installed from Lowell to the SW Clay Street drop shaft where it will connect into the Westside CSO Tunnel.

During this past fiscal year, BES initiated construction of the two upstream segments, Segment 1 and 2. Segment 2 is now complete and Segment 1 will be completed during this current fiscal year. Construction of Segment 3 (currently part of the West Side CSO Tunnel, Shafts, Pump Station and Pipelines project) will be initiated during this current fiscal year and is scheduled to complete in 2004.

West Side CSO Tunnel, Shafts, Pump Station and Pipelines

BES completed the design of most of the components of this integrated system that includes 20,000 feet of 14-diameter tunnel at depths from 70 to 120 feet below the ground surface. Project starts north of Lowell St. and terminates with a connection to the existing Peninsular Tunnel near Greeley Ave. The pump station will have a future capacity of 220 MGD but will initially only require 100 MGD capacity to pump the Westside CSO flows to the existing Peninsular Tunnel interceptor.

The construction contractor was selected and placed under contract to help finalize the design and determine options for cost savings. The Notice to Proceed for construction is expected to be issued in the Fall of 2002.

Influent Pump Station Capacity Improvements

BES completed the design for upgrading the CBWTP Influent Pump Station from 105 MGD to 135 MGD capacity to manage the additional flows from the Westside CSO system.

CBWTP Wet Weather Headworks

BES completed design of new headworks structure to allow 150 MGD of wet weather flows to enter CBWTP in addition to the current 300 MGD headworks capacity. This project is required to treat Westside CSO flows that will arrive at the plant in Year 2006.

Sellwood Basin CSO & Relief Projects

BES has been performing several projects in the Sellwood Basin in Southeast Portland to control basement flooding, address structural problems, and reduce CSO. The specific projects and work accomplished this past fiscal year include:

Garthwick Combined Sewer Basin Relief

BES completed design and construction of the new combined sewer relief pipes and partial sewer separation conduits to control CSO discharges to Outfall #26A. Downspout disconnection could not cost-effectively be implemented due to local drainage patterns.

Umatilla Pump Station Upgrade

The design project to upgrade this existing pump station for future CSO control of Outfall #27 was put on hold this past fiscal year due to design conflicts and constraints of the CIP budget.

Sellwood Reliever

Design of this sewer separation and flow re-direction project to reduce CSO discharges at Outfall #27 was placed on hold due to CIP budget constraints.

Sellwood Diversion Manholes

Completed design effort to reconstruct diversion manholes to divert Sellwood combined sewage into Insley Trunk and reduce Sellwood CSO discharges. The construction work for completing these diversion modifications was folded into the Sellwood Interceptor Upgrade Project.

Sellwood Interceptor Upgrade

Designed to replace and improve existing Sellwood gravity interceptor that conveys sewage to the Umatilla Pump Station and reduce CSO discharges to Outfall #27 was placed on hold due to CIP budget constraints.

The Sellwood Reliever, Sellwood Interceptor Upgrade, Sellwood Diversion Manholes and the Umatilla Pump Station Upgrade projects were all delayed due to funding constraints of the CIP as a result of the costs for the West Side CSO facilities. The Sellwood projects are on hold until 2007 when the West Side system is completed.

Columbia Slough CSO Program

Since the completion of the Columbia Slough CSO facilities, the primary work performed on the facilities consisted of operation, maintenance and monitoring. The large Columbia Slough Consolidation Conduit (CSCC) and the related pumping and conveyance system has performed above the required level in controlling storms equal to and exceeding the 5-year winter storm. There has not been an overflow from the CSCC system since it began operation in October 2000.

North Portland CSO Improvements

In the North Portland combined sewer area which lies west of the Columbia Boulevard Wastewater Treatment Plant (CBWTP), the CSO control facilities consist of sewer separation, stormwater treatment and diversion structure improvements. Results of monitoring the diversion structures during December 2001 and January 2002 showed that the separation performed in the St Johns, Oswego and Oregonian basins was insufficient to prevent overflows during storms smaller than the minimum allowed by the ASFO. In response to this information, BES analyzed the source of flows and possible solutions through field investigations and detailed modeling. As of June 30, 2002, the 90% design of new relief conduits and diversion manholes was completed. Design was completed in the current fiscal year (July 2002) and followed soon by contract bid

and award under an accelerated process. Construction of the new facilities began in August 2002.

Columbia Slough CBOs

Community Benefit Opportunities (CBOs) are specific improvements or enhancements to the community environment that are performed as part of the large CSO construction projects. The enhancement must be related to the CSO project and must be consistent with the mission of the Bureau of Environmental Services. Several CBOs were completed in the Columbia Slough basin as part of the CSO facilities in the fall of 2000. **Table 2** below describes the CBOs, their related CSO Project, and their status at the end of the last fiscal year.

Table 2 : CBOs Implemented by Columbia Slough CSO Program

Project Number	Project Name	CBO Task Name	CBO Task Description	Status
6182	CSCC Segment 2	Interstate Place Pedestrian Improvements	Construction of a sidewalk on the north side of Columbia Blvd at Interstate Place.	Completed
6182	CSCC Segment 2	CSCC Trail Noise Berm	Placement of tunnel mining spoils to create a noise berm as a barrier between residential neighborhood and North Columbia Boulevard. The noise berm is west of North Chautaqua Boulevard.	Completed
6183	CSCC Segment 3	Farragut Park Parking Lot Removal	Demolition and regrading of a nuisance parking lot at Farragut Park.	Completed
6184	CSCC Segment 4	Columbia Boulevard Frontage Improvements	Construct walkway from Kenton Park to N Chautaqua Blvd with sidewalks connecting to neighborhood streets. Project includes surface restoration, landscaping improvements, adding street trees, removal of nuisance vegetation and cleaning up years of accumulation.	Completed
6603	CSCC Segment 4B	Penninsular Junction Sidewalk	Construct walkway and landscaping improvements along the south side of Columbia Boulevard from North Chautaqua Boulevard to North Portsmouth Boulevard.	In Construction
6652	CSCC Segment 4C	Columbia Slough Trail	Construct pathway on top of the levee on the north side of the Columbia Slough from North Denver Ave to North Vancouver Ave.	On hold due to lack of easements
6286	CBWTP Wet Weather Treatment Facilities	Environmental Enhancements	Construct connecting trails to the 40-Mile Loop Trail, construct canoe landing and provide environmental enhancements to the area east of CBWTP.	Completed

D. CSO Operation and Maintenance Activities

During the year the City continued implementation of operation and maintenance practices that reduce the impact of CSOs and stormwater on the receiving streams. These activities capture and remove pollutants, floatables and debris from the stormwater before it is discharged to the receiving streams from the CSO outfalls. The following information provides the magnitude of the city-wide effort.

- Sewer Cleaning: 169 miles
- Catch Basin / Inlet Cleaning: 15,400 units
- Drainage Sump/Sedimentation Manhole Cleaning: 1,882 units
- Street Sweeping: 62,300 curb miles

The maintenance activities described above that are performed and recorded specifically in the CSO area include the following:

- Sewer Cleaning: 111 miles
- Drainage Sump/Sedimentation Manhole Cleaning: 914 units
- Street Sweeping: 25,400 curb miles

The data to determine the split between the numbers of catch basins cleaned on a city-wide basis versus only in the CSO area was not available.

Diversion Structure Inspections and Modifications

The Diversion Structure Inspection Program, in which Portland inspects each active diversion structure once a week, was modified last fiscal year to address the redundancy in the CSO control system. The Columbia Slough Consolidation Conduit (CSCC) and other sewer system improvements provided new protection that prevented overflows from approximately 40 diversion structures from reaching the Columbia Slough or the Willamette River. Ten of these diversion structures are sealed off and no longer need to be inspected. 30 of the diversion structures will be inspected bimonthly or as needed to assure proper performance. For the remaining 130 diversion structures, BES will continue to inspect each active diversion structure on a weekly basis. The change to the Inspection Program was implemented in October 2001. Overall, the City performed approximately 8,000 diversion inspections last fiscal year.

As a result of Diversion Structure Inspection Program and the flow monitoring system installed on many diversions, the City modified six diversion structures during the past fiscal year to improve performance or address maintenance issues specific to the structure. The diversion structures that were modified are summarized in Table 3 below.

Table 3 : Diversion Structures Modified FY 01-02

Diversion Manhole Number	Status	Street Location	Modification Performed	Date of Modification	New Dam Height (feet)
EC17	Abandoned	N. Greely, 1630 feet from Interstate Ave	Removed orifice, re-built diversion channel and manhole to send all flow to interceptor. Sealed off overflow pipe.	19-Sep-01	N/A
SE126	Abandoned	SE McLoughlin & Woodward	Rebuilt manhole to send all flow to interceptor. Sealed and abandoned overflow.	5-Sep-01	N/A
WC100A	Active	NW 21st near Sherlock	Replaced rotten wood extension on dam top; raised dam 10 inches	4-Jan-02	2.6
SE195	Active	Waverly Golf Course	Poured new manhole, raised dam to springline of pipe	2-Nov-01	0.57
NW29	Active	N. James St., 300 feet North of Bruce St.	BOM raised dam 14 inches. Reshaped downstream channel to improve hydraulic performance.	19-Dec-01	2.83
SJ31	Abandoned	N. Van Buren & Bradford	Inflow reduced by sewer separation. Sealed off 18-inch storm overflow with bricks, flashing and grout. All flows goes to interceptor / treatment plant.	11-Dec-01	N/A

Monitoring Information Analyzed FY01-02

During this past fiscal year, the City of Portland implemented an important study of the instream water quality data collected on the Willamette River in the CSO area. The study was performed in response to the clearly observed reductions in E coli concentrations in the Willamette since 1995 when the Cornerstone Projects were initiated in the Willamette CSO area. A short summary of the "E coli Trend Analysis for the Willamette River" is provided below. A more extended summary of the study is provided as Appendix B for this report.

Summary of the "E coli Trend Analysis for the Willamette River"

Measured E coli concentrations in the Willamette River through the City of Portland have decreased from 1995 to the present. Because E coli concentrations are influenced by a number of factors, the City wished to determine whether the decrease was significant and if the decrease could be attributed to CSO reductions or whether it was primarily due to changes in precipitation and contributions of E-coli from upstream sources. To address this question, a statistical analysis of the City's monitoring data was conducted by Dr. Jim Loftis of Colorado State University.

The study used a widely applied statistical method, linear regression, to determine whether the observed changes in E coli concentration were larger than one would expect given the inherent natural variability of the E coli measurements and observed changes in other factors. The study utilized an extended period of record, back to 1992, to identify pre-Cornerstone Project conditions, by estimating E coli concentrations from measured

fecal coliform concentrations prior to December 1995. The effect of changing rainfall over the period was considered by including 24-hour precipitation in a linear regression model. The effect of changing upstream contributions of E coli was incorporated into the analysis techniques. In order to minimize the effect of measurement errors and assumptions, the statistical analyses relied primarily upon the rank order of the E coli observations rather than on the actual numerical values.

The overall conclusion of the study was that significant evidence exists that observed changes in E coli concentrations over the entire study period, 1992- present, were greater than those one would expect from natural variability within the period. Thus, there is statistical evidence to support the conclusion that the Cornerstone Projects and CSO controls have been effective in reducing instream E coli concentrations in the Willamette River.

E. Public Involvement, Education and Information Activities

CSO Program public involvement activities have expanded to meet the needs of individual projects identified by the Willamette CSO Predesign Project. As projects move from design to construction, the goals listed below are met through the public involvement activities:

Goal 1: Inform and involve residents and businesses within the proposed alignment area and the broader public about key issues such as alignment, construction schedules and traffic plans.

Goal 2: Develop and maintain good working relationships between the public and project team members.

Goal 3: Meet design and construction timelines and minimize community impacts.

Goal 4: Respond to individual citizen or business concerns within 24 hours.

Goal 5: Help complete projects on time and within budget.

Public involvement plans have been developed for each Columbia Slough and Willamette CSO project.

Columbia Slough CSO projects successfully involved citizens in project design decisions. The CBWTP Citizen Advisory Committee (CAC) met and provided input to CSO projects during the year. Several of the CAC members served on the Conduit Steering Committee and the Outfall Advisory Committee, which provided input to outfall design and construction. Citizens provided input to the Columbia Slough Consolidation Conduit (CSCC) and the CBWWTF Outfall Project which are now constructed and fully operational. The Bureau and community members together celebrated the completion on the Columbia Slough projects by holding a community fair at the Columbia Boulevard Treatment Plant.

Outreach activities for the West Side Willamette River CSO Projects continued during the past fiscal year. The West Side Willamette River CSO Projects included the: Westside Stream Diversion, Southwest Parallel Interceptor, Ankeny Pump Station, West Side CSO Tunnel and Shafts, Cheltenham Storage, and Tanner Creek Stream Diversion.

Outreach activities have been conducted during predesign and design and will continue to be conducted during construction of these projects. Outreach provides businesses, residents and neighborhood groups with project information and opportunities to give input on project decisions, including: pipe alignment, construction mitigation measures and traffic plans. These activities are tailored to the needs of and impact to area communities and have included:

- **Databases** - Developed 22 databases containing over 31,850 residents and businesses. This information helps the bureau keep business and residential property owners, neighborhood, business and tenants associations and other stakeholder organizations within the project area informed about the project.
- **Project Fact Sheets** - Developed 42 project fact sheets and distributed them to over 150,000 citizens and businesses to provide an overview of the CSO program, background information on the project, the purpose of the design and construction phases. BES also provided a mail-in feedback form to solicit community input.
- **Citizen Advisory Committees** - BES developed and convened the Businesses for Clean Rivers Advisory Committee. This committee provides direct feedback and advice during our construction phase of the tunnel and shafts projects. In addition, the CBO Selection Committee was formed to assist with recommending projects for the Community Benefits Opportunity Program.
- **Community Presentations** - Provided 49 presentations for 1,688 meeting participants representing neighborhood, business and tenant associations as well as to other key stakeholder groups within the project area to provide an overview of the CSO program, the project and design and construction issues.
- **Public Meetings** - Held 17 meetings during project design and construction phases to provide more detailed information on the recommended alignment and solicite concerns and ideas regarding the project.
- **Site Visits** - Conducted 931 site visits with businesses and residents along construction routes and within the project area to resolve design and construction issues. These issues include business and residential access, parking, construction hours and traffic management.

In addition to involving impacted communities in CSO project decisions, the Bureau is committed to educating the public about environmental issues.

- **Educational Presentations** focusing on water quality issues were provided to Portland schools and community groups. Environmental Educators made over 500 presentations. A special Combined Sewer Overflow presentation is available for students in grades 6 to 12. Students learn the history of the CSO problem, talk about solutions, and how they can help. More than 15,000 students were contacted with information about river pollution problems during the fiscal year. This is not counting an additional l0,000 students that received the all school assembly program entitled “River Heroes.”

- **New development on the horizon:** Currently, the upcoming All School Assembly Program is being adapted to include a new, original story about the history of the CSO project in Portland. We are also taking citizens that are keenly interested in the status of the CSO

program on four Willamette River jet boat trips this summer. The BES Education Advisory Committee has begun to help the Clean River Educators brainstorm new, improved components to the classroom "It's an Overflow" program for this coming year. Work is also being done to establish a new contract to update the CSO video.

- **22 Educational Tours** of the Willamette River have been provided to youth and adult groups who have received presentations and learned about the City's CSO program. Typically any youth group that wants to do a jet boat tour is required to first receive the "It's an Overflow" program as a prerequisite.

- **OMSI display** – OMSI exhibit staff developed the concept for a 5 year exhibit that would be housed in the museum's main science section (just outside the Watershed Lab). The exhibit would highlight the CSO program components. OMSI will work with BES to seek partners to sponsor the construction of the exhibit.

Public Notification/River Alert Program includes 55 CSO identification signs that indicate where outfall pipes are located. It also includes 14 folding signs with the message "WARNING: SEWAGE" and the River Alert Hotline number, 503-823-2479. The public can call the hotline at any time to hear a message about the CSO program and to learn if a CSO advisory is in effect. The folding signs are opened and closed every time there is an overflow from May 15 to October 15 each year. During the winter months, the signs remain open with the message in view for boaters and other river users. The River Alert program notifies the media (by fax) every time there is an overflow from May 15 to October 15. The Oregonian newspaper publishes an overflow icon on the top of the weather page when overflows occur.

- **Clean River Projects Construction Signage** requires contractors to post signage at any sewer system-related construction site with the Clean Rivers message to inform the public that the construction is a sewer project designed to keep our rivers and streams clean.

- **Media Relations** draw the media's attention to CSO projects. Media advisories, news releases and media events are used to alert the media about CSO projects. Individual briefings are also held with reporters. The City provides timely, accurate responses to all media requests and keeps files of all newsprint and broadcast media coverage. This past year, 30 media notifications regarding combined sewer overflow projects were released. Eleven were related to actual combined sewer overflows during the summer notification period.

- **Five CSO media events** were held in the last year.
  1. In August 2001, Environmental Services closed a section of West Burnside Street – a major Portland arterial – to dig a trench to install a section of the Tanner Creek Stream Diversion Project. The Tanner Creek project is part of Portland's CSO abatement program. To publicize the closure and detour information, Environmental Services held a news conference at the site four days before the closure and made staff available for live interviews on the morning of the closure.
  2. In October 2001, Environmental Services held a news conference on West Burnside to announce the completion of the project one month ahead of schedule.

3. On October 13, Environmental Services sponsored a street fair on West Burnside for merchants and residents who were affected by the two month closure of West Burnside.
4. On April 18, 2002, Environmental Services co-sponsored a forum on CSO project subcontracting opportunities for firms owned by minorities and women, and for emerging small businesses.
5. On April 25, 2002, Environmental Services held a briefing for local media on plans for the West Side CSO Projects and reductions in Willamette River bacteria levels since the CSO program began.

- **Bill Inserts** were enclosed in water/sewer bills to provide residential customers with information about West Side CSO construction. Bill inserts were included with residential water/sewer bills beginning June 3, 2002. Throughout the summer, 165,000 customers will receive the information.

- **The Internet** was used to provide current information about the City's CSO programs to the general public. CSO information is available at http://www.cleanrivers-pdx.org. In addition, Environmental Services launched a separate website dedicated entirely to CSO construction projects, schedules, and impacts at http://www.cleanriverworks.com.

V. Planned Efforts for Current Fiscal Year

Fiscal Year 2002-2003 activities to reduce CSO continue the implementation of the 20-year program to plan, design, construct, and operate Portland's CSO control system. The activities this fiscal year can be briefly summarized as follows:

- Begin large scale construction of the West Side Willamette CSO Tunnel and Swan Island Pump Station
- Begin preliminary design of the East Side Willamette CSO Tunnel System
- Continue operating, maintaining and monitoring the Columbia Slough CSO System to assure compliance with the ASFO and the NPDES Permit
- Continue implementation of stormwater inflow reduction projects in the form of the Downspout Disconnection Program

The current year's work is divided into the same five subsections used for the previous year's efforts.

A. ASFO Milestones to be Achieved

This fiscal year contains two ASFO milestones that address required submittals to DEQ. One submittal is the Annual CSO Progress Report. The other important submittal will demonstrate that the thirteen Columbia Slough Outfalls and the seven Willamette Outfalls have been controlled and meet the performance standard of the ASFO. The City is committed and positioned to achieve both of these ASFO milestones for this fiscal year:

- ASFO Section 12.d: Requiring Respondent to demonstrate that each untreated CSO discharge has been eliminated, subject to the storm return frequencies specified in

Paragraph 12.a. of this Amended Order, by a means approved by the Department, within twelve months of the scheduled date when compliance is required in this Amended Order.

- ASFO Section 12.a (11): By no later than September 1 of each year that this Amended Order is in effect, the City shall submit to the Department and to the Commission for review an annual progress report on efforts to eliminate untreated CSO discharges, subject to the storm return frequencies specified in Paragraph 12.a. of this Amended Order.

B. Program Planning to be Accomplished

CSO Program level planning will continue during the current fiscal year. The activities that will support the CSO Program include:

- Portland's Clean River Planning Efforts: The CSO Program staff will be working with the BES Planning Group to further integrate the stormwater elements of the CSO Program into the watershed approach directed by the Clean River Plan.
- The BES Planning Group will continue the top priority planning efforts to further refine the Clean River Plan. These efforts consist of the Willamette River Watershed Plan, Tryon-Fanno Watershed Plan, and the BES Monitoring Plan.
- The City of Portland will also continue the new efforts to integrate key city functions that impact watershed health under the "River Renaissance." BES will continue to lead and participate in the River Renaissance Management Team, which will direct the work to integrate the city activities. BES is one of three bureaus serving as the executive committee for the River Renaissance Management Team.

C. CSO Projects to be Predesigned, Designed and/or Constructed

The CSO control projects that will be in the predesign, design and/or construction phases during the current fiscal year include:

- North Portland CSO Improvements: Construct new diversion structure manholes and underflow pipe capacity to direct excess wet weather flows to the St. Johns interceptor. The construction activity will be completed by December 1, 2002 and will provide a new, higher level of control at Outfalls #54, #55 and #56.
- Southwest Parallel Interceptor: Continue construction of Segment 1 of the Southwest Parallel Interceptor and initiate construction of Segment 3. Once completed, the Southwest Parallel Interceptor will help control CSO from OF#01 through OF#07.
- Tanner Creek Stream Diversion: Begin construction on Phase 4 (Nicolai basin / Burnside) and continue design efforts on Phase 3 (Sylvan /Canyon) segments of the Tanner Creek Stream Diversion Project.
- Initiate construction of the West Side Willamette CSO Facilities consisting of the West Side Tunnel, Swan Island Pump Station and the Peninsular Forcemain. This will be the first year of a 4-year construction effort to implement this large, complex and difficult to

construct CSO control system. This effort will provide CSO control for Outfall #07 through OF#15.

- Preliminary Design of the East Side Willamette CSO System will be initiated this fiscal year through two parallel activities that are scheduled to be completed in FY03-04.
  - CSO Sizing and Flow Management Predesign Project: This project (short name - "Flow Management Project") will examine the latest information on combined and stormwater flows that can impact the Willamette CSO System. The project will evaluate the sizing, system operation, water quality and cost-effective options available to the City in determining the final size and uses of the Eastside CSO Tunnel.
  - East Side CSO Tunnel Predesign: This project focuses on the horizontal and vertical alignment, connections, and final preliminary design parameters for the East Side CSO Tunnel. It will use the final size recommendation from the Flow Management Project in developing the 30% design for the tunnel and related facilities.
- Continue Implementation of Inflow Reduction Projects: Implement Phase III of the Downspout Disconnection Program. This work expands the downspout disconnection activities into the central Eastside combined areas that are outside of the original Cornerstone Project areas.
- The Eastside Inflow Controls Predesign Project: Project to determine the stormwater inflow control sites, technologies and activities that will cost-effectively reduce CSO and basement flooding. This fiscal year, models for each individual Eastside CSO basin will be built and an automated modeling process used to determine cost effective locations for stormwater inflow controls. Elimination of basement flooding and reductions in CSO operating costs will be the primary cost-effectiveness criteria, with inflow control costs being compared to a pipe-only conveyance alternative. Specific sites and control technologies will be recommended based on GIS, hydraulic modeling and field analyses.
- Carolina Stream Diversion Project: Explicit modeling information and data from flow monitors installed last fiscal year will be used to refine and calibrate a new Carolina Basin model and develop alternatives to evaluate cost-effective separation and stormwater treatment options.

D. CSO Operation and Maintenance Activities Planned

During the current fiscal year the City will continue the implementation of operation and maintenance practices that reduce the impact of CSOs on receiving streams. This City-wide effort will include the following project work:

- Sewer Cleaning: 180 miles
- Catch Basin/inlet Cleaning: 16,000 catch basin/inlets
- Drainage Sump Cleaning: 1,800 sumps/sedimentation manholes
- Street Sweeping: 54,000 curb miles
- Diversion Structure Inspections: Perform weekly inspections on all active diversion structures that directly overflow to the receiving

stream; perform routine inspections on all other active diversions as needed for maintenance and proper performance.

E. Public Involvement Activities Planned

BES will continue to educate and identify opportunities for Portland residents, businesses and neighborhood groups to participate in CSO and watersheds enhancement projects. The City will expand efforts to increase citizen participation in project decisions, raise awareness about watershed issues and encourage citizens to become stewards for the Portland watershed. The Bureau will work closely with Neighborhood Coalition Offices and Associations to raise awareness about the CSO program, gain active public input on project decisions, and involve more citizens, businesses and neighborhood groups in watershed protection and restoration efforts. This year's activities include:

- Work with citizen committees and work groups to address issues regarding CSO project designs and construction plans;
- Continue support of the Businesses for Clean Rivers Advisory Committee;
- Develop informational materials that explain CSO projects, time lines, construction mitigation plans and opportunities to enhance impacted communities;
- Conduct watershed walks and boat tours;
- Implement public awareness campaign (known as the Big Pipe campaign) to alert communities to the West Side CSO construction;
- Implement the Willamette Stormwater Inflow Control Projects to encourage and assist commercial and industrial property owners in the combined area to remove stormwater from the combined system by creating on-site stormwater infiltration facilities. These facilities use more natural systems like swales, wetlands and native vegetation to detain and treat stormwater;
- Implement the Community Benefits Opportunity Program projects;
- Provide educational CSO classroom presentations;
- Provide guided tours, such as the jet boat tours;
- Continue CSO River Alert signage and notification program;
- Distribute City-wide newsletters and quarterly bill inserts that inform citizens about the CSO program, watershed restoration activities and how citizens help protect Portland watersheds.

VI. Conclusions

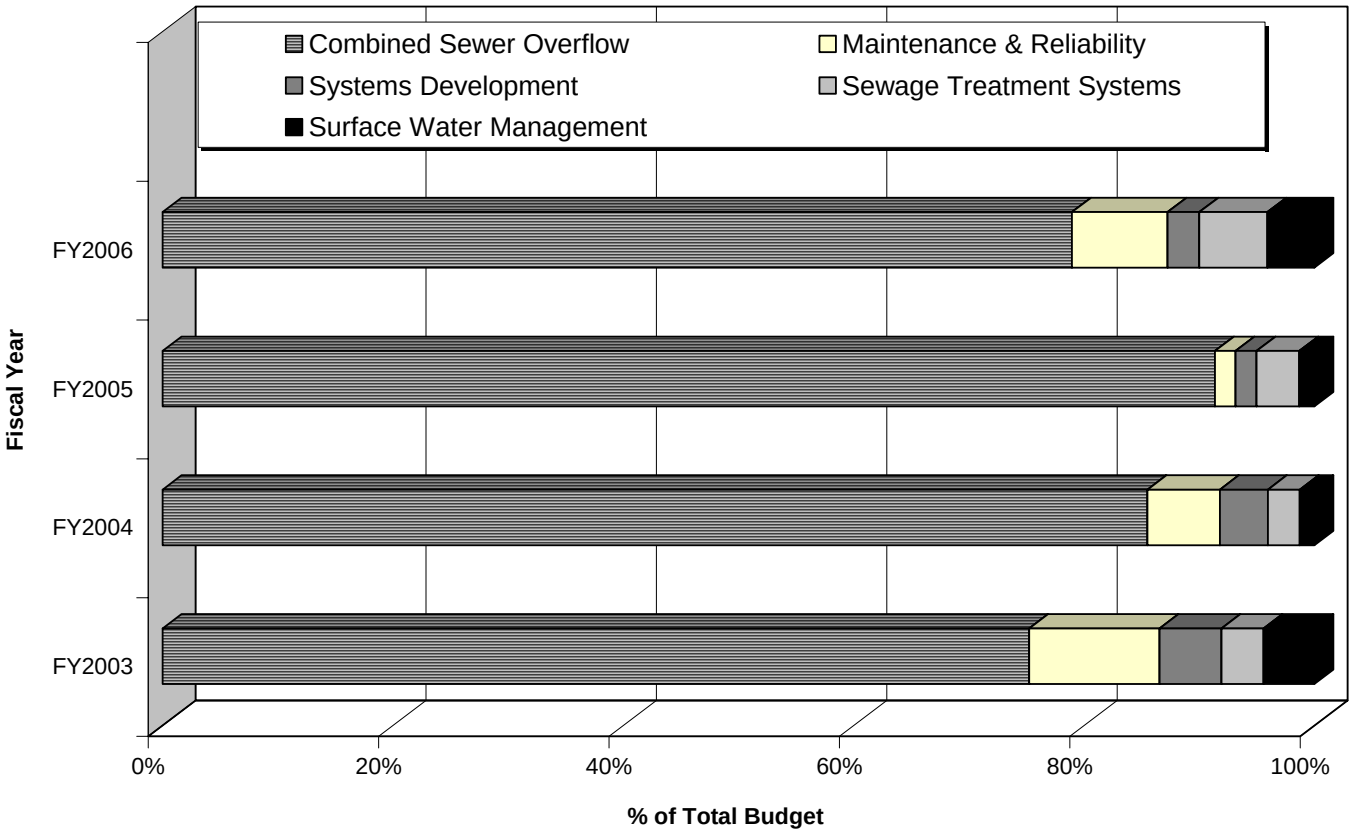
This past fiscal year, the City met multiple ASFO milestones that mark the halfway point in the 20-year program to control CSO. Portland's effort has resulted in significant and measurable water quality improvements to the Columbia Slough and Willamette River. The milestones accomplished include:

- Completed projects that control CSO discharges from thirteen outfalls on the Columbia Slough and seven on the Willamette River.
- Developed, submitted and received approval of the Update to the CSO Facilities Plan.
- Reported to the Environmental Quality Commission in a public forum on the progress for reducing CSO discharges.
- Submitted the engineering plans and specifications for controlling 16 additional CSO outfalls on the Willamette River.
- Initiated contracts to begin construction of the West Side CSO Tunnel and the large Swan Island CSO Pump Station.
- All 15 of the 38 SFO/ASFO milestones have been met on schedule.

The CSO Program is now initiating a massive construction effort to build the West Side CSO Tunnel and Swan Island CSO Pump Station. At the same time, the City is implementing additional inflow controls on the East Side Willamette River and designing the final configuration of the East Side CSO Tunnel System. In the Columbia Slough area, Portland will be enhancing North Portland CSO facilities to meet a higher design standard and address excess wet weather flows. The City will continue to monitor the performance of the overall Columbia Slough CSO System to assure that it meets the ASFO and NPDES permit requirements. To support all of these activities, the City is applying a high level of resources in terms of CIP dollars, staff hours and public participation. This high level of effort must continue for several years to meet the ASFO requirements.

The cost of the CSO program has caused significant shifts in the planning, scheduling and budgeting process for the Capital Improvement Program. The difficulty of funding the CSO program can be seen in the breakdown of the CIP budget by Program from Figure 2 below. Over the next 4 years, the CSO program will consume an average of 85% of the total annual CIP budget of about $95 million/year. The cost of the CSO Program is limiting the available funds for other programs such as Maintenance, Treatment and Watersheds (Surface Water).

Figure 2: Annual Capital Improvement Budget Breakdown by Program



APPENDIX A

CITY OF PORTLAND - BES

CSO Capital Improvement Program Implementation Schedule

(Appendix A contains 33 pages including this title page)

APPENDIX B

CITY OF PORTLAND - BES

E coli Trend Analysis for the Willamette River in Portland

Summary Report produced by BES Communications

Decreasing E. coli Concentrations in TheWillamette River

April 2002

Water quality in the Willamette River has shown a definite reduction in bacteria concentrations since regular monitoring began in 1992. That is roughly the same time frame the City has been implementing its Combined Sewer Overflow (CSO) control program. The City expects even more dramatic reductions in bacteria concentrations in the river as we approach the completion of the CSO program in 2011. This report represents Environmental Services routine monitoring on the Willamette River over approximately nine years and includes over 4600 sample results.

Reductions in Willamette River bacteria concentrations could be due to a number of factors, so the Bureau of Environmental Services set out to determine the cause of the improvement. Reductions in bacteria are closely linked to the amount of precipitation in Portland. Since rainstorms cause Portland's combined sewer system to overflow, the overflow volume fluctuates depending on the amount of rainfall. The volume of CSOs is also steadily declining as Portland's Bureau of Environmental Services moves forward with a CSO control program launched in 1991.

CSOs are a significant source of fecal bacteria and they limit public use of the Willamette River during wet weather. CSOs and sewer systems are not the only source of bacteria in surface water. Streams can carry bacteria from soils and animals. This report evaluates the effectiveness of the early phases of Portland's CSO control program in reducing fecal bacteria in the Willamette River.

Portland's Sewer History

In the City's early days, Portland built sewers that combined rainwater and raw sewage in the same pipe and carried the wastewater directly to the river and the Columbia Slough. The sewer system was designed in this manner to protect public health, but eventually had negative impacts on water quality. The negative impact on the Willamette River became clear as the City grew. Sewage, cannery waste, and industrial wastewater poured into the river every day. The pollution was killing aquatic life and threatening public health. A City report issued in 1949 said, "The present condition of the river prevents its use in industry over a long period of the year."

In 1951, Portland finished building its Columbia Boulevard Wastewater Treatment plant and completed construction of large interceptor sewers along the Willamette River and Columbia

Slough. In dry weather, interceptors on both sides of the Willamette redirect sewage to the treatment plant. During rainy weather, Portland's combined sewer system collects stormwater runoff from streets and sanitary sewage in the same pipes. These combined sewers carry most of the wastewater to the treatment plant but some sewage overflows to the Willamette River during wet weather. This basic collection and treatment system cleaned up the river considerably, but the job was not finished.

Combined Sewer Overflows

Portland took the first steps toward reducing CSOs in the 1970s by increasing the capacity of some combined sewers. At that time, the system dumped an estimated 10 billion gallons of combined sewage into the river and Columbia Slough each year. Annual CSO volume had been cut to six billion gallons by 1991 when the City launched a formal 20-year effort to further reduce CSOs. Through a combination of structural improvements and projects to divert stormwater runoff from combined sewers, the City has reduced CSO volume by 53% in the past decade. Here are some of the steps taken:

Stormwater Inflow Reductions

- In 1995, Portland eliminated combined sewer outfalls at Southwest Mill and Jefferson Streets by building separate sewers for stormwater in downtown Portland.
- In 1997 and 1999, Portland built separate storm sewers in the Fiske B and St. Johns B basins to eliminate two CSO outfalls in north Portland.
- Environmental Services has installed thousands of street sumps and sedimentation manholes and has disconnected thousands of residential downspouts to divert millions of gallons of stormwater from the combined sewer system.

Sewage Inflow Reductions

- Environmental Services obtained a Portland City Council resolution and inter-bureau agreements to limit discharges of water to the sewer system from fire hydrants, drinking water reservoirs and storage tanks. Large discharges of water to the sewer system can cause CSOs.
- The Environmental Services Illicit Discharge Elimination Program has identified and corrected many illegal and accidental sewer connections to storm sewers and combined sewers.

Diversion Improvements

Diversion structures prevent wastewater collected by interceptor sewers from overflowing during dry weather. When combined sewer pipes fill to capacity during rainstorms, some stormwater mixed with raw sewage flows over these diversion structures, through CSO outfall pipes, and into the Willamette River.

- Environmental Services modified a diversion structure and sealed off the Glen Harbor CSO outfall near Linnton.
- In 1993 and 1994, Environmental Services modified 70 diversions to send more flow to the treatment plant and reduce CSOs.

- Between 1997 and 2001, Environmental Services made similar modifications to an additional 30 diversions.
- In 1992, sewer maintenance inspections of diversions increased from once a month to once a week to detect and fix blockages that can cause CSOs.

Pump Station Improvements

- The Sullivan Pump Station increased pumping capacity from 100 million gallons per day to 135 million gallons per day to reduce CSOs.
- Larger overflow weirs were installed at both the Ankeny and Sullivan pump stations to capture more sewage flow and send it to the treatment plant instead of the river.

Collection System Improvements

- The Southeast Relieving Interceptor went into service in 1996 and diverts a large volume of sewage away from Willamette River outfalls and sends it to the treatment plant.
- The City cleaned and inspected major sewer pipes in 1996.
- Large sewer failures in the Waverly Moorage and Rose Garden areas were repaired.
- Continual reconstruction of aging sewer pipes has reduced groundwater infiltration to the sewer system.
- Sewage storage conduits installed in the Alder basin of southeast Portland have reduced basement flooding, increased sewer capacity, and reduced CSOs.

Water Quality Monitoring

The City of Portland has worked to protect and improve water quality in the Willamette River for 50 years. The City began monitoring Willamette River water quality in 1949 and did periodic monitoring for the next 40 years. In 1992, Portland's Bureau of Environmental Services began regular water sampling in the lower Willamette River to document trends in fecal coliform concentrations in the Willamette.

Fecal coliform bacteria (bacteria that originate from the intestinal tracts of warm-blooded animals) don't usually cause diseases in humans, but they can provide a reliable means of measuring the amount of sewage contamination. Environmental Services began monitoring fecal coliform in 1992 and changed to the *E. coli* standard in 1996 in accordance with changes in state regulations.

Environmental Services collects water samples from the river at four locations; 1) Waverly Country Club, 2) Morrison Bridge, 3) St. Johns Railroad Bridge, and 4) Kelley Point Park. Since systematic sampling began in 1992, all locations (except Kelley Point Park during the dry season) have shown significant reductions in *E. coli* concentrations. *E. coli* concentrations at Kelley Point Park were already low due to the influence of the Columbia River and the distance from the nearest CSO outfall.

Methods and Materials

- Environmental Services field operations staff collects water samples from a boat on a regular schedule.
- Samples are analyzed at the Bureau's Water Pollution Control Laboratory.
- Samples are collected at four locations on the Willamette River between river mile 17.9 and river mile 1.1.
- At each location, staff collects samples from points on the east side, middle, and west side of the river.
- Samples are taken at a depth of three meters at each point.

Data Analysis

- Environmental Services stopped collecting samples at the Tryon Creek location in June 2000 because of the proximity of a City of Milwaukie sewage treatment plant.
- Environmental Services added the Waverly Country Club sampling location in February 1995 as the City's upstream boundary.
- Monitoring seasons are divided into a dry season (May through October) and a wet season (November through April).
- Average stream velocity at each sampling location is based on stream velocity measurements taken by the U.S. Geological Survey at the Morrison Bridge.
- The City asked Dr. Jim Loftis of Colorado State University to conduct an independent review of its water quality monitoring data. His report is attached as Appendix A.
- Monitoring periods are divided into the time before CSO controls began (November 1992 through April 1996) and after CSO controls began (November 1998 through October 2001). May 1996 through October 1998 is considered the transition period.

Kelley Point Park

This location has consistently had low average concentrations of *E. coli* bacteria since monitoring began. This is due to the close proximity of the Columbia River and the long distance from the nearest CSO outfall. *E. coli* levels have declined 33% during the wet season at this monitoring location. The dry season results after CSO controls began have not shown a decrease.

St. Johns Railroad Bridge

This location has had the highest average concentration of *E. coli* bacteria. It is close to several large CSO outfalls in downtown, north, and northwest Portland. *E. coli* concentrations at this point have decreased 43% in both wet and dry weather seasons since 1992. This location is likely to show the most improvement when the West Side CSO Tunnel goes into operation in 2006.

Morrison Bridge

The reduction in *E. coli* concentrations is the most dramatic at the Morrison Bridge, dropping 59% in the dry season and 51% in the wet season. Sewer improvement projects in southeast Portland in 1996 significantly reduced CSO volume entering the river upstream of the Morrison Bridge and probably contributed to the reduction in *E. coli* concentrations at this location. This

spot showed some of the highest *E. coli* counts before 1996. During two large rain storms in 2001, Environmental Services detected much higher *E. coli* levels at the Morrison Bridge. This could indicate that because of the sewer system improvements in 1996 it now takes much larger storms to cause CSO discharges in this part of the river.

Waverly Country Club

Testing water samples at the Waverly Country Club measures background levels of contaminants that enter the river before it flows through the area affected by Portland's CSO discharges. *E. coli* levels have dropped 61% in the wet season and 78% in the dry season at this point. A decrease in precipitation during the study period is likely responsible for some, but not all, of the decrease in *E. coli* levels at this location. There is no information in this report about other upstream factors that may have contributed to the decrease in *E. coli* concentrations.

Table 1. Percent Change After Implementation of CSO Controls

Season	Morrison Br. (RM 12.7)	St. Johns RR (RM 6.8)	Kelley Pt .RM 1.1
Dry	- 59%	- 43%	+ 10%
Wet	- 51%	- 43%	- 33%

Discussion

The *E. coli* counts measured at Portland's Willamette River water sampling locations (Morrison Bridges, St. Johns Railroad Bridge, Kelley Point) are a combination of upstream and City of Portland contributions. To perform data analysis, the upstream contributions are subtracted from the sample location counts. By eliminating *E. coli* contributed from upstream sources, this mathematically corrected number more closely reflects *E. coli* discharged from Portland's combined sewer system.

The state standards for *E. coli* are (1) a 30-day log mean of 126 *E. coli* organisms per 100 ml, based on a minimum of five samples, and (2) no single sample shall exceed 406 *E. coli* organisms per 100 ml.

Before CSO controls began, water samples at all locations occasionally exceeded the 30-day standard during the wet season. After CSO controls began, none of the study areas exceeds that standard during the dry season.

Exceedances of the single sample standard still occur routinely during rain events. Table 2 shows a decreasing trend in the number of exceedances.

Table 2. Exceedance of ODEQ Individual-Sample Standard

Year Monitored	Tyron Creek Rr Bridge	Waverly Country Club	Morrison St Bridge	St Johns Rr Bridge	Kelley Pt Park	No.Exceedances*/No. Observations	% Of Exceedances*
1993**	3	***	2	2	1	**8 / 99**	**8%**
1994**	15	***	9	10	3	**37 / 335**	**11%**
1995**	19	6	16	14	6	**61 / 689**	**9%**
1996	22	14	15	11	12	**74 / 699**	**11%**
1997	13	12	18	15	9	**67 / 750**	**9%**
1998	9	7	14	12	11	**53 / 705**	**8%**
1999	4	2	1	5	***	**12 / 622**	**2%**
2000	***	0	2	0	0	**2 / 444**	**0%**
2001	***	0	3	6	1	**10 / 276**	**4%**

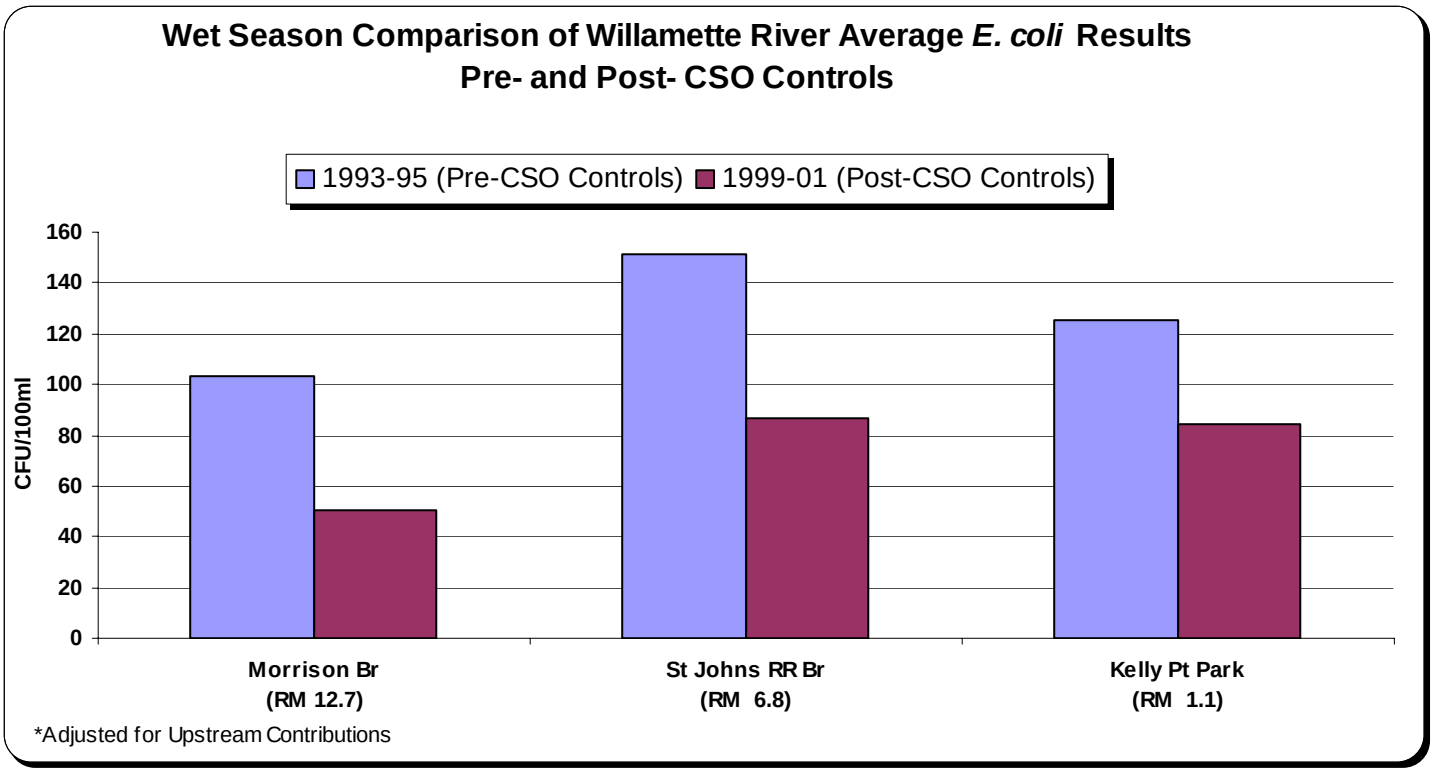
*In-stream water quality standard of 406 *E. coli* CFU/100ML

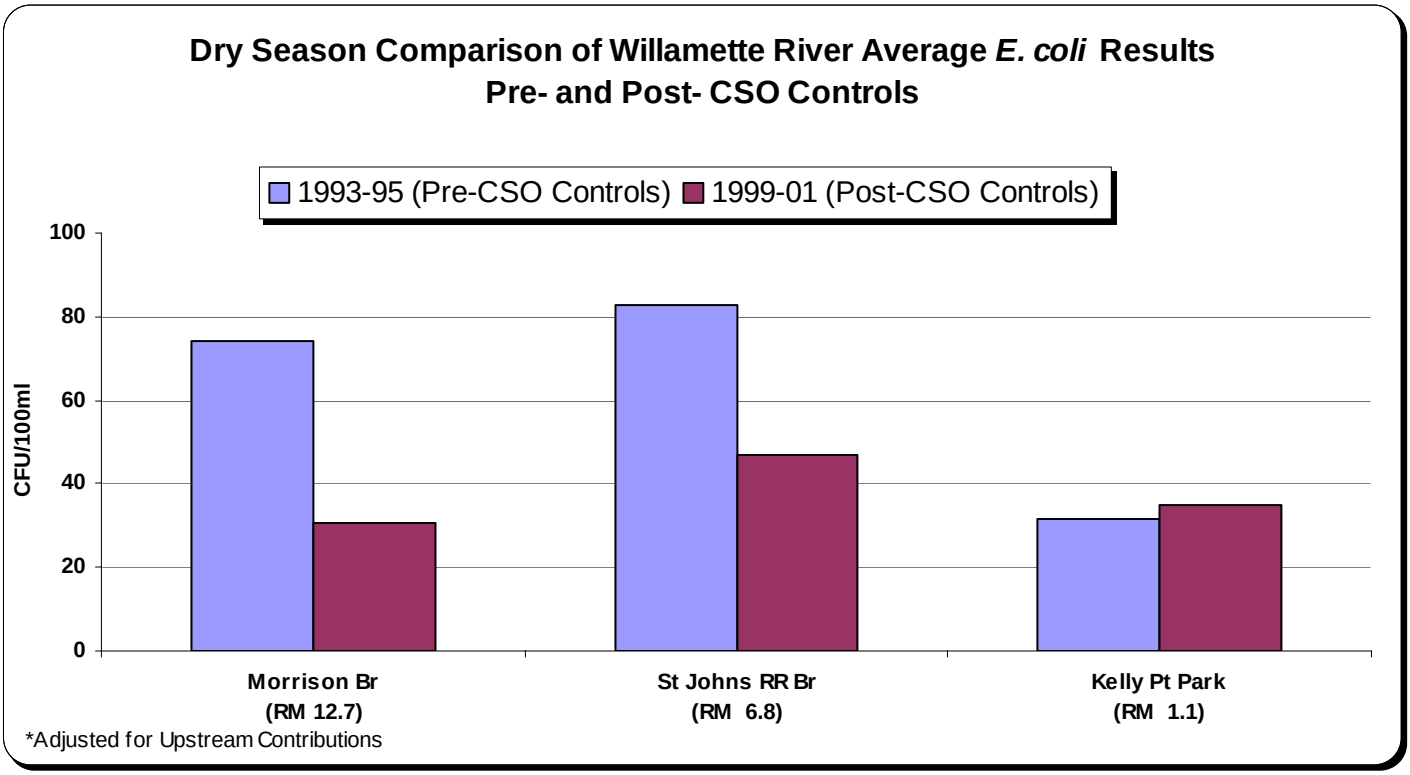
** Fecal count converted to *E. coli* count

*** No samples collected

Conclusions

E. coli concentrations have decreased significantly at the Morrison Bridge, St. Johns Railroad Bridge, and Kelley Point Park during the wet season. Dry season concentrations have decreased significantly at all locations except Kelley Point Park. The decreases cannot be attributed entirely to reductions in precipitation. The system improvements made in the last 5 to 10 years by the City of Portland have resulted in improved water quality in the Willamette River. As Environmental Services implements more CSO controls through 2011, Willamette River water quality will continue to improve. When West Side CSO Projects are complete in 2006, they will reduce the remaining annual CSO volume by 23% for a total reduction of 76%. When the east side CSO projects are complete in 2011, the reduction in annual volume will be 94%.


Wet Season Comparison of Willamette River Average E. coli Results
Pre- and Post- CSO Controls
1993-95 (Pre-CSO Controls)
1999-01 (Post-CSO Controls)
CFU/100ml
160
140
120
100
80
60
40
20
0
Morrison Br
(RM 12.7)
St Johns RR Br
(RM 6.8)
Kelly Pt Park
(RM 1.1)
*Adjusted for Upstream Contributions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1999-01 (Post-CSO Controls)
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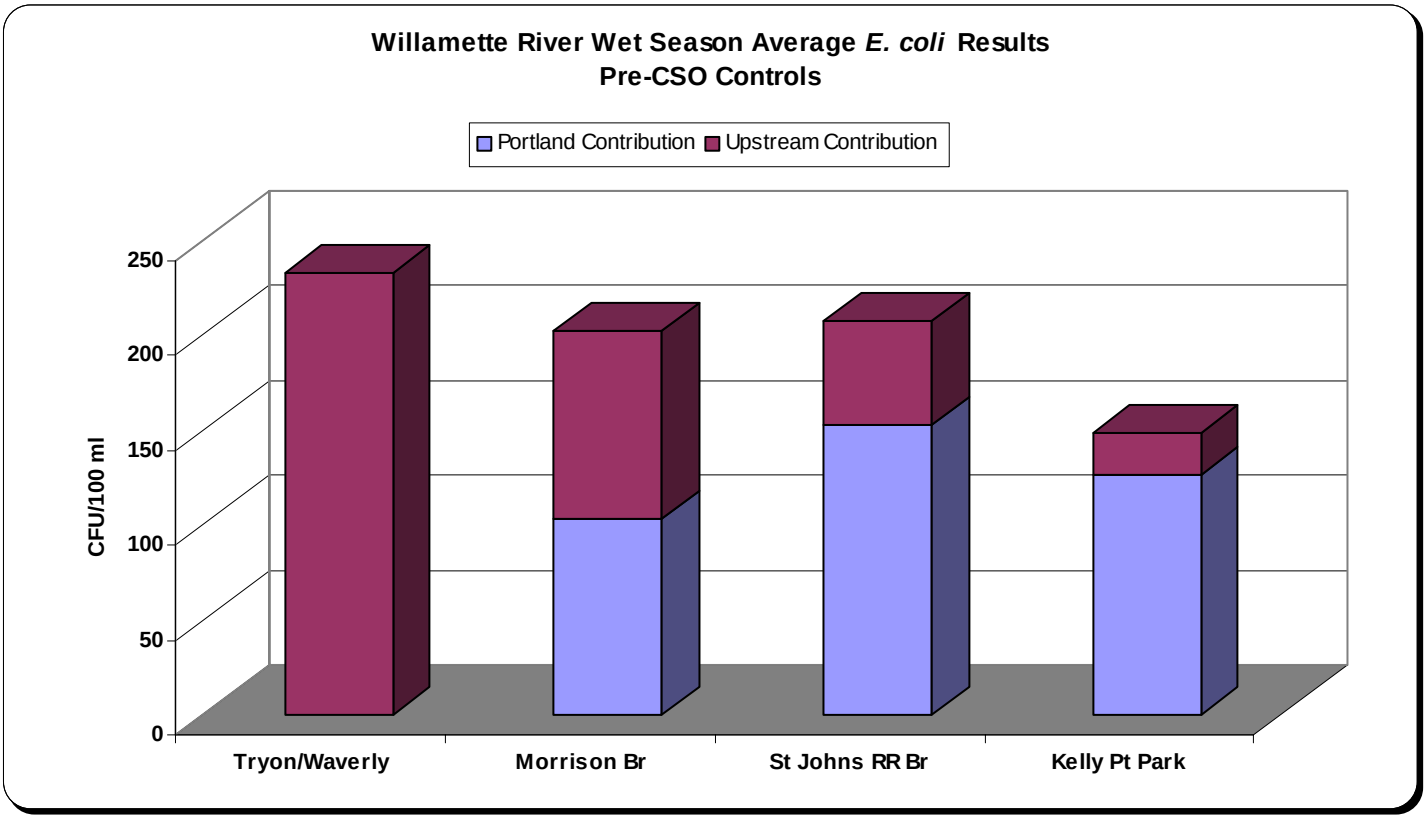
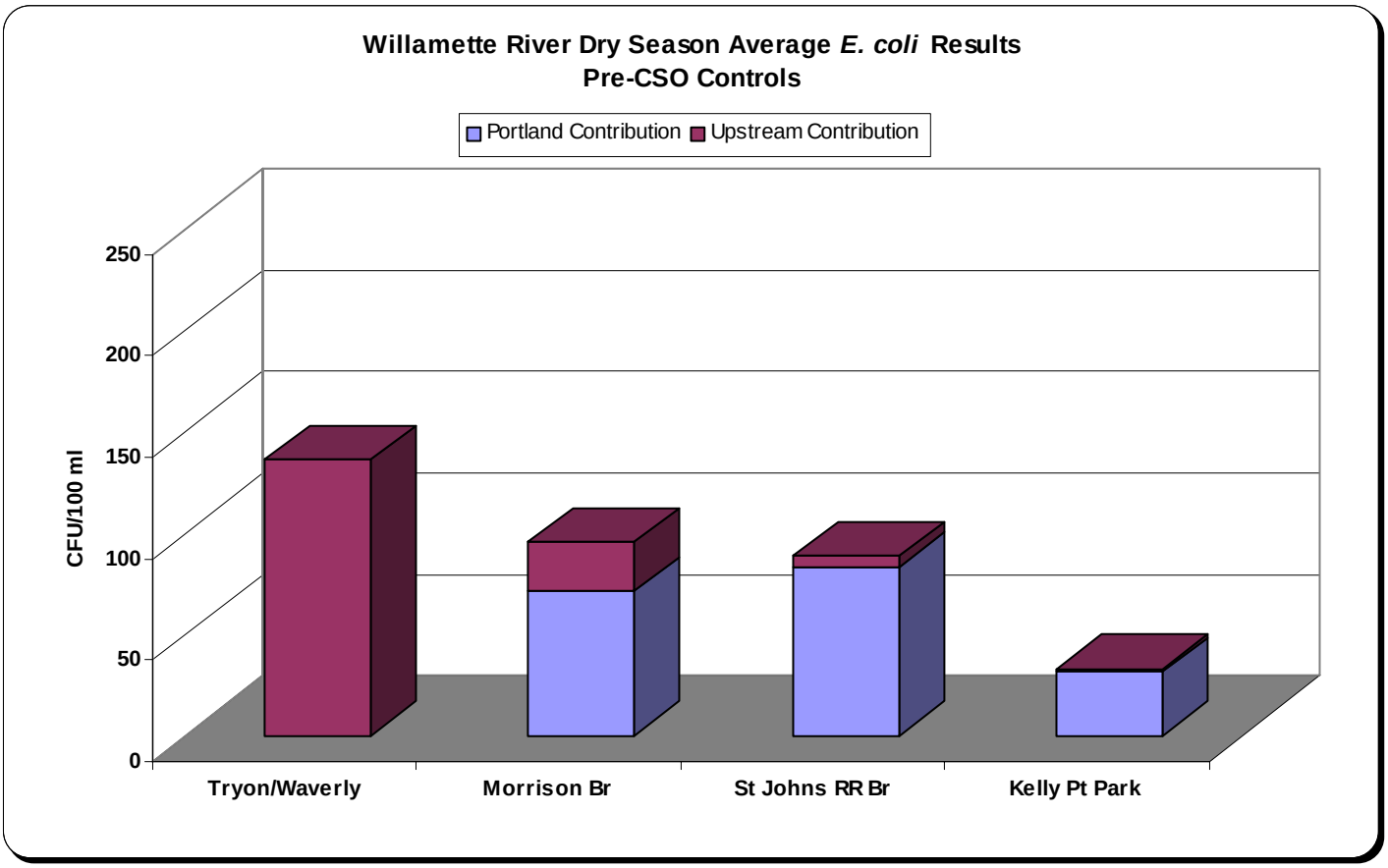
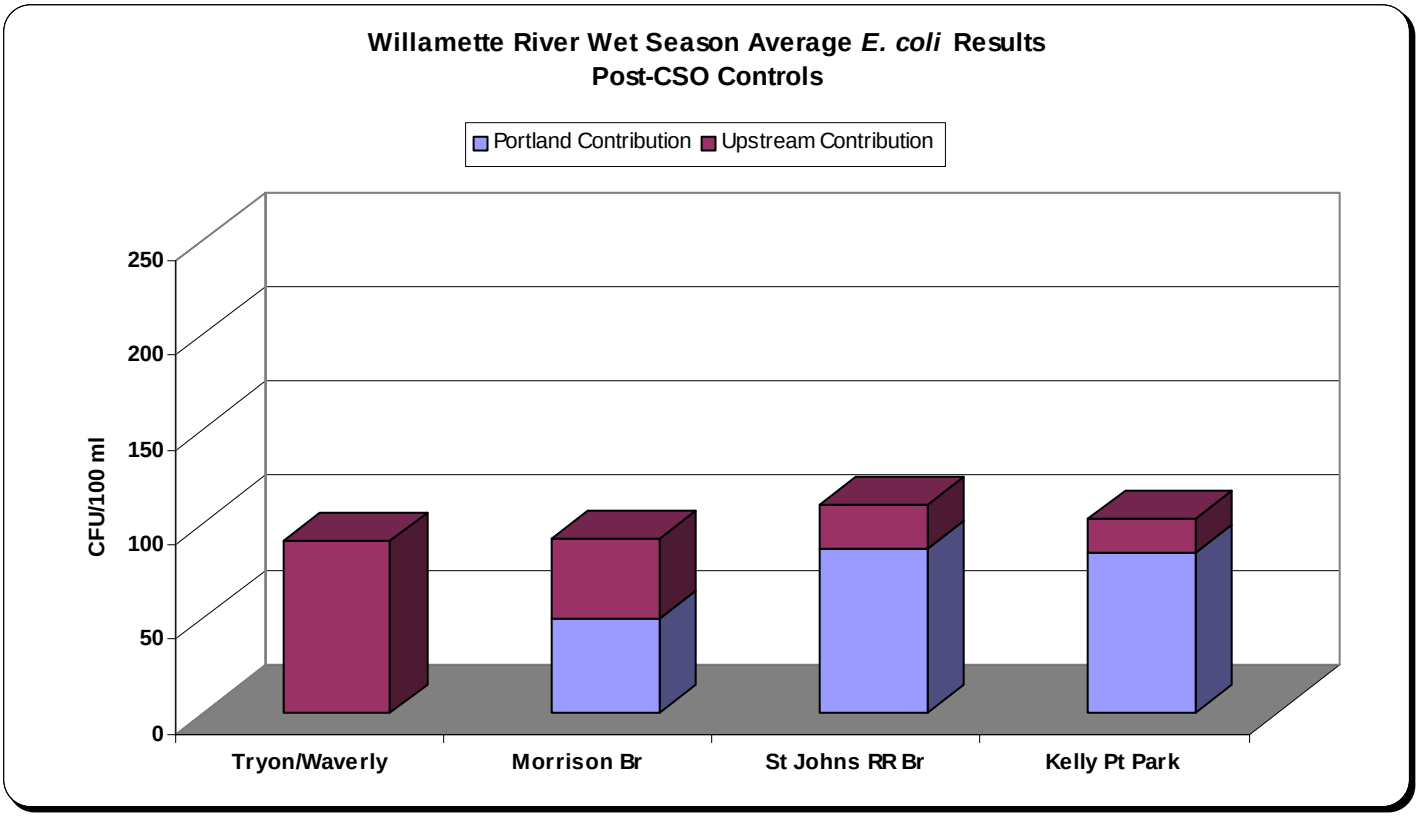
80
60
40
20
0
Morrison Br
(RM 12.7)
St Johns RR Br
(RM 6.8)
Kelly Pt Park
(RM 1.1)
*Adjusted for Upstream Contributions


Willamette River Wet Season Average E. coli Results
Pre-CSO Controls
Portland Contribution
Upstream Contribution
CFU/100 ml
250
200
150
100
50
0
Tryon/Waverly
Morrison Br
St Johns RR Br
Kelly Pt Park


Willamette River Dry Season Average E. coli Results
Pre-CSO Controls
Portland Contribution
Upstream Contribution
CFU/100 ml
250
200
150
100
50
0
Tryon/Waverly
Morrison Br
St Johns RR Br
Kelly Pt Park


Willamette River Wet Season Average E. coli Results
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CFU/100 ml
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Tryon/Waverly
Morrison Br
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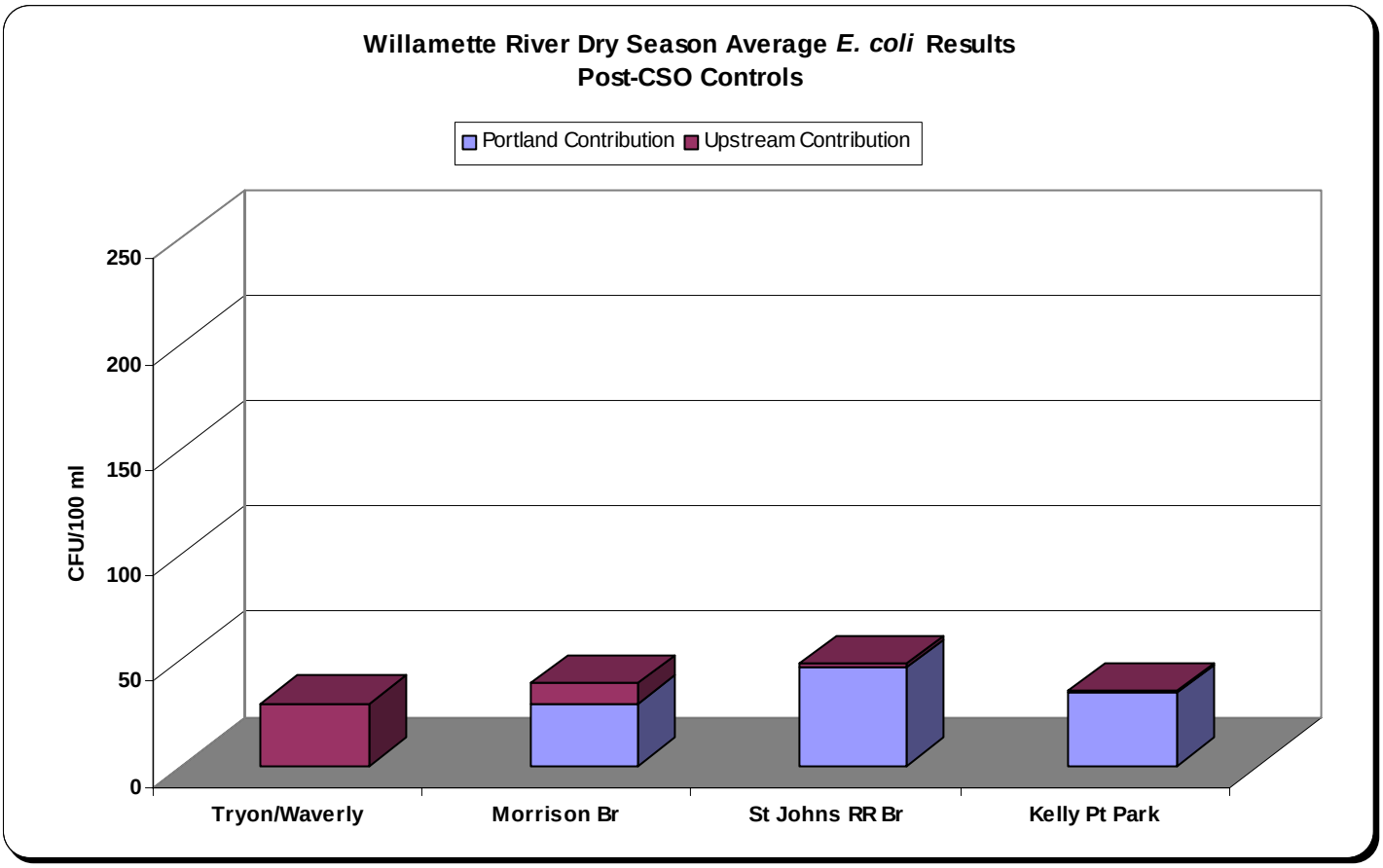
Kelly Pt Park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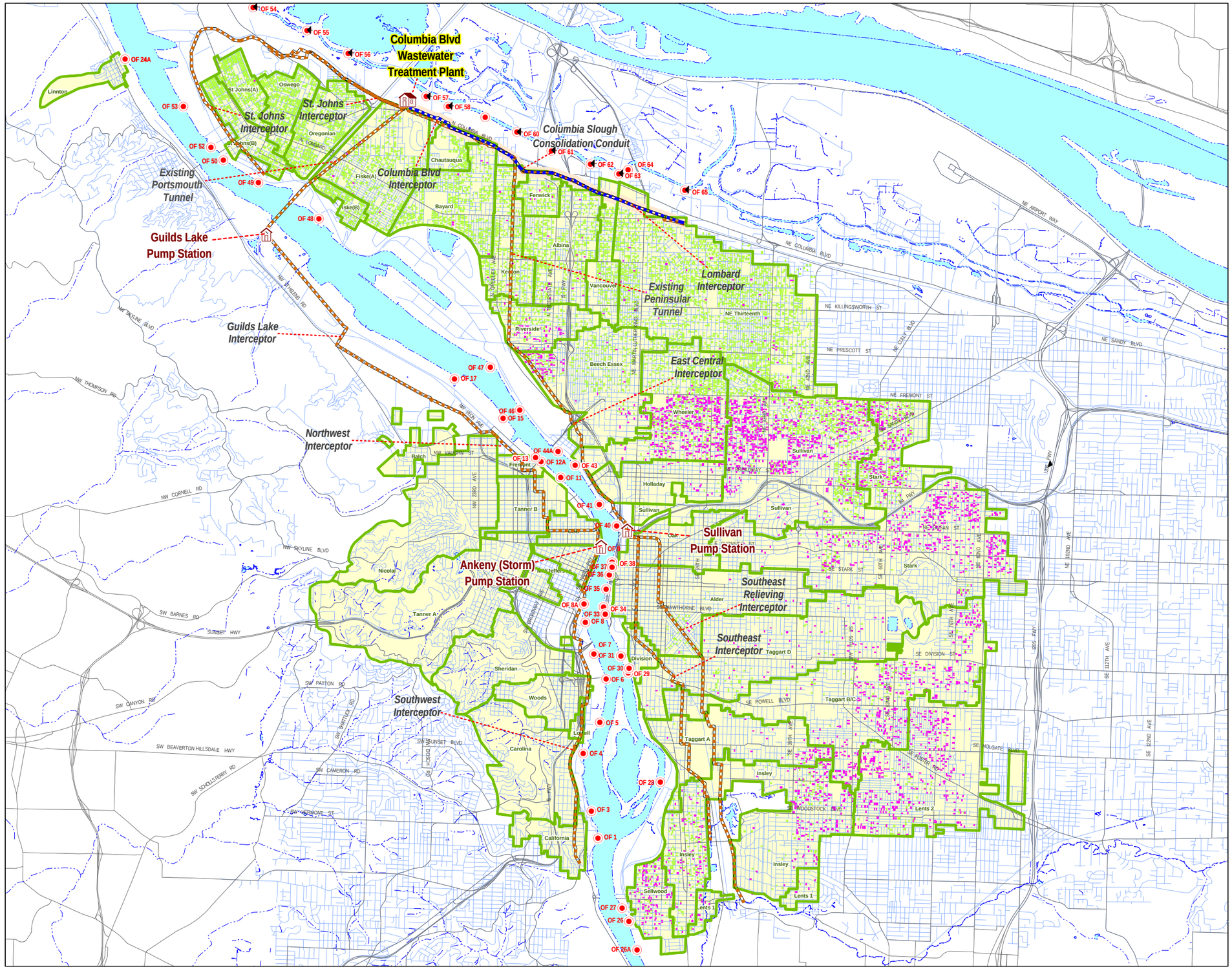
200
150
100
50
0
Tryon/Waverly
Morrison Br
St Johns RR Br
Kelly Pt Park

FIGURE 1
Downspout Disconnection Program Activities
FY 2000 - 2001



Legend

- CSO Outfalls and Number
- Exisiting Major Interceptors
- Columbia Slough Consolidation Conduit
- Columbia Blvd Wastewater Treatment Plant
- All Properties Inspected by Downspout Disconnection Program During 07/01/2000 - 06/30/2001
- All Properties Inspected by Downspout Disconnection Program up to Present Date
- Combined Sewer Basin Boundary

N
W E
S

0 3000 6000 9000 ft

Workspace:
Disco_Activities.WOR

Systems Analysis

Produced In MapInfo(\\OberonGis2\Projects\145-31-030\Virgil\A082701\Disco_Activities.WOR) ATT August 2001

FIGURE 2
Existing CSO System and Diversions Modified FY 2000 - 2001

N
W E
S

0 1000 2000 3000 ft

Systems Analysis

AAB545
AAA797
AAB717
AAA806
AAB719
AAH039
ABC437
ABC448
ABC331
ABC443
ABC518
ABZ093
ACH894
ACY274

Columbia Blvd Wastewater Treatment Plant

St. Johns Interceptor
Columbia Blvd Interceptor
Columbia Slough Consolidation Conduit (CSCC)
Lombard Interceptor
Guilds Lake Interceptor
East Central Interceptor
Northwest Interceptor
Southwest Interceptor
Southeast Interceptor
Southeast Relieving Intterceptor

Ankeny Pump Station
Sullivan Pump Station

St Johns(A)
St Johns(B)
Oswego
Oregonian
Fiske(A)
Fiske(B)
Chautauqua
Bayard
Fenwick
Albina
Kenton
Vancouver
Riverside
NE Thirteenth
Beech Essex
Wheeler
Balch
Fremont
Holladay
Sullivan
Tanner B
Nicolai
Mill/Jefferson
Alder
Tanner A
Southwest Interceptor
Sheridan
Woods
Lovell
Carolina
California
Insley
Division
Taggart A
Southeast Interceptor
Southeast Relieving Intterceptor

N MARTIN LUTHER KING
N INTERSTATE AV
NE MARTIN LUTHER KING BLVD
N LOMBARD ST
W ST JOHNS BRDG
NW LOVEJOY ST
I405 RP
I5 FRWY
NE WEIDLER ST
BROADWAY BRDG
I84 FRWY
I84 RP
SBD
BURNSIDE BRDG
W BURNSIDE ST
HAWTHORNE BRDG
SE 12TH AV
SE 11TH AV
SE MADISON ST
SE HAWTHORNE
SW BROADWAY DR
SW FRONT AV
I5 RP
SW BARBUR BLVD
SW BEAVERTON HILLSDALE HWY
SW CAPITOL HWY
SW BERTHA BLVD

Willamette River

Legend

- Columbia Blvd Wastewater Treatment Plant
- Major Pump Stations
- Diversion Structures Modified FY 2000-2001

Existing Diversion Structures
- Combined
- Storm
- Sanitary

- Columbi Slough Consolidation Conduit

Major Interceptors
- Columbia Blvd Interceptor
- East Central Interceptor
- Guilds Lake Interceptor
- Lombard Interceptor
- Northwest Interceptor
- Southeast Interceptor
- Southeast Relieving Intterceptor
- Southwest Interceptor
- St. Johns interceptor
- Tryon Creek Interceptor

- Combined Sewer Basin Boundary

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