

**Qualitative Assessment of the Change in Pollutant Loads Associated with
MS4 Discharges in the Portland Metropolitan Area**

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1 INTRODUCTION

The purpose of this report is to compare the pollutant loads associated with discharges authorized by the 1995 municipal separate storm sewer system (MS4) permits within the Portland Metropolitan Area to the pollutant loads associated with discharges authorized by the 2004 MS4 permits. The discharges authorized in the 1995 MS4 permits were “all existing and new discharges of stormwater from the municipal separate storm sewer” within the permit area (as defined in the 1995 MS4 permits). These permits authorized discharges from full development within the permit area with the controls that existed at that time. The discharges authorized in the 2004 MS4 permits were “all existing and new discharges of stormwater from the municipal separate storm sewer” within the permit area (as defined in the 2004 MS4 permits) assuming full development with the controls that existed in 2004.

The first round of MS4 permits within the Portland Metropolitan Area were issued by the Oregon Department of Environmental Quality (DEQ) on September 7, 1995 and expired on August 31, 2000. These MS4 permits were issued to four sets of co-permittees¹:

- (1) the City of Portland, Multnomah County, and Port of Portland;
- (2) the City of Gresham, City of Fairview, and Multnomah County;
- (3) Clackamas County, storm sewer service districts, and the incorporated cities within the county; and
- (4) Clean Water Services.

The two-part applications for the 1995 permits were submitted by the MS4 co-permittees in 1991 (Part 1) and in 1993 (Part 2).

The DEQ issued four renewal MS4 permits to the co-permittees in 2004 in response to applications which were received by DEQ in 2000 from each of the permittees. Between 2000 and issuance of the renewal permits in 2004, the co-permittees continued to operate under an administrative extension of the 1995 permit.

On April 29, 2004, a petition for reconsideration of the renewal permits was filed by the Northwest Environmental Defense Center and other organizations and individuals. On May 17, 2004, the Department Director issued an order granting reconsideration of each of these permits. DEQ published proposed modifications to the four renewal MS4 permits based on these reconsiderations for public review and comment on March 7, 2005.

This report is organized into four sections. Section 2 discusses the 1995 permitted sources and permit areas, and the load reductions achieved through stormwater management program implementation pursuant to the 1995 MS4 permits. Section 2 then presents two case studies on

¹ The 1995 permits included the Oregon Department of Transportation and other agencies that are not included in the 2004 permits.

improvements to receiving water quality in response to the implementation of stormwater controls. The loads associated with the 2004 authorized discharges are qualitatively compared to the loads associated with the 1995 authorized discharges in Section 3. A summary of findings is presented in Section 4.

2 1995 MS4 PERMITS – PERMITTED SOURCES, PERMIT AREAS, AND MS4 PROGRAM IMPLEMENTATION

2.1 1995 Permitted Sources and Permit Areas

The 1995 MS4 permits (as well as the renewal permits) identified the sources covered by the permit on the cover page. The permitted sources and 1995 permit areas are summarized below.

- The City of Portland, Multnomah County, and Port of Portland 1995 permitted sources included: “all existing and new discharges of stormwater from the MS4 within the City of Portland Urban Services Boundary.” The permit area was approximately 60,000 acres, of which approximately 12,600 acres were served by sumps, for a total permit area of approximately 47,400 acres.
- The City of Gresham, City of Fairview, and Multnomah County 1995 permitted sources included: “all existing and new discharges of stormwater from the municipal separate storm sewer system within the incorporated areas of the cities of Gresham and Fairview, and the small areas of unincorporated Multnomah County within the urban service boundaries of the two cities.” The total permit area was 38,310 acres, although recent analysis conducted by Gresham indicates that the land area within the permit boundary was significantly overestimated in 1995.
- The Clackamas County 1995 permitted sources included: “all existing and new discharges of stormwater from the municipal separate storm sewer system within Clackamas County urban growth boundary.” The permit area was approximately 74 square miles (47,360 acres).
- The Clean Water Services 1995 permitted sources included: “all existing and new discharges of stormwater from the MS4 within the stormwater service area district boundary of Clean Water Services and within the urban growth boundary of Washington County.” The permit area was approximately 75,000 acres.

Pollutant load estimates and a description of the methodologies used to develop the estimates were provided in each of the four Part 2 applications. These load estimates were based on the existing conditions (current land uses and areas) in 1993. This estimate of pollutant loads was imprecise because of the limitations of available prediction methods and data to support predictions at that time. The relative values, and not the absolute values, of the pollutant loads

were intended to be used to assign priorities and to allocate resources for reducing pollutants in stormwater through implementation of Stormwater Management Plans pursuant to the 1995 permits; they were not intended to provide an estimate of loads associated with the discharges authorized under the 1995 permits.

2.2 Load Reduction through 1995 MS4 Permit Implementation

The 1995 MS4 permits required the MS4 co-permittees to implement a stormwater management program to reduce the contribution of pollutants in stormwater to the “maximum extent practicable” (MEP), the technology-based standard established by Congress in CWA section 402(p)(3)(B)(iii). The four MS4 Programs have each implemented a Stormwater Management Plan (SWMP) to meet the MEP requirement. Implementation of the SWMPs has resulted in reduced pollutant loads in stormwater discharges from the 1995 permit areas as compared to the pollutant loads associated with discharges originally authorized in the 1995 permits.

Although each of the four groups of co-permittees was implementing some limited stormwater-related pollutant control activities prior to issuance of the 1995 permit, none of the programs had developed or implemented a comprehensive SWMP prior to issuance of the 1995 MS4 permits.

Program elements that were in place prior to 1995 typically included the following types of practices, although implementation of these and other elements was not uniform among the permittees:

- Operation and maintenance of the storm drain system and roadways, such as catch basin cleaning and street sweeping.
- Illicit connections addressed through sanitary sewer inspection programs.
- Development controls for a few environmentally-sensitive areas that restricted certain developments and activities, and required erosion control and on-site stormwater treatment.
- Drainage master plans addressed mostly flood control, although some watershed plans had been adopted that addressed water quality (e.g., the Tualatin Watershed Plan).
- Some erosion control enforcement provisions existed.
- Some limited encouragement of stormwater BMPs at public development sites. (e.g., Portland Airport and Oregon Museum of Science and Industry parking lot swales).
- Tualatin basin stormwater treatment requirements. The Tualatin TMDL included requirements to treat runoff for phosphorus control.

The program elements included in the 1995 SWMPs reduced permitted loads in two ways: 1) through implementation of new development and redevelopment standards, and 2) through implementation of program elements that reduced loads from existing sources. These program elements included public education and involvement, operations and maintenance of both the storm drain system and roadways, industrial/commercial controls, illicit discharge elimination,

construction site erosion control standards, structural retrofit controls, and water quality critical lands preservation and restoration. A summary of new or improved Best Management Practices (BMPs) implemented pursuant to each of the 1995 permits is provided in Attachment A to this report.

Requirements for incorporating structural treatment BMPs in new development and redevelopment projects have been adopted by all of the co-permittees. A wide range of structural BMPs are permitted with the qualification that the selection process for structural BMPs must consider the pollutants of concern for the development project and receiving water. Pollutants of concern are pollutants likely to be generated from a project. Permissible BMPs typically include common structural BMPs such as vegetated swales, dry detention ponds, wet detention ponds, and manufactured technologies, as well as less common but very effective BMPs such as treatment wetlands, infiltration or flow through planters (stormwater planter boxes), and green roofs.

While more emphasis appears to have been placed on structural treatment BMP implementation in new development and redevelopment projects in the first years following the 1995 permit issuance, more recently the programs have promoted innovative hydrologic controls through site design practices that reduce runoff volumes. Green roofs, planter boxes, and bioretention areas are examples of effective site design practices used to greatly reduce the amount of runoff generated by new development. Another example of good site design that is promoted by all of the co-permittees is the preservation of critical habitat and riparian areas through acquisition programs or the restoration of these areas through revegetation projects.

Program elements that reduced loads from existing sources have been widely implemented by the MS4 Programs since the 1995 permit issuance. These program elements include:

- street sweeping;
- increased BMP operation and maintenance (O&M);
- erosion control programs for construction sites, including those smaller than covered under a state-issued Construction General Permit;
- public education programs;
- litter control programs;
- industrial/commercial inspection programs;
- spill response programs; and
- restricting the use of certain chemicals, such as de-icing salts, and reclaiming other materials such as gravel used to provide traction.

Education programs can result in reducing the introduction of pollutants into stormwater runoff through practices such as the proper disposal of household chemicals (e.g. stenciling drains to discourage illegal dumping of oil) and the proper disposal of pet wastes. Erosion control and construction site inspection programs have a similar effect on controlling the loss of sediment

from construction sites. Proper construction site stormwater management can greatly decrease the amount of sediment and other pollutants in construction site runoff. Illicit discharge programs have removed many illicit sources of pollutants from the MS4s over the past ten years of program implementation.

Street sweeping programs and increased drainage system and treatment BMP O&M activities are responsible for preventing large amounts of trash, sediment, and associated pollutants from being transported in stormwater runoff to receiving waters. O&M activities are particularly effective in reducing pollutant loads associated with sediment in MS4 discharges.

The MS4 Programs have effectively implemented additional source controls since 1995 and have consistently improved the extent, by both area and category, that they are applied; and therefore, have improved the effectiveness of these required controls. Overall, the source controls implemented since 1995 have likely prevented a significant amount of stormwater pollutants from becoming entrained in stormwater runoff or reaching receiving waters.

In addition to structural treatment controls for new development and redevelopment projects, structural treatment retrofit projects that reduce pollutant loads from development that existed in 1995 have significantly reduced the pollutant loads originally allowed under the 1995 MS4 Permits. Selected retrofit controls implemented by the programs are provided in Attachment A.

2.3 Receiving Water Trend Analysis

2.3.1 Bronson Creek

A recent study investigated if urbanization within the Bronson Creek watershed, located within the Clean Water Services permit area, has impacted water quality over the past decade.² Bronson Creek drains a 3,195 acre watershed within Multnomah and Washington Counties. Bronson Creek originates in the west hills of Portland and is a tributary to the Tualatin River by way of Beaverton and Rock Creeks. Land uses in the headwater area are rural with minor encroachment of suburban residences. The middle sections of the creek are developed with single family residences and the lower sections have mixed use and commercial development.

As part of the Bronson Creek urbanization study, Clean Water Services has been monitoring for 39 water quality parameters at nine stations twice a month since 1994. Seven parameters were selected for trend analysis using data collected from 1994 to 2001: sediment, nutrients (total and dissolved phosphorus, total nitrogen, and ammonia), temperature, and E. Coli. Total impervious area was used as the indicator of urbanization and increased from 15 to 22 percent over the eight year study period.

² Creech, J. (2003). Urbanization and its Relationship to Water Quality within the Bronson Creek Watershed. Project report submitted for Masters Degree in Environmental Sciences and Resource at Portland State University, provided by Clean Water Services.

The study investigated if water quality had changed over time as the watershed urbanized and if there was a relationship between water quality and impervious area while accounting for seasonal variation. Trends were analyzed by parameter for each of the monitoring stations. Temperature did not show a significant trend at any of the stations. Nutrients showed significant decreasing trends (i.e., a decrease in concentration was considered an improvement in water quality) at several monitoring stations, with only one increasing trend for soluble phosphorus at one station. E. Coli showed a significant decreasing trend at several stations with no significant increases. In general, water quality within Bronson Creek exhibited an improvement (decreases in the pollutant concentrations) over the eight year study period, during which development increased.

2.3.2 Fanno Creek

Fanno Creek begins in the hills of southwest Portland and enters the Tualatin River near the town of Tualatin. The City of Portland has jurisdiction over approximately 4,200 acres within the Fanno Creek watershed. This portion of the watershed is approximately 85 percent developed, primarily with single family residences and to a lesser degree with multi-family residences and commercial uses.

The Portland Bureau of Environmental Services (BES) has been managing surface water quality in Fanno Creek since the late 1980's, when the Tualatin River was listed as water quality limited. The DEQ established a total phosphorus (TP) Total Maximum Daily Load (TMDL) in 1988 for Fanno Creek; in 2001 the TP TMDL was revised and new TMDLs for temperature, bacteria, dissolved oxygen were established.

Monitoring conducted by BES (1998-2002) has shown a reduction in the number of days per year in which the temperature water quality objective was exceeded. Efforts to control TP have resulted in summer in-stream concentrations generally meeting TMDL requirements, while in-stream monitoring during or after storm events continued to show elevated TP concentrations that exceeded TMDL criteria. E. coli levels in summer flows within Fanno Creek exceeded water quality objectives in about 50 percent of samples at two of three monitoring stations, while E. coli levels exceeded criteria less frequently (approximately 25 percent) in stormwater.

In July of 2000, BES began working on a comprehensive Watershed Plan for Fanno Creek (and Tryon Creek) to improve or restore beneficial uses such as water supply, fish passage and habitat, and recreation uses. Best management practices implemented as part of the plan included public outreach and education, stream and road signage, treatment facilities, extended sanitary sewer service area, and regularly scheduled maintenance for treatment facilities and streets. While a comprehensive study assessing water quality trends within Fanno Creek has not been conducted, available data for TP and temperature indicate that management practices have

caused some improvement in these water quality parameters, despite continued development within the Fanno Creek watershed.

2.4 Summary

In summary, the pollutant loads associated with discharges authorized by the 1995 MS4 permits were those in all existing and new stormwater discharges within the permit area (as defined in the 1995 MS4 permits) assuming full development with the controls that existed at that time. Since that time, new or improved controls have been implemented, including new development and redevelopment standards and program elements that reduced loads from existing sources, resulting in reduced pollutant loads. There is site-specific available data to support this conclusion, as illustrated in the two watershed studies summarized above.

3 2004 PERMITTED SOURCES AND PERMIT AREAS

For those permits where the permit area has not increased since 1995, loads associated with discharges authorized by the 2004 permits have certainly decreased as compared to loads associated with discharges authorized by the 1995 permits as described in Section 2 above. In areas where the permit areas have increased due to expansion of the urban growth boundaries or changes to the service boundaries, the potential for increased pollutant loads has likely been offset by the decrease in pollutant loads through stormwater program implementation. The following presents a discussion for each permittee. Note that the Oregon Department of Transportation (ODOT) was a co-permittee with each of the four permittee groups below in the 1995 permits; however, ODOT was issued its own MS4 permit in June 2000.

3.1 City of Portland, Multnomah County, Port of Portland

The City of Portland, Multnomah County, and Port of Portland 2004 permitted sources as identified on the cover page of the permit include: “all existing and new discharges of stormwater from the MS4 within the City of Portland Urban Services Boundary.” Thus, the permitted sources are identical to those in the 1995 permit, with the exception of ODOT and ODOT’s facilities which are no longer included under this permit.

The 2004 renewal permit area is approximately 49,300 acres or approximately four percent larger than the 1995 permit area. Although the Portland permit area has increased since 1995, it is very likely that when all of the program implementation actions that have occurred since the issuance of the 1995 permit are considered as a whole (see Attachment A, Table A-1), the loads associated with the 2004 permitted discharges are likely to be less than the loads associated with the discharges permitted in 1995.

3.2 City of Gresham, City of Fairview, Multnomah County

The City of Gresham, City of Fairview, Multnomah County 2004 permitted sources as identified on the cover page of the permit are identical to those in the 1995 permit (with the exception of ODOT facilities): “all existing and new discharges of storm water from the municipal separate storm sewer system within the incorporated areas of the cities of Gresham and Fairview, and the small areas of unincorporated Multnomah County within the urban service boundaries of the two cities.”

Gresham's urban service area, essentially the current city limits, did not change from 1995 to 2004.

Program implementation by the Gresham co-permittees over the last 10 years has been extensive (see Attachment A, Table A-2). Due to the load reductions afforded through these program implementation measures in combination with no change in the renewal permit area, the loads associated with the 2004 permitted discharges are less than the loads associated with the discharges permitted in 1995.

3.3 Clackamas County, Storm Sewer Service Districts, and Incorporated Cities within the County

The Clackamas co-permittees include: Clackamas County, Clackamas County Service District No. 1, Surface Water Management Agency of Clackamas County, the Oak Lodge Sanitary District, and the cities of Gladstone, Happy Valley, Johnson City, Lake Oswego, Milwaukie, Oregon City, River Grove, West Linn, and Wilsonville.

The Clackamas 2004 permitted sources as identified on the cover page of the permit are identical to those in the 1995 permit (with the exception of ODOT facilities): “All Existing and New Discharges of Storm Water from the Municipal Separate Storm Sewer System within the Clackamas County urban growth boundary.” At the time of the 1995 permit issuance, the urban service areas consisted of approximately 74 square miles (47,360 acres). As of 2004, the service areas have increased as follows for the existing co-permittees:

- Unincorporated Clackamas County - 364 acres
- West Linn - 371 acres
- Oregon City - 660 acres
- Happy Valley - 743 acres
- Wilsonville - 525 acres
- Lake Oswego – 883 acres

Thus, the 2004 renewal permit area is approximately 3,546 acres (5.5 sq miles) larger than the 1995 permit area of 74 square miles, or about a 7.4 percent increase. Although the Clackamas

permit area has increased since 1995, it is likely that when all of the program implementation actions that have occurred since the issuance of the 1995 permit are considered as a whole (see Attachment A, Table A-3) the loads associated with the 2004 permitted discharges are likely to be less than the loads associated with the discharges permitted in 1995.

3.4 Clean Water Services

The Clean Water Services 2004 permitted sources as identified on the cover page of the permit are identical to those in the 1995 permit: “all existing and new discharges of storm water from the MS4 within the storm water service area district boundary of Clean Water Services and within the urban growth boundary of Washington County.”

The 2004 permit area is approximately 75,000 acres (117 square miles), thus there is no increase in permit area.

Program implementation by Clean Water Services over the last 10 years has been extensive, as is summarized in Attachment A, Table A-4. Due to the load reductions realized through these program implementation measures in combination with no change in the renewal permit area, the loads associated with the 2004 permitted discharges are less than the loads associated with the discharges permitted in 1995.

4 SUMMARY AND CONCLUSIONS

The purpose of this assessment is to compare the pollutant loads associated with discharges authorized by the 1995 MS4 permits to the pollutant loads associated with discharges authorized by the 2004 MS4 permits. The pollutant loads associated with discharges authorized by the 1995 MS4 permits were those in all existing and new stormwater discharges within the permit area (as defined in the 1995 MS4 permits) assuming full development with the controls that existed at that time. The pollutant loads associated with discharges authorized in the 2004 MS4 permits are those in all existing and new stormwater discharges within the permit area (as defined in the 2004 MS4 permits) assuming full development with the controls that existed in 2004.

All of the MS4 co-permittees have implemented substantial stormwater management programs since 1995. The program elements included in the SWMPs have reduced loads originally permitted in 1995 in two ways: 1) through implementation of new development and redevelopment stormwater standards, and 2) through implementation of program elements that reduced loads from existing sources, including public education and involvement, operations and maintenance of both the storm drain system and roadways, industrial/commercial controls, illicit discharge elimination, construction site erosion control standards, structural retrofit controls, and water quality critical lands preservation and restoration.

Conclusions specific to each MS4 permit are as follows:

- City of Portland, Multnomah County, Port of Portland: Although the Portland permit area has increased by approximately four percent since 1995, it is likely that when all of the program implementation actions that have occurred since the issuance of the 1995 permit are considered as a whole, the pollutant loads associated with discharges permitted in 2004 are likely less than the pollutant loads associated with discharges permitted in 1995.
- City of Gresham, City of Fairview, Multnomah County: The 2004 renewal permit area remained the same as the 1995 permitted area. In combination with the load reductions afforded through program implementation measures, the pollutant loads associated with discharges permitted in 2004 are less than the pollutant loads associated with discharges permitted in 1995.
- Clackamas County, Storm Sewer Service Districts, and Incorporated Cities within the County: Although the Clackamas permit area has increased by approximately 7.4 percent since 1995, it is likely that when all of the program implementation actions, especially the treatment and detention requirements placed on new development and the extensive list of structural retrofit BMPs that have occurred since the issuance of the 1995 permit, are considered as a whole the pollutant loads associated with discharges permitted in 2004 are likely to be less than the pollutant loads associated with discharges permitted in 1995.
- Clean Water Services: As there has been no increase in permitted area, in combination with the load reductions afforded through program implementation measures within the permit area, the pollutant loads associated with discharges permitted in 2004 are less than the pollutant loads associated with discharges permitted in 1995.

ATTACHMENT 1
SUMMARY OF STORMWATER BEST MANAGEMENT PRACTICES THAT WERE
IMPLEMENTED PURSUANT TO THE 1995 PERMIT

Table A-1: City of Portland, Multnomah County, Port of Portland Summary of Stormwater Best Management Practices (BMPs) that were implemented pursuant to the 1995 Permit

BMP General Category	New or Improved BMPs Pursuant to the 1995 MS4 Permit ³
Public Involvement and Education	Improved and expanded education and outreach programs, including Clean Rivers Education programs (for K-12 and general public); developed educational programs and public tours on stormwater solutions; developed and expanded Community Watershed Stewardship Grant program, offering up to \$5K for community-based enhancement programs (currently ~\$55K available annually). Developed an EcoBiz program to certify and recognize environmentally friendly automotive businesses in coordination with the regional Pollution Prevention Outreach group. Participated in and helped expand participation in the Regional Coalition for Clean Rivers and Streams for regional coordination of stormwater education; formed and coordinated a volunteer public technical advisory committee (the Stormwater Advisory Committee) to guide the city on stormwater policy issues; installed “dump no waste” storm drain decals adjacent to high priority Port of Portland catch basins as part of the Port’s public outreach campaign to prevent stormwater pollution stormwater educational folders and stickers developed by the Port for Columbia Slough Watershed Council’s “Slough School.”
Operation and Maintenance of the Storm System	Conducted an inventory and assessment of stormwater management facilities and operations and maintenance activities; completed a stormwater facilities risk assessment and potential pollution general assessment; began work on a Stormwater Facilities Maintenance Plan that will enhance performance of the MS4. New and expanded work by the Port included development and implementation of specific stormwater maintenance practices relevant to Port and tenant operations and installation of catch basin filters in high priority industrial and commercial storm drains.
Operation and Maintenance of Roadways	Reviewed and evaluated Operations and Maintenance (O&M) activities in public rights-of-way and developed an implementation plan to test improvements to minimize pollutant discharges; adopted Oregon Department of Transportation road maintenance water quality BMP guidance for use in O&M activities.
Industrial/Commercial Controls	In 2000, entered into a Memorandum of Agreement with DEQ to implement an Industrial Stormwater Permit program within city boundaries to administer 1200COLS and 1200Z permits as DEQ’s authorized representative, including direct dischargers to waterways. The program also performs inspections, monitoring and outreach to industrial and commercial properties, providing pollution prevention education and technical assistance to reduce pollutant discharges. The Port of Portland implemented a pesticide program, including a

³ Co-Permittees coordinate MS4 programs and activities through Intergovernmental Agreements (IGAs) and regular coordination meetings. More information on BMPs can be found in the annual compliance reports, which are available online at <http://www.portlandonline.com/bes/index.cfm?c=37485> and in the DEQ permit file number 108015.

BMP General Category	New or Improved BMPs Pursuant to the 1995 MS4 Permit ³
	Technical Guidance Document and an Integrated Pest Management and Work Schedules Program for Port-owned mitigation sites in order to minimize pesticide application and control non-native species.
Illicit Discharges Elimination	Of the 19 non-stormwater discharges identified in the 1995 permit, 16 have been evaluated and policies and processes changed where appropriate; the 2004 permit added an additional 5 discharge types, one of which has already been evaluated. The remaining 7 discharges are currently under evaluation; developed and chaired a Regional Spill Response Committee to address response and coordination at a regional level; implemented a Spill Response Hotline; established an Illicit Discharge Elimination Program, including an outfall prioritization plan, dry weather monitoring and enforcement authority.
Water Quality Standards for New Development and Re-Development	Authorized the Stormwater Management Manual (SWMM) in 1999, which implemented stormwater standards for all new development and redeveloped projects that create over 500 sq. ft. of impervious area. Revisions in 2000, 2002 and 2004 refined and improved the SWMM with emphasis on reducing effective impervious area, using vegetated facilities and providing greater groundwater protection. Since SWMM adoption, over 2,300 stormwater facilities have been constructed on private property. Various Bureaus provide technical assistance, grants and other incentives for retrofits and exceeding SWMM standards (such as the Office of Sustainable Development's Green Building Programs and BES's Sustainable Stormwater Management Program).
Erosion Control Standards for Construction	Established citywide erosion control code (Title 10) and revised the Erosion Control Manual to reflect NPDES MS4 permit conditions, establishing a comprehensive citywide erosion and construction site pollutant control program erosion and sediment control requirements for construction are incorporated into all Port of Portland construction project specifications.
Structural Controls	Completed a Public Facilities Plan, which provides the framework for prioritizing and implementing new and retrofitted MS4 projects; constructed public stormwater pollution reduction facilities (PRFs), including Russell Pond Wetland, Water Pollution Control Laboratory Pond, Willamette inflow control projects, a Johnson Creek PRF (SE 45 th Ave.) and Columbia Slough PRFs (138 th Ave., 148 th Ave., Whitaker Ponds, Buffalo Slough, Wapato Wetland, Ramsey Lake Wetland); developed design standards and implemented pilot projects to manage stormwater from public streets using porous pavement, vegetated planters and other Green Street approaches; received \$1.6 million EPA grant for innovative stormwater projects., including implementation of Green Street projects and school campus downspout retrofits. As Multnomah County bridges undergo retrofits and upgrades, stormwater management controls are incorporated into design; currently stormwater runoff from the Burnside and the Broadway Bridges is managed with water quality devices.
Other	Implemented a Willing Seller program for water quality critical lands acquisition; in conjunction with the Metro open space program,

BMP General Category	New or Improved BMPs Pursuant to the 1995 MS4 Permit³
	<p>purchased 2,422 acres of land from willing sellers; revised tree and landscaping code for consistency to integrate landscape-based stormwater management approaches for parking lots developed code amendment proposals to improve enforcement of environmental violations and facilitate permit process for resource enhancement projects; implemented the Watershed Revegetation Program for long-term restoration and revegetation of natural areas; planted over 2.5 million trees and shrubs, primarily along waterways and high-resource environmental areas; The Port enhanced 1,500 feet of shoreline along West Hayden Island focusing on non-native vegetation removal and native species revegetation and monitoring. As part of the Toyota redevelopment project at Terminal 4, the Port restored 1,700 feet of riparian area, planted more than 11,000 native trees and shrubs, and designed an integrated stormwater management system. The Port worked with the Multnomah County Drainage District to stabilize and remove invasive plants on over one-half mile of Columbia Slough bank and replant with native vegetation.</p>

Table A-2: City of Gresham and Co-permittees (City of Fairview and Multnomah County) Summary of Stormwater Best Management Practices (BMPs) that were implemented pursuant to the 1995 Permit

BMP General Category ⁴	New or Improved BMPs Since 1995
Public Involvement and Education	<p>There has been a significant increase in public involvement and education regarding stormwater management since 1995. Specific examples include:</p> <p>Slough School Watershed field sites expanded to include five Gresham schools.</p> <p>Four Fish-Friendly Car Wash sites identified throughout Gresham and two high schools certified. Two Car Wash kits available for loan at no charge.</p> <p>Doggie Don't Boxes installed in eight Gresham Park sites.</p> <p>Website Enhancement: Created in 1998. Added content related to individual behavior changes related to home owner practices. Created a native plant information guide for gardening in 2003.</p> <p>County's Adopt-A-Road and Catch basin Marking programs</p> <p>Gresham and County are active participants of the Regional Coalition for Clean Rivers and Streams programs.</p> <p>Fairview provides public education through bi-monthly newsletter, annual report, and active web site. The City also has an active education program with riparian property owners about riparian buffer care, prohibited chemicals, and native plantings.</p>
Operation and Maintenance of the Storm System	<p>Since 1995, there have been steady improvements to the O&M activities, frequencies, and effectiveness.</p> <p>Decant Facility Constructed in 1997 to control releases from City-owned vehicles and equipment.</p> <p>Catch Basin Cleaning: Current City inventory 5,200. Annual cleaning since 1981. Amount of debris collected has increased due to increased inventory and improved cleaning methodology, i.e., shovel vs. Vector machine. Change in methodology has lead to over 51% increase in debris captured.</p> <p>Sedimentation Manhole Cleaning: Current inventory 133. Began systematic inventory and cleaning in 2004. This activity is new since 1995, as no sedimentation manholes existed prior to 1995.</p> <p>Storm Sewer Line Cleaning: Current inventory 210 miles. Currently in a 10-year cleaning cycle. The miles of sewer line cleaning has increased by 66% since 1995.</p> <p>Storm Detention Pipe Cleaning/Control Release Manhole Cleaning: Current inventory 121 underground detention pipes. This activity represents new BMP, as no detention facilities existed prior to 1995.</p> <p>“Black Box” Maintenance: Annual inspection of all facilities. Cartridges replaced as needed. This activity is new since 1995, as no proprietary facilities existed prior to 1995.</p> <p>County low impact Ditch Cleaning by Vector.</p> <p>Catch basins on County arterials cleaned twice a year.</p> <p>Fairview changed ditch and channel maintenance method to incorporate less intrusive practices like less chemical use; use of low lying grass seed; and cleaning the inverts with an auger and reseeded upon completion.</p>

⁴ Details to the information included in this table can be found in annual reports submitted to DEQ in compliance with NPDES Stormwater Discharge Permit.

BMP General Category ⁴	New or Improved BMPs Since 1995
	Fairview has a dedicated FTE to maintain City parks, wetland areas, and stormwater features.
Operation and Maintenance of Roadways	Since 1995, there has been over 23% increase in the miles of street swept on an annual basis. Between the County and City, in most areas of the city, all streets are swept at least 9 times per year. In addition, over 60% of all de-icing material are collected and recycled after hazard weather usage. No salt has been used on the roadways within the Permit area since 1999.
Industrial/Commercial Controls	In Gresham, DEQ issues and administers industrial permits. The City’s role has been to coordinate and cooperate with these activities. Since 1995, the City has implemented the GREAT Business Program to target businesses with potential environmental impacts and recommend “green” practices. Since the inception, over 200 businesses have been audited and over 70 have been certified as “green.” Business License Review: began reviewing all new business permit applications in 2002. Gresham and Fairview implement Wellhead Protection Program aimed at eliminating pollutants discharge to surface & ground water from industrial users.
Illicit Discharges Elimination	Prior to 1995, this activity was essentially compliant-based. Since 1995, Gresham uses TV inspections and other “investigative” methods to identify and eliminate illicit discharges. In addition, legal authority to inspect was improved in 1996 and additional code enforcement staff was hired in 1997. County Right-of-Way inspectors monitor catch basins for illicit connections. Gresham and Fairview have appropriate ordinance that prohibits illicit discharges, requires compliance, and allows the City to carry out monitoring when necessary.
Water Quality Standards for New Development and Re-Development	This is a new BMP since 1995, as no stormwater quality standards existed prior to 1995. New standards were adopted in 1999 to address water quality component with new and development re-development projects. The City also actively began collecting maintenance agreements for privately-owned water quality facilities in 2000. Since 1995, approximately 250 acres of new development projects has constructed on-site water quality BMPs. The County continues to require stormwater to be maintained on site for the unincorporated area of Interlachen. Fairview’s Planning and Public Works Departments work closely to ensure proper plan reviews to minimize impacts to the stormwater system.
Erosion Control Standards for Construction	The original EPSC Manual has been modified and enhanced since it was originally adopted in 1991. Standards and inspections protocol has been improved to include new technology and practices. Additional inspection staff were hired in 1996. Stormwater Division coordinates with DEQ to review all 1200-C plans. City’s public works inspector visits all development projects at least once/day during public infrastructure construction activities. In addition, Stormwater Division staff are actively involved with enforcement activities. In 2004, County revised its grading and erosion control standards for the unincorporated area of Interlachen. In addition to coordination with 1200-C permits, Fairview works closely with contractors to ensure BMPs are adequate and effective during rainy season.

BMP General Category⁴	New or Improved BMPs Since 1995
Structural Controls	<p>This is a new BMP since 1995.</p> <p>Regional Fairview Creek Constructed Wetland: Completion date – fall of 2005, approximate drainage area is 900 acres.</p> <p>Kelly Creek Regional Detention Pond: completed in 1998, approximate drainage area is 800 acres.</p> <p>Constructed Wetland and Detention facility for Roadway Drainage: Halsey Ave and another at 207th Ave., each treating approx. 11 acres of impervious surface.</p>
Other	<p>These are examples of “other” activities new since 1995:</p> <p>Fujitsu Wetland Mitigation – created approximately 4.5 acres of wetland adjacent of the Fairview Creek</p> <p>Gresham Woods Restoration – multi-year wetlands/wet meadow restoration project in 55 acres of open space adjacent to the Johnson Creek</p> <p>High School Stewardship Program – 3 sites totaling about 8.5 acres to replace with native vegetations</p> <p>Incorporated IPM in 2001 for all City activities.</p> <p>Yamhill Green Street Project in 2004 – converted to pervious pavement, approximately 8,000 sq ft of neighborhood collector street</p> <p>Division and Stark Street Project – used pervious pavers on sidewalk, approximately (1 mile)</p> <p>Master Plans: updated each Gresham Watershed master plan during the years of 2002-2005.</p> <p>New Communities Planning: Stormwater management for Springwater and Pleasant Valley areas will utilize green sustainable development practices.</p>

Table A-3: Clackamas County and Co-Permittees' Summary of Stormwater Best Management Practices (BMPs) that were implemented pursuant to the 1995 Permit

BMP General Category	New or Improved BMPs Since 1995
Public Involvement and Education	<p>Programs that motivate citizens to prevent or reduce storm sewer system pollutant loading are provided in the following formats:</p> <ul style="list-style-type: none"> • Websites • Brochures • Newsletter Articles • Face-to-face in public meetings, fairs, classrooms, etc.
Operation and Maintenance of the Storm System	<p>Two Primary Elements:</p> <ul style="list-style-type: none"> • Solids are regularly vacuumed from the piped storm sewer system • Vegetation, garbage and sediment is regularly removed from ditches, stormwater ponds and other above-ground storm sewer system segments
Operation and Maintenance of Roadways	<p>Three Primary Elements:</p> <ul style="list-style-type: none"> • Streets are swept • Roadside vegetation is controlled through mowing to minimize herbicide use • Ice is controlled with low impact materials, such as sand and calcium magnesium acetate, to minimize or avoid the use of salt.
Industrial/Commercial Controls	<p>This category pertains to: 1) municipal landfills, 2) hazardous waste treatment, disposal and recovery facilities, 3) industrial facilities that are subject to section 313 of SARA title III, and 4) certain other industrial facilities. The MS4 permit holders take reasonable measures which control, minimize, or prevent stormwater pollution from these sites. For example, if a MS4 permit holder believes that a facility may need a stormwater pollution control permit from DEQ, the facility and DEQ are provided with formal notification. As another example, if a MS4 permit holder determines that a facility contributes a material load of pollutants to the MS4, the implementation of control measures is overseen by the MS4 permit holder. In these instances, if the discharger's initial attempts to improve stormwater quality do not produce the required improvement, the MS4 permit holder continues to provide guidance, technical assistance, and if necessary, enforcement action until the facility's stormwater quality improves to the required level.</p>
Illicit Discharges Elimination	<p>Citizens are encouraged to report these to the MS4 permit holder. Illicit discharges and spills are addressed and, if necessary, controlled by the MS4 permit holder. The local fire dept. plays a lead role in many hazardous materials incidents. Dry-weather storm sewer outfall inspections, which can proactively identify these discharges, are conducted at certain outfalls.</p>
Water Quality Standards for New Development and Re-Development	<p>The MS4 permit holders have adopted and implemented Standards for new development and redevelopment to prevent or reduce storm sewer system pollutant loading. These standards include, but are not limited to, stormwater volume reduction to minimize runoff, stormwater treatment to remove pollutants from stormwater, and site design standards to prevent stormwater from contacting areas where it may become polluted.</p>
Erosion Control Standards for Construction	<p>The MS4 permit holders have adopted and enforce erosion control requirements. Regular inspections of construction sites are conducted by the MS4 permit holders. In general, stormwater pollution is prevented by requiring that stormwater be directed away from contact with disturbed soil through good site design. Structural controls, including but not limited to silt</p>

BMP General Category	New or Improved BMPs Since 1995
	fencing and biobags, are also required to be deployed to remove sediment from stormwater. The controls are required to be maintained during construction to ensure effectiveness. Sediment on roadways is also required to be removed. Sediment that is captured by the storm sewer system must be removed and properly disposed of.
Structural Controls	Since 1995 there has been a significant increase in a) the number of structural controls (swales, man-made stormwater ponds, etc.) that have been installed and b) in the acreage that is served by these devices within the MS4 permit holders' service areas.
Other	Some riparian areas have been enhanced. Other healthy riparian areas which do not require enhancement have been protected in separate land tracts or in conservation easements. Metro Title III, which requires riparian area protection in the MS4 permit holders' service areas, is implemented for wetlands, natural ponds, creeks, springs, and rivers.

Note #1: The information provided in the table above provides a general summary of information included in the various annual reports submitted to the Department of Environmental Quality by each co-permittee to the Clackamas County MS4 NPDES permit.

Note #2: The information is a general summary of the BMPs implemented within Clackamas County pursuant to the 1995 MS4 NPDES Permit. However, the BMPs implemented and the level of implementation varies from co-permittee to co-permittee. For information specific to a particular co-permittee, please refer to that co-permittee's Storm Water Management Plan and Annual Reports.

Table A-4: Clean Water Services’ Summary of Stormwater Best Management Practices (BMPs) that were implemented pursuant to the 1995 Permit

BMP General Category	New or Improved BMPs Since 1995
Public Involvement and Education	<p>There has been a significant increase in public involvement and education regarding stormwater management since 1995. In 1995 the program primarily focused on the relationship between littering and water quality, i.e., “adopt-a-highway” type programs which promoted urban “good housekeeping”.</p> <p>Current public education and involvement programs are significantly more complex and broader in focus. Through the Coalition for Clean Rivers and Streams, the metro area MS4 permittee’s collectively leverage public awareness dollars (\$60,000) to inform the public on the use of herbicides, pesticides, and fertilizers through a focused transit and print advertising campaign. Through the use of the District’s website, which receives approximately 13,000 hits per month, distributed 7300 <i>Gardening with Native Plants</i> posters. Distributed 354,000 billing inserts during the 2004 which focused on personal behaviors to reduce impacts to stormwater quality and quantity, such as pet waste management, leaf pick-up, car washing and maintenance, etc.</p>
Operation and Maintenance of the Storm System	<p>Since 1995, there was a 125% increase in the number of catch basins cleaned on an annual basis and a 25.8 % increase in miles of storm sewer lines cleaned on an annual basis. In 1995, the O&M of the storm system varied from jurisdiction to jurisdiction. Currently there are performance measures/targets established for each jurisdiction.</p>
Operation and Maintenance of Roadways	<p>Since 1995, there was a 65% increase in the miles of street swept on an annual basis. In 1995, most communities swept arterial streets monthly or every two months (average frequency was 10.3 times per year). Currently the average mile-weighted frequency is 22.4 times per year.</p>
Industrial/Commercial Controls	<p>In 1995, through the District’s industrial pretreatment/source control program, staff provided “advice” to commercial and industrial sites regarding stormwater management. Currently, the District oversees the 1200-Z industrial stormwater permit program in our service area which has significantly increased the monitoring, compliance and enforcement activities for this program. We have over 150 industrial stormwater dischargers currently under permits.</p>
Illicit Discharges Elimination	<p>In 1995, there was only a minimal program which was primarily a “react-to-a-complaint”. Currently through TV inspections, greater education and outreach, and the 1200-Z program, the District has significantly increased the detection and elimination of illicit discharges.</p>
Water Quality Standards for New Development and Re-Development	<p>In 1991, the District revised its Design and Construction Standards to include requirements for construction of storm water quality and quantity facilities for all new developments. Twenty-five foot vegetated buffers on streams, creeks and wetlands were also implemented. In 2000, the buffer widths were increased to a maximum width of 200 feet. In March, 2004, the District revised its Design and Construction Standards which included: a definition for redevelopment; requirements to pretreat stormwater from redevelopment; increased buffer widths; improved guidance with invasive species control and landscaping; additional clarifications to prohibited activities. The 2004 revisions also doubled buffer restoration and planting densities.</p>

BMP General Category	New or Improved BMPs Since 1995
Erosion Control Standards for Construction	The District has had an erosion control program in place since 1991, in part due to the implementation of the 1988 Tualatin TMDL. The District administers and enforces the 1200-C general storm water permit program within our jurisdiction which has resulted in increased oversight and enforcement of regulations. In 2002, the 1200-C permit threshold was reduced from 5 acres to 1 acre, effectively doubling the number of sites covered under both a District and 1200-C permit.
Structural Controls	Since 1995 there has been a significant increase in the structural controls (swales, ponds, etc.) installed and acreage served within the District's service area. There are approximately 12 times as many structural BMPs installed currently as compared to 1993. The area served by these structural BMPs was increase about 10 fold.
Other	In 1995, the District had no program relating to enhancement of riparian areas. Currently the District is actively pursuing riparian area protection and enhancement. Between 2001 and 2004, the District enhanced 5.5 miles of streams.