MS4 Stormwater Management Plan

Prepared by

Clean Water Services

Our commitment is clear.

Co-implementers:

Banks, Beaverton, Clean Water Services, Cornelius, Durham, Forest Grove, Hillsboro, King City, North Plains, Sherwood, Tigard, Tualatin, and Washington County

August 2008

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Acronyms and Abbreviations

BMP	best management practice
CFR	Code of Federal Regulations
CIP	capital improvement plan
CWA	Clean Water Act
DCS	design and construction standards
DEQ	Oregon Department of Environmental Quality
DLID	Drainage Local Improvement District
DLUT	Washington County Department of Land Use and Transportation
DMA	designated management agency
DO	dissolved oxygen
DSL	Oregon Department of State Lands
EMC	event mean concentration
EPSC	erosion prevention and sediment control
EQC	Oregon Environmental Quality Commission
ESA	Endangered Species Act
EDU	Equivalent Dwelling Unit
IGA	intergovernmental agreement
LA	load allocation
LID	low impact development
MOA	memorandum of agreement
MS4	municipal separate storm sewer system
NEC	no exposure certification
NOAA	National Oceanic and Atmospheric Administration
NPDES	National Pollutant Discharge Elimination System
OAR	Oregon Administrative Rule

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ODA	Oregon Department of Agriculture
ODF	Oregon Department of Forestry
ODOT	Oregon Department of Transportation
PLOAD	GIS based pollutant load model
SDC	system development charges
SIC	Standard Industrial Classification
SOD	sediment oxygen demand
SOP	standard operating procedure
SUIC	Sewer Use Information Card
SVS	settleable volatile solids
SWM	surface water management
SWMP	stormwater management plan
SWPCP	stormwater pollution control plan
TMDL	total maximum daily load
TP	total phosphorus
TSS	total suspended solids
TSWCD	Tualatin Soil and Water Conservation District
UGB	urban growth boundary
URMD	Urban Road Maintenance District
USEPA	U.S. Environmental Protection Agency
USFWS	U.S. Fish and Wildlife Service
WES	Clackamas County Water Environment Services
WLA	waste load allocation

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Executive Summary

Introduction

This executive summary provides a brief outline of the stormwater management plan (SWMP), and summarizes the information found in the main body of the plan. The sections in this executive summary reflect the sections contained in the plan.

The implementers of the SWMP are Clean Water Services (District), Washington County, and the cities of Banks, Beaverton, Cornelius, Durham, Forest Grove, Hillsboro, King City, North Plains, Sherwood, Tigard, and Tualatin (together referred to as "co-implementers"). This SWMP describes the co-implementer's program to reduce the introduction of pollutants from stormwater sewer systems into the waters of the state. The program focuses on the municipal separate storm sewer system (MS4) within the service area served by the co-implementers (service area). Incorporated in the program are best management practices (BMPs), a monitoring program, and an adaptive management strategy. As discussed in Section 3 of the SWMP, this program reduces the discharge of pollutants in stormwater to the maximum extent practicable.

Figure ES-1 indicates the service area, municipal boundaries, and sub-watershed boundaries referred to in this plan.

The SWMP addresses permit renewal requirements specified in the National Pollutant Discharge Elimination System (NPDES) Watershed-Based Permit issued to Clean Water Services on July 27, 2005.

Also provided in this SWMP is important background information about the co-implementers, their respective jurisdictions and responsibilities, and the practices and procedures they use to meet their missions, goals, and objectives, while complying with a variety of other federal, state, and regional environmental requirements beyond those governing stormwater control operations.

This SWMP was written for:

- Regulatory agency personnel within the U.S. Environmental Protection Agency (USEPA) and Oregon Department of Environmental Quality (DEQ) to provide for a better understanding of the co-implementers' respective agencies, and of the practices and procedures co-implementers use to meet the requirements of the MS4 regulations.
- Managers and staff of the co-implementers to provide for a better understanding of the implementation of the practices and procedures to meet the requirements of the MS4 regulations.
- Members of the general public to provide for a better understanding of the co-implementers, and their respective MS4 stormwater management practices and procedures.

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Regulatory Requirements

In 1990, USEPA issued stormwater regulations that apply to entities that own and operate MS4s. These "Phase I" stormwater regulations required that designated municipal entities develop and submit materials to apply for an MS4 permit.

In 1993, the District (known then as Unified Sewerage Agency of Washington County), Washington County, and the Oregon Department of Transportation (ODOT) joined as co-applicants and submitted the two-part application required by the MS4 regulations. In 1995, DEQ issued an MS4 permit to these three entities defining the circumstances and conditions under which their respective MS4 systems can discharge to receiving waters.

In 1999, ODOT applied for its own statewide stormwater NPDES permit. In 2000, the District and Washington County applied for the renewal of the MS4 permit, with the *MS4 Stormwater Management Plan for the Unified Sewerage Agency of Washington County* (URS, 2000) submitted as part of the permit renewal application. Subsequently, a watershed-based NPDES permit was issued February 26, 2004 that integrated and consolidated the MS4 permit with the District's wastewater treatment plant permits in the watershed. Afterwards, the District and Washington County negotiated an intergovernmental agreement, with the result that Washington County was removed from the permit as a co-permittee. The NPDES permit was re-issued on July 27, 2005, with modifications to the MS4 requirements developed by DEQ in response to a Petition for Reconsideration filed in 2004. The District is the sole permittee of the permit.

In May 2006, the co-implementers updated the SWMP and submitted it to DEQ in the form of an Interim Evaluation Report. Along with an update of the BMPs, the May 2006 SWMP/Interim Evaluation Report included stormwater pollutant load calculations and benchmarks for TMDL pollutants, an updated stormwater monitoring program, and an adaptive management strategy. The co-implementers are currently operating under the May 2006 SWMP/Interim Evaluation Report.

The watershed-based NPDES Permit requires the District to submit a permit renewal application package in early August 2008 - 180 days prior to expiration date of the permit. The permit renewal application package requires the submittal of an updated SWMP. Since the current SWMP was recently developed (May 2006) and reflects the activities of the co-implementers, no significant programmatic changes have been made as a result of this update. In this update, the program descriptions for each BMP category have been enhanced and highlight key program elements; measurable goals and tracking measures in each BMP category have been established for key program elements based on discussions with co-implementers.

The TMDL pollutant load calculations have been revised to reflect updated land use and structural BMP data; the benchmarks discussion has also been updated. As required by the watershed-based NPDES permit, annual pollutant load estimates are provided for pollutants in the original Part 2 MS4 permit application. The discussion regarding 303(d) pollutants has also been updated to reflect the listings in DEQ's 2006 303(d) list.
The monitoring component has been enhanced. The SWMP contains an integrated watershed-based monitoring program that includes stormwater runoff monitoring, in-

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stream water quality monitoring (grab and continuous), physical monitoring (stream width, depth, riparian condition, etc.), continuous flow and rainfall monitoring, and biological monitoring (macro-invertebrate surveys).

Legal Authority

The NPDES permit requires the permittee to maintain adequate legal authority to effectively implement and enforce the relevant provisions of this permit. The District's legal authority to implement MS4 regulations and permit requirements is established and maintained through ORS 451, the use of ordinances, resolutions and orders, and intergovernmental agreements (IGAs) with the cities of Banks, Beaverton, Cornelius, Durham, Forest Grove, Hillsboro, King City, North Plains, Sherwood, and Tualatin, and Washington County.

In 1990, the District reached consensus with its member cities to extend their respective IGAs related to cooperative operation of the sanitary sewer system to address storm and surface water management. These IGAs were renegotiated in 2004 and 2005.

The District has "full service agreements" with the following cities: Banks, Durham, King City, and North Plains. Under the "full service agreements," each city agrees that all stormwater services are to be provided by the District. The following cities are referred to as "self-service providers" under the IGAs: Beaverton, Cornelius, Forest Grove, Hillsboro, Sherwood, Tigard, and Tualatin. Under these "self-service provider" agreements, specific stormwater functions are to be provided by those cities. For "self-service providers," each city has operation and maintenance authority over the storm sewer systems, water quality systems, and roadside ditches in street rights-of-way under city jurisdiction. Each city is responsible for maintenance and other associated functions of the storm sewer system and stormwater program within city limits, and must follow work program maintenance standards established by the District.

In January 2005, the District entered into an IGA with Washington County and the Urban Road Maintenance District (URMD) that established operating principles between the parties for the operation, maintenance, and management of the sanitary sewer and stormwater system within the service area and transferred NPDES MS4 responsibilities and permittee status to the District.

Fiscal Resources

The co-implementers have an established surface water management monthly fee and a surface water management system development charge (SDC) for funding the stormwater program. The monthly fee and SDC for the previous year and for the upcoming year are specified in the MS4 Annual Report. Each MS4 Annual Report also presents a summary of program expenditures for the previous year, the number of staff that work in the stormwater program, and the projected revenue for the upcoming year.

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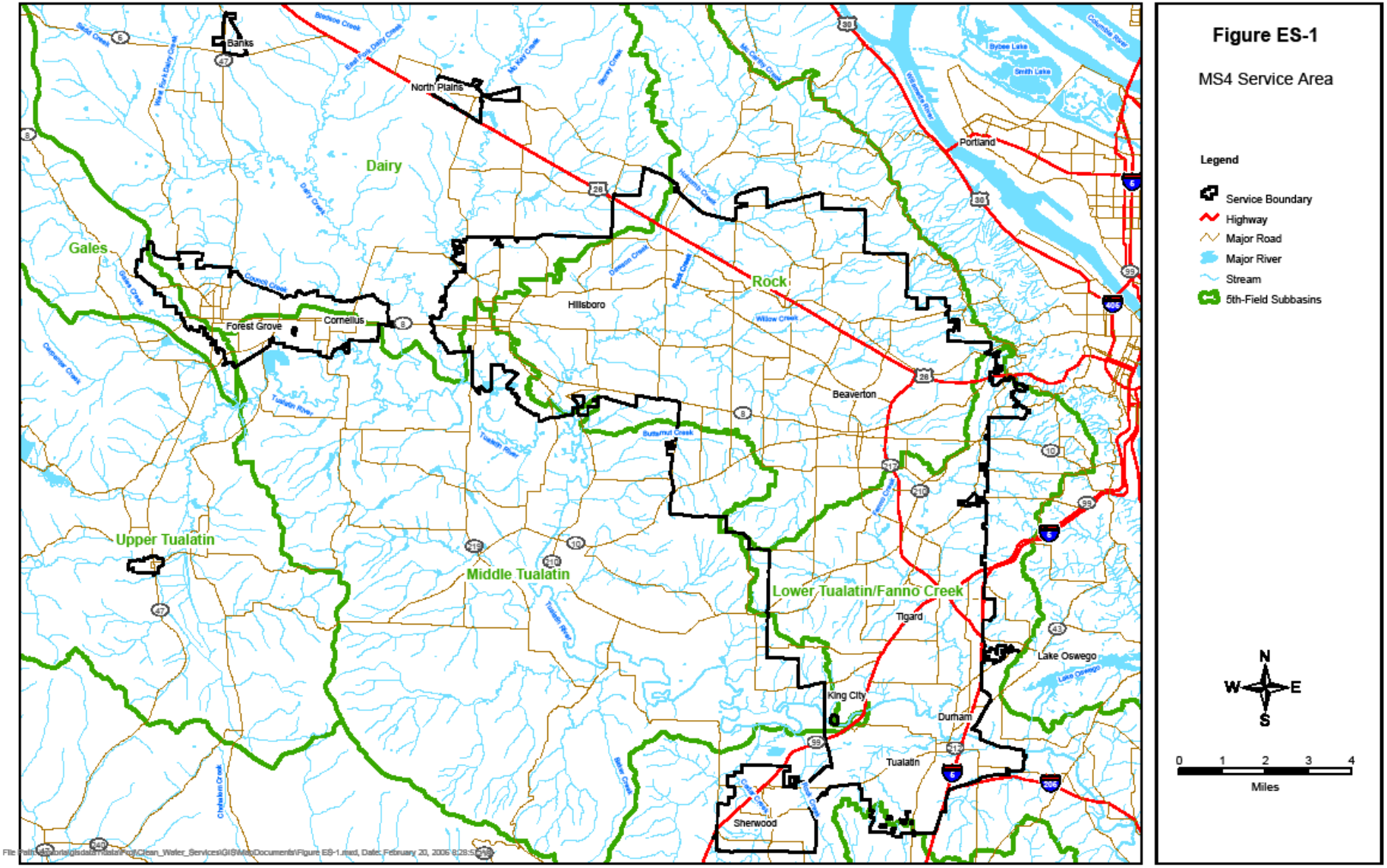
Figure ES-1
MS4 Service Area
Legend
Service Boundary
Highway
Major Road
Major River
Stream
5th-Field Subbasins
N
W
E
S
0
1
2
3
4
Miles
Banks
North Plains
Dairy
Gales
Rock
Hillsboro
Forest Grove
Cornelius
Portland
Beaverton
Upper Tualatin
Middle Tualatin
Lower Tualatin/Fanno Creek
Tigard
Lake Oswego
King City
Durham
Tualatin
Sherwood

Maximum Extent Practicable Determination

The District's MEP determination outlines the efforts that were undertaken in establishing the initial MS4 program and on-going adaptive management efforts. The District initially developed and established the program that met MEP as part of their original 1993 permit application. That program has become the foundation of the District's program – a foundation that has been continuously evaluated and improved through adaptive management since 1995. As a result, the program described in the District's SWMP is the result of the cumulative effect of implementing, continuously evaluating, and making corresponding changes to ensure that the most appropriate controls are implemented in the most effective manner based on site-specific conditions.

Stormwater Management Plan Development Process

The SWMP is a stormwater management document that describes the program that will reduce the discharge of stormwater related pollutants to the maximum extent practicable. The plan is formally revised on a 5-year cycle, with intermediate reporting requirements and opportunities for adaptive management of specific plan elements. The planning process for development of the SWMP by the co-implementers and approval by DEQ includes a thorough internal audit of effectiveness of plan elements, financial allocations, regulatory oversight, and integration with the overall District mission and strategy.

In addition, opportunities are created for interactions with co-implementers through regular meetings and workshops of a Technical Committee of City engineers and operations staff. As part of updating the SWMP, District staff met with co-implementers that carry out various portions of the SWMP. Ad-hoc meetings were scheduled to discuss, update and enhance each BMP category. Drafts of each BMP category and of the SWMP were made available for review and comment by the co-implementers.

Public Involvement

Public involvement is an integral part of the SWMP. Members of the public have been provided an opportunity to engage in the development of the plan, adaptive management of the plan, and its implementation. The co-implementers have established programs to foster public participation at these different stages of the regulatory process.

Public Participation during SWMP Development

The public participation aspect of the SWMP development process included the following:

- Public notices in a local newspaper and the District's web site outlining how the public may obtain information and provide comments on the proposed SWMP.
- The information was presented to the Clean Water Services Advisory Committee (CWAC) in order to solicit input during the development of the SWMP.
- The District provided the public with a minimum of 30 days to provide comments on the proposed SWMP before submission to DEQ.

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- A summary of public participation materials and public comments received during the development of the revised SWMP is included in Appendix D.

Adaptive Management Change Process

Adaptive management changes that require public notification will begin with an e-mail alert to an "interested parties" distribution list describing the issue that needs to be addressed, the adaptive management change under consideration, alternatives being explored, and a timeframe for decision-making and implementation of the proposed change. A more complete description of the proposed change and alternatives under consideration will also be made available on the District's web site. Respondents will have 30 days to submit comments on the proposed change to the District. In addition, a public workshop will be held relatively early in the 30-day comment period. The District will then evaluate the proposed changes to determine which will be most effective. Once this determination has been made, another e-mail or postcard will be distributed. This notice will describe the change, the timeframe for implementation, the anticipated results, and the evaluation procedure that will be used to determine its effectiveness.

Pollutant Load Estimates, Benchmarks, and 303(d) listed Pollutants

Total Maximum Daily Loads and Benchmarks

The Clean Water Act requires States to list water bodies that are not meeting applicable water quality criteria, and States are then required to develop total maximum daily loads (TMDLs) for those water bodies when technology-based controls are not sufficient to bring the water body into compliance. The TMDLs are designed to result in the water body meeting criteria.

Initially in 1988, TMDL requirements were established in the Tualatin Basin for ammonia and total phosphorus by the Oregon Environmental Quality Commission (EQC). In 2001, USEPA approved the revised and updated *Tualatin Subbasin Total Maximum Daily Load Report* (DEQ, 2001), which established waste load allocations (WLAs) for urban stormwater and wastewater facilities in the Tualatin River Subbasin. The TMDLs included stormwater compliance requirements for the District's MS4 area related to phosphorus, bacteria, and oxygen-demanding pollutants.

The NPDES permit renewal application submittal requires an analysis of current loadings of the TMDL pollutants compared to WLAs, and where necessary to provide an estimate of a benchmark (or target) for reduction of that pollutant loading. This comparison of loadings was developed using a GIS based pollutant loadings model (PLOAD) and is summarized below.

Bacteria: Modeling results indicate that the bacteria WLAs are being met in the summer and winter in all sub-basins, except in Rock Creek during the winter. To better understand the sources of bacterial loading and to develop a targeted program to reduce bacterial loads, The District conducted a DNA fingerprinting study of bacterial sources in the Tualatin sub-basin. The study concluded that a significant portion of the bacterial loading in municipal stormwater runoff as well as surface streams is from non-human sources. The co-

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implementers have used this information to develop targeted BMPs to reduce bacterial contributions from anthropogenic sources. The co-implementers are implementing public outreach and education programs regarding pet waste management and waterfowl feeding to reduce bacterial levels. The SWMP does not include a benchmark for bacteria because it is very difficult to quantify the expected improvements from such a program. The District is continuing to monitor bacteria levels in municipal stormwater runoff and in streams to assess the effectiveness of its programs.

Phosphorus: The activities, BMPs, and programs implemented by the co-implementers have resulted in significant reductions in phosphorus loading to the Tualatin basin. The need to continue to work to further reduce phosphorus loading beyond the programs and activities currently being implemented is deemed not to be necessary. The co-implementers expect to achieve additional phosphorus reductions through implementation of BMPs more specifically aimed at oxygen demand related parameters. As the co-implementers continue to address the oxygen demanding constituents associated with storm water through both structural and non-structural activities and BMPs, it is expected that there will be continued ancillary reduction in the discharges of phosphorus. The TMDL benchmarks for phosphorus are based on expected improvements that can be achieved as ancillary reductions associated with enhancing non-structural and structural BMPs associated with reducing sediment and oxygen demanding constituents of stormwater, along with flow reductions from low impact development approaches (LIDA). From these activities, the District anticipates reducing phosphorus loading to 5,450 and 5,200 pounds per TMDL season by 2013 and 2025, respectively.

Settleable Volatile Solids: The TMDL established percent reduction allocations related to reducing sediment oxygen demand (SOD). This was done to improve dissolved oxygen (DO) concentrations, particularly in some of the tributary streams. These reductions were expressed in terms of settleable volatile solids (SVS) because it was assumed that settling organic matter is the key cause of SOD. However, there are no established SVS procedures, and no SVS data. Therefore, total suspended solids (TSS) was used as an available surrogate parameter, as allowed by the 2001 TMDL.

The modeling indicates that the required TSS reductions are being met in nearly all the sub-watersheds. However, water quality monitoring observations indicate that dissolved oxygen levels in the tributaries are still impaired. Therefore, the allowed use of TSS as a surrogate for SVS may not by itself adequately address the complex interactions leading to the low dissolved oxygen observations in the tributaries. In an effort to better understand the potential impacts of storm water discharges on in-stream dissolved oxygen levels, the monitoring protocol has been revised to include two additional parameters, total organic carbon (TOC) and total volatile suspended solids (TVSS). The development of benchmarks for this TMDL WLA is not possible at this time as there is no baseline data for TOC and/or TVSS. As monitoring data are accumulated, the development of benchmarks will be undertaken.

Annual Stormwater Pollutant Load Estimates

The NPDES permit renewal application submittal requires an annual pollutant load estimate for the pollutants in the original Part 2 MS4 permit application. The pollutant load estimates

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were developed using a GIS based pollutant loadings model (PLOAD) and are presented in Section 5.

303(d) Listed Pollutants

The District has reviewed the pollutants that are on the 2006 303(d) list of impaired waters that are relevant to the MS4 discharges to determine whether there is a reasonable likelihood for stormwater discharges from the MS4 to cause or contribute to the water quality degradation of receiving waters. If discharges from the MS4 contribute to specific listed pollutants, the District must determine and describe the relationship between the 303(d) listed pollutant and the MS4 discharges. Finally, the District must determine whether the BMPs in the existing SWMP are effective to address the 303(d) pollutants.

The 2006 303(d) listings in the Tualatin River Sub-basin include mercury in the entire Willamette River basin; iron and manganese in the mainstem Tualatin and Beaverton Creek; dieldrin in Fanno Creek; and metals in Koll Wetland (DEQ, 2006a).

A detailed analysis of MS4 discharges and 303(d) listed pollutants is included in Section 5 of the SWMP. The analyses concludes that BMPs that are effective at reducing sediment loading to receiving streams and moderating the effects of increased urban runoff volumes would be effective in controlling the contributions of the 303(d) pollutants from MS4 discharges. The District's suite of management practices (i.e. erosion prevention and sediment control, operation and maintenance, structural and public education/outreach) is geared towards controlling sediment loading from the MS4 to receiving streams. Furthermore, the District has developed a capital improvement plan to install structural BMPs in high pollutant load areas with no current structural controls. The District has also incorporated BMPs for LIDA which would be effective in controlling sediment loading and moderating the effects of increased runoff volumes into its Design and Construction Standards.

Stormwater Management Plan Best Management Practices

Stormwater management practices have been categorized into the following sections:

- Construction Site Stormwater
- Operation and Maintenance
- Structural and Source Control Measures
- Illicit and Non-stormwater Discharges
- Landfills, Hazardous Waste Sites, and Industrial Facilities
- Public Education and Outreach

Each section includes a description of the program and highlights key program elements. At the end of each section, a BMP category fact sheet is included that specifies measurable goals for key program elements and the tracking measure associated with each measurable goal. The measurable goals and tracking measures will be elements that will be reported in the MS4 Annual Report.

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Construction Site Stormwater

This section of the SWMP specifies the types of construction activities that are subject to regulation, and the roles and responsibilities of co-implementers in implementing this program. It also includes a discussion of on-site planning procedures, best management practice requirements, site inspections, enforcement, and education and training programs for construction site operators.

Operation & Maintenance

This section of the SWMP outlines the management practices for operating and maintaining the MS4 infrastructure and public streets. It specifies the key program elements – street sweeping, leaf pickup, catch basin and water quality manhole cleaning, storm line inspections and cleaning, and structural water quality facility maintenance. This section of the SWMP also includes a discussion of deicing practices, and pesticide, herbicide, and fertilizer pollutant reduction programs.

Structural and Source Control Measures

The Structural and Source Control Measures describe management practices and controls that apply to new development and re-development. It includes a discussion of low impact development approaches, incentives for using these approaches, and public/private partnerships to demonstrate the use of these techniques. This section also includes a discussion of private water quality facilities – inventory, education and outreach, and inspection and enforcement. A discussion of retrofitting of flood management facilities for pollutant control, and outfall/storm system retrofit projects in areas without structural controls is also presented.

Illicit and Non-Stormwater Discharges

This section presents the programs that the co-implementers employ to address non-storm water, and illicit discharges to the MS4. The permit includes a list of non-stormwater discharges that do not need to be addressed by the illicit discharge program if appropriate control measures are developed under the SWMP (as needed) to minimize the impacts of such sources to the MS4. Examples of these types of non-stormwater discharges are landscape irrigation and individual residential car washing. The SWMP includes an analysis of these types of non-stormwater discharges and specifies control measures, where necessary.

The co-implementer's program to identify, investigate, control and/or eliminate illicit discharges (i.e. cross-connections, illegal dumping and spills) to the MS4 is also presented. The co-implementers address illicit discharges as a result of cross-connections through prevention, screening, investigation, and abatement. Each of these elements is discussed in the SWMP. The co-implementers address illegal dumping and accidental spills through public outreach and its Water Quality Investigation program.

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Landfills, Hazardous Waste Sites, and Industrial Facilities

There are no municipal landfills, or hazardous waste treatment, disposal and recovery facilities within the service area. Stormwater discharges from industrial facilities are managed through the 1200-Z NPDES Stormwater General Permit assigned to industrial facilities by the DEQ. The District's industrial stormwater program operates under a memorandum of agreement (MOA) with DEQ to manage industrial facilities requiring an NPDES permit. Under the current MOA, the District acts as DEQ's agent in managing industrial facilities in the service area that are required to have a 1200-Z permit.

The District performs the following activities for the 1200-Z facilities:

- Identification of facilities requiring industrial stormwater permits
- Industrial stormwater permit application review
- Stormwater Pollution Control Plan (SWPCP) review
- Technical assistance
- Facility inspections
- Review of industrial self-monitoring data
- Coordination with DEQ on enforcement matters

In addition to the program for industrial facilities that are covered by the 1200-Z Stormwater General Permit, the District implements a program for select industrial and commercial facilities using local regulatory controls. This program includes select facilities that have oil/water separators, conduct washing operations, and other activities that result in discharges to the MS4.

Public Education and Outreach

The purpose of this BMP is to inform and educate the public, businesses, industry, and government about the causes of stormwater pollution, the effects on local streams and rivers, and to promote stream healthy behaviors. These BMPs encourage behavior change and participation that will reduce stormwater pollution and promote the health of the Tualatin River Watershed.

The public education and outreach components of the SWMP are placed into four categories:

- Pesticide, herbicide and fertilizer educational activities;
- Reporting of illicit discharges and water quality impacts;
- Used oil and toxic material management; and
- Additional public education and outreach activities.

Each category contains a list and a brief description of the programs that are implemented to meet the objectives of the MS4 education and outreach requirements.

Monitoring

The District performs a variety of activities (including monitoring, program evaluation, and reporting) as part of this stormwater management plan. Some of these activities are performed to satisfy specific permit requirements, but others will be performed in the

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interest of obtaining insights that will help the co-implementers make management decisions regarding the wise, effective use of resources it spends on stormwater management practices and procedures.

The District is proposing an extensive monitoring program that includes stormwater runoff monitoring, in-stream water quality monitoring (grab and continuous), physical monitoring (stream width, depth, riparian condition, etc.), continuous flow and rainfall monitoring, and biological monitoring (macro-invertebrate surveys). Discrete monitoring is conducted six times per year at 15 in-stream water quality monitoring sites (9 on the Tualatin River, 6 on tributaries); 6 in-stream continuous sites; 10 stream flow sites; 5 rainfall sites; 15 macro invertebrate and habitat sites (once every two years); and 5 land use based stormwater runoff sites (older residential land use, newer residential land use, high density development, industrial office park, and commercial land use) three times per year.

The following parameters are monitored in stormwater runoff and in-stream samples: *E. coli,* TSS, total organic carbon (TOC), total phosphorus, dissolved ortho-phosphorus, hardness, specific conductance, nitrite + nitrate, total mercury, and total recoverable and dissolved copper, iron, lead, manganese and zinc. In addition to the above parameters, temperature, dissolved oxygen and pH monitoring is also conducted for in-stream samples; total volatile suspended solids (TVSS) and pesticide monitoring is conducted for stormwater runoff samples. The in-stream continuous sites are monitored for temperature, pH, dissolved oxygen, specific conductance, and turbidity.

Section 7 of the SWMP includes details on program evaluation monitoring. Each BMP category contains a fact sheet that specifies measurable goals and tracking measures, which will be evaluated and reported annually. The program evaluation monitoring is designed to provide adequate data to verify that components of the plan are implemented appropriately and inform the adaptive management process.

Evaluation of Plan, Adaptive Management, and Reporting Requirements

Evaluation and adaptive management of the SWMP BMPs and program policies and procedures are important to the successful reduction of pollutant discharges in the Tualatin River Subbasin.

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The co-implementers track and evaluate MS4 BMPs to refine their stormwater management programs on an ongoing basis as trends are identified. This process is intended to identify the most successful practices, to gather information that will enable co-implementers to ensure their BMPs are useful, and to make changes based on identified trends so that pollutant discharges can be reduced to the maximum extent practicable.

Adaptive management is the strategy that is used to make changes in stormwater management practices that result from performance feedback, and which will be reflected in future improvements of this SWMP. Through an adaptive management process, the co-implementers will evaluate on an annual basis how well each of the SWMP's strategies is working, and make adjustments to those strategies if they are not performing as anticipated. Changes to BMPs as a result of adaptive management will be documented in the MS4 Annual Report.

The District submits an annual system-wide MS4 report that summarizes stormwater activities for the preceding year. The measurable goals and tracking measures specified in the fact sheet for each BMP category are evaluated and reported in the MS4 Annual Report.

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SECTION 1

Introduction

1.1 Purpose of the MS4 Stormwater Management Plan

The implementers of the SWMP are Clean Water Services (District), Washington County, and the cities of Banks, Beaverton, Cornelius, Durham, Forest Grove, Hillsboro, King City, North Plains, Sherwood, Tigard, and Tualatin (together referred to as "co-implementers"). This SWMP describes the co-implementer's program to reduce the introduction of pollutants from stormwater sewer systems into the waters of the state. The program focuses on the municipal separate storm sewer system (MS4) within the service area served by the co-implementers (service area). Incorporated in the program are best management practices (BMPs), a monitoring program, and an adaptive management strategy.

Figure 1-1 outlines the service area, municipal boundaries, and sub-watershed boundaries referred to in this plan.

The SWMP addresses the permit renewal requirements specified in the NPDES Watershed-Based Permit issued to Clean Water Services on July 27, 2005.

Also provided in this SWMP is important background information about the co-implementers, their respective jurisdictions and responsibilities, and some of the practices and procedures they use to meet their missions, goals, and objectives, while complying with a variety of other federal, state, and regional environmental requirements beyond those governing stormwater control operations.

1.2 Surface Water Management Program

The following provides an overview of stormwater program elements and activities in urban Washington County. The District's Surface Water Management (SWM) program was developed and approved by city and county partners with official operations beginning July 1, 1990, in response to the establishment of the total phosphorus TMDL. In 1998, the SWM Program was revisited and a policy guidance document, the SWM Framework, was produced that outlined strategies for improving the SWM program.

The area covered by the SWM program is within the service boundary, which is the same as the area for the municipal wastewater program (with the exception of Gaston), and includes most of the area within the urban growth boundary (UGB) within Washington County and small portions of Multnomah and Clackamas Counties that are tributary to the Tualatin River. The SWM program was designed to deal with urban storm and surface water management issues, both quality and quantity.

There is an important distinction between the MS4 and surface waters (streams and wetlands). The definition of MS4 from the federal regulations (40 CFR Part 122.26(b)(8) is as follows: *Municipal separate storm sewer system* means a conveyance or system of conveyances

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(including roads with drainage systems, municipal streets, catch basins, curbs, gutters, ditches, man-made channels, or storm drains). Discharges of stormwater from the MS4 are regulated by the NPDES permit while surface waters are not.

The District's SWM program manages water quality, protects habitat, and provides drainage services. It is much broader in scope than the stormwater quality and quantity programs described in this MS4 SWMP, and addresses issues regarding surface waters that are not a part of the MS4.

1.3 Intended Users/Readers

This SWMP was written for:

- Regulatory agency personnel within the USEPA and DEQ to provide for a better understanding of the co-implementers' respective agencies, and of the practices and procedures the co-implementers use to meet the requirements of the MS4 regulations.
- Managers and staff of the co-implementers to provide for a better understanding of the implementation of the practices and procedures to meet the requirements of the MS4 regulations.
- Members of the general public to provide for a better understanding of the co-implementers, and their respective MS4 stormwater management practices and procedures.

1.4 Organization of this Document

This plan is organized to describe the elements of the co-implementer's stormwater management program and at the same time explicitly address specific permitting and regulatory requirements. The headings of this report are frequently taken directly from the headings in the NPDES Watershed-Based Permit.

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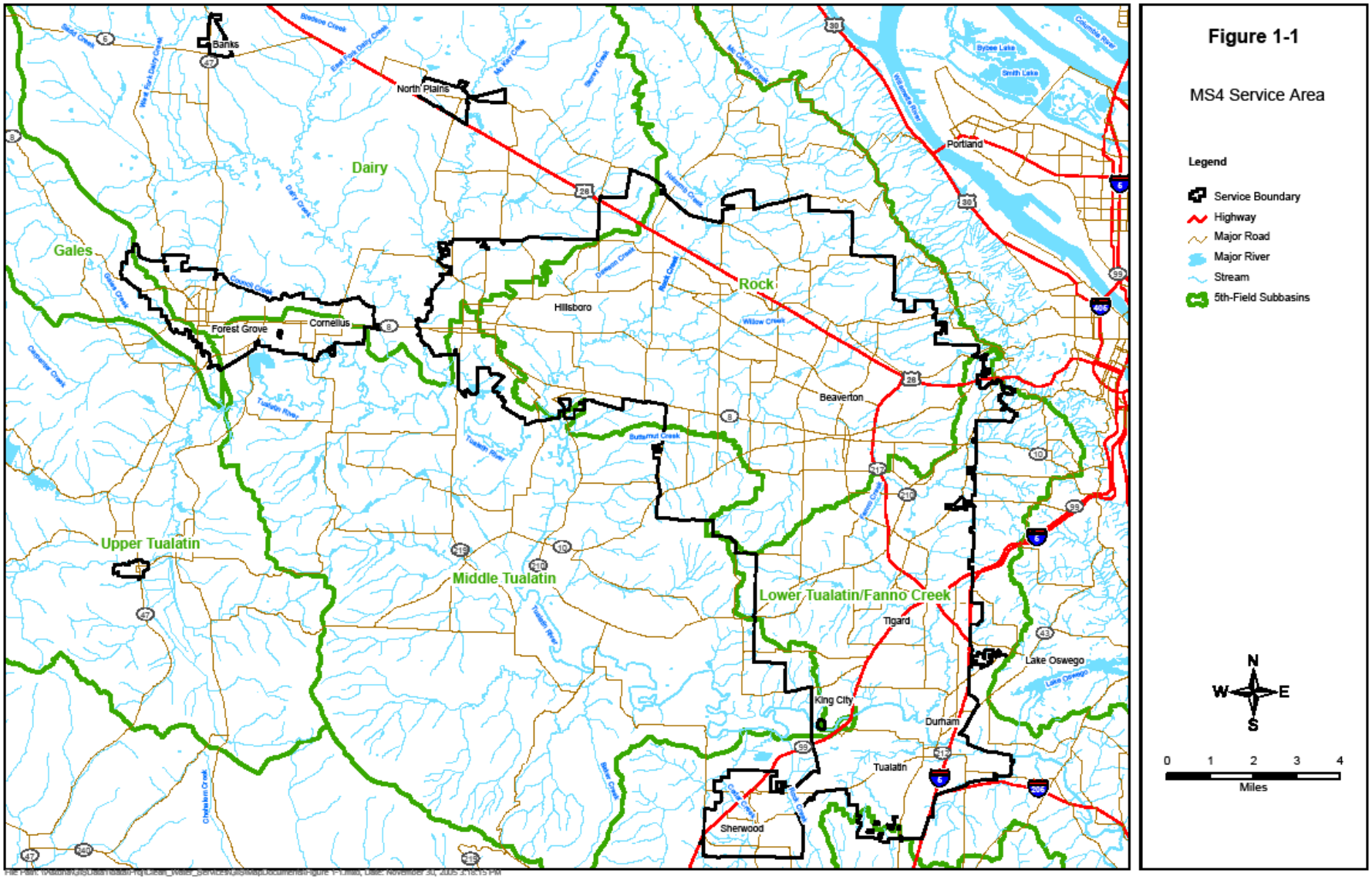
Figure 1-1
MS4 Service Area
Legend
Service Boundary
Highway
Major Road
Major River
Stream
5th-Field Subbasins
N
W
E
S
0
1
2
3
4
Miles
Banks
North Plains
Dairy
Gales
Rock
Hillsboro
Forest Grove
Cornelius
Beaverton
Portland
Upper Tualatin
Middle Tualatin
Lower Tualatin/Fanno Creek
Tigard
Lake Oswego
King City
Durham
Tualatin
Sherwood

SECTION 2

Regulatory Requirements

2.1 MS4 Requirements

In 1990, the USEPA issued a set of stormwater regulations that apply to entities that own and operate MS4s. These "Phase I" stormwater regulations are described in Title 40, Part 122, Section 26 of the Code of Federal Regulations (40 CFR 122.26). The regulations required that designated municipal entities develop and submit materials to apply for an MS4 permit.

In 1993, the District (known then as Unified Sewerage Agency of Washington County), Washington County, and the Oregon Department of Transportation (ODOT) joined as co-applicants and submitted the two-part application required by the MS4 regulations. In 1995, the DEQ issued an MS4 permit to these three entities defining the circumstances and conditions under which their respective MS4 systems can discharge to receiving waters. By this action, the programs and activities described in the SWMP were deemed to meet the maximum extent practicable (MEP) standard.

In 1999, ODOT applied for its own statewide stormwater NPDES permit, leaving the District and Washington County to become co-permittees, whose systems and programs were defined in the *MS4 Stormwater Management Plan for the Unified Sewerage Agency of Washington County* published June 2, 2000 (URS, 2000).

The District and Washington County applied for the renewal of the MS4 permit in June 2000. Subsequently, a watershed-based NPDES permit was issued February 26, 2004. In this permit, the MS4 permit was integrated and consolidated with District's wastewater treatment plant permits in the watershed. Afterwards, the District and Washington County negotiated an intergovernmental agreement, with the result that Washington County was removed from the permit as a co-permittee. The NPDES permit was re-issued on July 27, 2005, with modifications to the MS4 requirements developed by DEQ in response to a Petition for Reconsideration filed in 2004. The District is the sole permittee of the permit.

The MS4 requirements of the watershed-based permit are addressed in this SWMP. The co-implementers of the SWMP are the District, Washington County, and the cities of Banks, Beaverton, Cornelius, Durham, Forest Grove, Hillsboro, King City, North Plains, Sherwood, Tigard, and Tualatin.

To place the co-implementers' MS4 practices and procedures in proper context, this document refers to several types and sources of discharges. However, only those discharges that are specifically defined in the MS4 regulations are covered by the MS4 permit. These include only stormwater and some non-stormwater discharges that are discharged from the co-implementers' MS4 systems into waters of the state.

Each category of BMPs has been refined to include a concise description of the program being implemented and to highlight key program elements. Each BMP category also

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includes a fact sheet with a brief description of the BMP category, measurable goals for key program elements, and tracking measures for each measurable goal.

Table 2-1 summarizes the history of the District's MS4 permit.

TABLE 2-1
Historical Summary

Date	Activity
May 1992	Part 1 Permit Application for an MS4 Permit submitted by Clean Water Services, Washington County, and ODOT, as co-applicants.
May 1993	Part 2 Permit Application for an MS4 Permit submitted by Clean Water Services, Washington County, and ODOT, as co-applicants.
July 26, 1995	MS4 Permit issued to Clean Water Services, Washington County, and ODOT by DEQ. Permit Number 101309, expiration date: June 30, 2000.
December 1997 and undated official permit modification	Clean Water Services requested a permit modification to change monitoring sites (i.e., replace land use characterization with in-stream monitoring sites and BMP effectiveness studies). DEQ approved requested permit modification submitted in December 1997 as Addendum No. 1 to the MS4 permit. Modification took effect in Permit Year 3.
May 1999	DEQ approved change in monitoring sites.
June 2000	Renewal application submitted to DEQ. ODOT no longer a co-permittee.
February 2004	Watershed-based NPDES permit issued, including MS4 requirements. Expiration date: January 31, 2009.
July 2005	Watershed-based NPDES permit re-issued, including modifications to MS4 requirements. Washington County was removed as a co-permittee. Expiration date: January 31, 2009.
August 2008	Application for renewal of watershed-based NPDES permit submitted to DEQ

2.2 Legal Authority

Requirement: The permittee must maintain adequate legal authority, through ordinance(s), interagency agreement(s) or other means, to effectively implement and enforce the relevant provisions of this permit. The legal authority must enable the permittee to:

(1) Control through ordinance, permit, contract, order or similar means, the contribution of pollutants to the municipal storm sewer by storm water discharges associated with industrial activity and the quality of storm water discharged from sites of industrial activity.

(2) Prohibit through ordinance, order or similar means, illicit discharges to the municipal separate storm sewer.

(3) Control through ordinance, order or similar means the discharge to a municipal separate storm sewer of spills, dumping or disposal of materials other than storm water.

(4) Control through interagency agreements among the contribution of pollutants from one portion of the municipal system to another portion of the municipal system.

(5) Require compliance with conditions in ordinances, permits, contracts or orders.

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(6) Carry out all inspection, surveillance and monitoring procedures necessary to determine compliance and noncompliance with permit conditions including the prohibition on illicit discharges to the municipal separate storm sewer.

Clean Water Services is a municipal corporation and county service district established in 1970 under Oregon Revised Statutes Chapter 451. Upon order of the Portland Metropolitan Area Boundary Commission and subsequent action by the Washington County Board of County Commissioners, storm and surface water drainage and management were added to the District's responsibilities. Its legal authority to implement MS4 regulations is established and maintained through the use of ordinances, resolutions and orders, and intergovernmental agreements (IGAs) with the cities of Banks, Beaverton, Cornelius, Durham, Forest Grove, Hillsboro, King City, North Plains, Sherwood, and Tualatin, and Washington County. Appendix A includes a list of the ordinances, and resolutions and orders that are relevant to stormwater.

2.2.1 Intergovernmental Agreements

The District has management and enforcement authority over the storm and surface water program throughout its service area and within each of its member cities. The cities have varying degrees of operation and maintenance authority delegated by the District to them via IGAs.

In 1990, the District reached consensus with its member cities to extend their respective IGAs related to cooperative operation of the sanitary sewer system to address storm and surface water management. These IGAs were renegotiated between 2004 and 2005 (copies provided in Appendix C).

The District has "full service agreements" with the following cities: Banks, Durham, King City, and North Plains. Under the "full service agreements," generally, each city agrees that all stormwater services are to be provided by the District. This arrangement benefits the water resources because the cities do not necessarily have the resources to manage the functions of the systems.

The following cities are referred to as "self-service providers" under the IGAs: Beaverton, Cornelius, Forest Grove, Hillsboro, Sherwood, Tigard, and Tualatin. Under these "self-service provider" agreements, specific stormwater functions are to be provided by those cities. The IGAs for these cities are identical, except for the specific self-service areas identified. For "self-service providers," generally, each city has operation and maintenance responsibility through the IGA over public storm drain systems and water quality systems. Each city is delegated responsibility for maintenance and other associated functions of the storm drainage and stormwater program within city limits, and must conform to work program and maintenance standards adopted by the District. Each City is required to periodically report on the activities conducted under the IGA.

Before July 1990, Washington County managed the Drainage Local Improvement District (DLID) program. This program ceased July 1, 1990, when the District's SWM Program began, and the existing DLIDs were dissolved. In January 2005, the District entered into an IGA with Washington County and the Urban Road Maintenance District (URMD) that established operating principles between the parties for the operation, maintenance, and

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management of the sanitary sewer and stormwater system within the service area and transferred NPDES MS4 responsibilities and sole permittee status to the District.

Under the IGA with Washington County, the District's MS4 responsibilities include the following:

- With input from Washington County and URMD, development, adoption, and enforcement of standards and rules for the design, construction, use, operation, maintenance, and repair of the storm system.
- Performance of system planning and the adopted work program for the maintenance, repair, and operation of the urban storm system, including street sweeping of Washington County and local access road rights-of-way.
- Performance of the adopted work program for the maintenance, repair, and operation of roadside stormwater facilities in Washington County and local access road rights-of-way. Roadside stormwater facilities include roadside ditches and swales, driveway culverts, cross-piping, and roadside piping systems.

The District has the authority to perform these responsibilities and others as stipulated in the IGA with Washington County (copy provided in Appendix C), except where that authority has been delegated to the cities under the City IGAs.

2.3 Fiscal Resources

The co-implementers have established a monthly surface water management fee and a one-time system development charge (SDC) for funding the stormwater program. Both the monthly fee and the SDC are assessed on an equivalent dwelling unit basis. The MS4 Annual Report specifies the applicable monthly fee and development charge for the previous year and for the upcoming year. Each MS4 Annual Report also presents a summary of program expenditures for previous year, the projected revenue for the upcoming year, and the number of staff that work in the stormwater program.

2.4 Other Regulations

The co-implementers are subject to a variety of federal, state, and regional regulations that require them to control water pollutants and protect aquatic habitats. The purpose of describing these other regulatory programs is to provide a context for understanding the co-implementers' overall environmental conservation activities, and to draw the distinction between these activities and those driven by or accountable under MS4 regulations.

2.4.1 Clean Water Act: Total Maximum Daily Load Requirements

The federal Clean Water Act (CWA) outlines a formal process by which state-level regulatory agencies (e.g., DEQ) define water bodies throughout the state, "designate" their respective beneficial uses, and set narrative and/or numerical water quality criteria to protect such uses. The CWA also prescribes a process of "adaptive management" for periodically reviewing water quality conditions. DEQ reviews monitoring data for receiving waters, develops a Section 303(d) list that names water bodies that do not meet standards,

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and then determines the maximum amounts of specific pollutants that the water body should be able to accommodate without exceeding ambient standards or impairing the beneficial uses.

The 2006 303(d) listings in the Tualatin River Sub-basin include mercury in the entire Willamette River basin; iron and manganese in the mainstem Tualatin and Beaverton Creek; dieldrin in Fanno Creek; and metals in Koll Wetland. The 303(d) listings are discussed in Section 5.7.

The District is one of several Designated Management Agencies (DMAs) in the Tualatin River Subbasin that have supported implementation of the TMDL process to improve water quality conditions in the subbasin. In 1989, the DMAs began applying watershed management and pollution control practices. The District, through construction and operation of wastewater treatment facilities and enhancing river flow, has substantially reduced the loads of pollutants discharged and has greatly improved conditions in the Tualatin River. Activities of the District and other DMAs throughout the basin have improved conditions in the Tualatin River and its tributaries.

In 1988, TMDL requirements were established in the Tualatin Basin for ammonia and total phosphorus by the Oregon Environmental Quality Commission (EQC). In 2001, USEPA approved an updated and revised *Tualatin Subbasin Total Maximum Daily Load Report* (DEQ, 2001), which established waste load allocations (WLAs) for urban stormwater and wastewater facilities in the Tualatin River Subbasin. The 2001 TMDL included compliance requirements for the MS4 area related to phosphorus, bacteria, and oxygen-demanding pollutants as follows:

- An update of the previous phosphorus TMDL. Because of the new information about natural concentrations in groundwater, this updated TMDL revised waste load allocations for the treatment plants based on natural background concentrations. It also established new waste load allocations for stormwater sources and revised load allocations for surface waters that are based on achieving applicable natural groundwater concentrations in each of the sub-basins.
- A new TMDL for bacteria. This TMDL established waste load allocations for MS4s based on analyses indicating that with these allocations, the *E. coli* criterion of 126 colony forming units (cfu)/100 mL would be met at the mouth of each of the tributary streams. The TMDL explicitly provides that bacteria concentrations may be used to assess monitoring data and provide targets for runoff quality to comply with the TMDL allocations.
- Revised the dissolved oxygen TMDL on the Tualatin and developed a new TMDL on the tributaries. This TMDL revised the ammonia waste load allocations pertaining to the wastewater plants discharging to the mainstem river. It also established waste load allocations for stormwater and a load allocation for non-point sources for settleable volatile solids (surrogate for oxygen-demanding pollutants.) The primary concern in the tributary streams is sediment oxygen demand.

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2.4.2 Endangered Species Act Requirements

The Endangered Species Act (ESA) is relevant to the MS4 permit because it has influenced the designation of beneficial uses and water quality standards. Also, the quality of discharges from the MS4 system could affect, directly or indirectly, the long-term conservation of listed species in the wild. The National Oceanic and Atmospheric Administration's Fisheries Service (NOAA Fisheries) and the U.S. Fish and Wildlife Service (USFWS) administer provisions of the ESA for marine and anadromous species of fish, and for other aquatic and terrestrial organisms, respectively. As NOAA Fisheries and USFWS continue to administer the ESA, the co-implementers will continue to work to make revisions or refinements to their respective policies, programs, and facilities such that they support species recovery.

2.4.3 Land Use and Land Management Laws

The cities and Washington County are responsible for adopting local land use regulations that implement statewide planning and land use goals to protect water quality and fish and wildlife habitat. The District is responsible for meeting the requirements of the CWA and the ESA, but does not have land use authority. However, the co-implementers coordinate their water quality, quantity, and habitat management via intergovernmental agreements and day to day cooperation. The design and construction standards developed by the District are implemented by the District and local land use jurisdictions in accordance with intergovernmental agreements to ensure that land use activities within those jurisdictions comply with CWA and ESA intent as well as statewide planning goals 5, 6, and 7.

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SECTION 3

Maximum Extent Practicable Determination

MS4 permittees must develop and implement a stormwater management program to reduce the discharge of pollutants to the maximum extent practicable (MEP). The program accomplishes this through BMPs, monitoring, and adaptive management. The programs vary by municipality because they take into consideration site-specific conditions. The entire program as, documented in the permit and SWMP, reduce pollutants to the maximum extent practicable.

The District initially developed and established its programs to meet MEP as part of their original 1993 permit application. That program has become the foundation for the District's program – a foundation that has been continuously evaluated and improved through adaptive management since the Phase 1 MS4 NPDES permit was initially issued in 1995. As a result, the program described in the District's proposed SWMP is the result of the cumulative effect of implementing, continuously evaluating, and making corresponding changes that continue to ensure that the most appropriate controls are implemented in the most effective manner based on their site-specific conditions.

The District has used the following sequential processes to ensure its SWMP meets the MEP standard:

1. The original development of the SWMP submitted with the 1993 permit application.
2. The continual adaptive management process as reported in the annual reports and the following updates to the SWMP.

   a. The SWMP review conducted for the 2000 permit renewal application.

   b. The SWMP review conducted for the 2006 Interim Evaluation Report.

   c. The SWMP review conducted for the 2008 permit renewal application.

These processes are described below.

3.1 Permit Application (1993)

To comply with CWA requirements, the District (under the name of Unified Sewerage Agency at the time) and its co-permittees were required to submit an application for a NPDES permit to cover their MS4 discharges. The application was submitted in two parts. The first part of the application required the compilation of information related to the stormwater system within the permit area including outfall investigation results, maps and monitoring data. The second part of the application required the development of a SWMP. The SWMP was required to include BMPs to address several categories of stormwater management issues. Collectively, the BMPs were developed to reduce pollutants to the MEP. As a result, the District undertook an extensive process to develop their SWMP to address the MEP standard. The purpose of this section is to describe that process.

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In order to develop the SWMP, a series of technical workshops were held over a six-month period. The workshops were run by the District staff and were attended by staff from the other co-permittees and by staff from the cities in the service area. The workshops typically included twenty to twenty-five participants including a broad spectrum of technical, legal, public information, and management personnel representing these jurisdictions. The District hired a consultant with national expertise in stormwater to act as the meeting facilitator and to provide technical data and information necessary for participants to make informed decisions regarding the selection of SWMP program elements.

The individual actions that were considered for inclusion in the SWMP are referred to as best management practices or BMPs. The specific steps in the process to select BMPs for the SWMP included the following:

Step 1: Identify local stormwater quality problems.

Step 2: Define objectives of the SWMP.

Step 3: Identify a comprehensive list of candidate BMPs.

Step 4: Define and evaluate selection factors for preliminary screening of BMPs.

Step 5: Conduct preliminary screening of candidate BMPs.

Step 6: Conduct final evaluation, screening, and selection of BMPs for the SWMP.

Each step of the process is described as follows:

Step 1: Identify Local Stormwater Quality Problems.

Information on water quality problems in the permit area was compiled from previous monitoring studies conducted by the District. Additional information was obtained from DEQ's Section 305(b) biennial reports in which DEQ identified a number of local water bodies or segments of water bodies where water quality criteria were exceeded. In 1988, DEQ developed a TMDL for the Tualatin Subbasin that included requirements to reduce total phosphorus in stormwater. This information was used to aid in the selection of BMPs most likely to be effective at addressing water quality issues of concern.

Step 2: Define Objectives of the Stormwater Management Program.

The co-permittees and other participants defined an explicit set of objectives broad enough to capture the full range of issues to be considered in program planning but specific enough to use as the basis for decision making. The following objectives were developed:

- Meet the requirements of the NPDES MS4 permit.
- Focus the management program on existing stormwater quality problems that warrant the greatest attention (as defined under Step 1 above).
- Focus on problems and BMPs for which a reasonable degree of control would yield the greatest benefits.
- Propose a SWMP that emphasizes and builds upon stormwater controls and practices already in place.

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- Rely on and enhance existing practices where possible; where needed, phase in new practices during the term of the permit.
- Based on best professional judgment, the development and implementation of BMPs should:
    - Emphasize practices that are the most likely to be effective in reliably controlling targeted problems.
    - Emphasize practices that will be practical to implement and sustain, including consideration of liability and legal authority.
    - Emphasize practices that have acceptable initial and continuing costs.
    - Emphasize practices that have acceptable environmental impacts.
    - Emphasize programs that are politically acceptable to the elected officials and the public.
- Develop the SWMP with input from the cities in the permit area, outside groups/agencies, and the public.

It should be noted that with respect to the last bullet, a public involvement process took place in parallel to this SWMP development process. The public involvement process included presentations to over 100 community groups including open houses, and involvement from five different advisory committees representing the business community, neighborhood associations, and environmental groups. Public campaigns (including fliers and door hangers) and press releases were also conducted to publicize NPDES related activities.

Step 3: Identify a Comprehensive List of Candidate BMPs

A comprehensive list of 130 candidate BMPs was developed by the technical consultant representing virtually all types of management practices that might beneficially affect stormwater quality, regardless of the technical, economic or political feasibility of implementation. A matrix was created which summarized significant information with respect to each BMP including:

- Whether NPDES Regulatory Requirements would be met by the BMP
- Which pollutants would be addressed by the BMP
- The current implementation status of the BMP within the permit area.
- The probable lead agency responsible for the BMP if it was selected.

It would have been physically and fiscally impossible to implement all 130 BMPs; therefore, a screening process was conducted to rank and select the highest priority BMPs. The BMP matrix developed under this step was used as the template for scoring the 130 BMPs (Step 5) using the evaluation factors described in Step 4.

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Step 4: Define and Evaluate Selection Factors for Preliminary Screening of BMPs

In order to select the BMPs to implement, the program participants initially considered eleven selection factors to evaluate, score and rank candidate BMPs. Out of those eleven, the following six factors were selected as the highest priority for use in screening candidate BMPs.

- Addresses pollutants of concern,
- Life cycle costs,
- Meets regulatory requirements,
- Public acceptance,
- Risk/liability,
- Reliability.

The six selection factors were assumed to be of equal importance for the preliminary screening conducted under Step 5.

Step 5: Conduct Preliminary Screening of Candidate BMPs

Each participant scored each of the candidate BMPs for each selection factor. The consultant compiled net scores for each candidate BMP. A cutoff score was identified that resulted in a discreet group of 46 of the most highly scored BMPs. The consultant reviewed the results and some additional BMPs were added based on those that would be necessary to meet minimum requirements, and those that should be reconsidered due to a wide range in individual scores for that BMP. As a result, the consultant recommended an initial list of 57 BMPs for further consideration.

Step 6: Final Evaluation, Screening, and Selection of BMPs for the Stormwater Management Plan

Fact sheets were prepared for the 57 BMPs selected in Step 5 for further consideration. The fact sheets provided more detailed information on each BMP that allowed the process participants to better evaluate its practicability, effectiveness and financial feasibility. The participants reviewed the fact sheets and offered their comments on the selected BMPs. A meeting was then held to come to a consensus on a final list of BMPs for inclusion in the stormwater management plan. This meeting included process participants, co-permittees, and the cities in the service area. A number of BMPs were eliminated from consideration during the meeting (mainly due to taking a more detailed look at cost/effectiveness issues and overall program costs), and several others were combined into a single BMP description (e.g., combining some of the public education measures into one BMP). A final list of 40 BMPs was selected and incorporated into the proposed SWMP. The SWMP provided in the permit application includes a rationale for the selection of BMPs in each major permit category. As a result of the 1988 total phosphorus TMDL, a large number of existing programs were already in place (e.g., storm system operation and maintenance practices; erosion control and water quality standards for new development; etc.) and therefore, typically the main rationale for the selection of BMPs included building on already existing programs and modifying/refining those programs to maximize water quality benefits.

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The final SWMP was developed and submitted in the District's permit application to DEQ in 1993. The application was approved by DEQ and a permit was issued. Therefore, the CWS SWMP was deemed to meet the MEP standard. As mentioned in the introduction, this original SWMP has been the foundation for the District's stormwater management activities. As new information has become available and as more has been learned about BMPs and sources over time, the SWMP activities, programs, monitoring and BMPs have been revised and improved as described in the following sections through an adaptive management process.

3.2 Adaptive Management

To ensure that the District's SWMP continues to meet the MEP standard, the effectiveness of the programs, activities, and BMPs contained in the SWMP is revisited annually. Each year, the District is required to submit an annual compliance report. With respect to evaluating the SWMP, the annual report is required to include the following:

- The status of implementing the components of the storm water management program;
- Proposed changes to the storm water management plan components, including new BMPs identified through implementing adaptive management.

If there were changes identified during the annual reporting period, they were documented in the annual report. These changes are made as part of an adaptive management process to ensure that the program continues to meet the MEP standard.

3.2.1 Permit Renewal Application Submittal (June 2000)

During the first permit renewal process, the District's and county's technical, legal, public information, and management personnel met in technical workshop sessions facilitated by a consultant team to establish appropriate evaluation criteria, review candidate BMPs, and select BMPs for use during the permit cycle. During the evaluation process, some BMPs were completed and were thus not included in the June 2000 SWMP; some dealt with issues beyond the scope of the MS4 (i.e. non-point sources) and were also not included in the June 2000 SWMP; some were grouped to better facilitate implementation and tracking; and some were enhanced to ensure their practicality and effectiveness. The BMPs were also renumbered. This information can be found in the MS4 Stormwater Management Plan (Section 6 and Appendix 2), June 2, 2000 that was submitted to DEQ as part of the permit renewal process.

3.2.2 Interim Evaluation Report (May 2006)

The first permit term included the five-year period from 1995 to 2000. There was a delay in DEQ's issuance of new permits due to third-party group concerns. DEQ convened a working group to receive input on those concerns and issued a new permit in 2004. Third-party groups requested that DEQ reconsider the permit. DEQ did reconsider the permit and as a result, revisions to the permit were issued in 2005. However, the permit revisions did not change the term or expiration date of the permit. The District's renewed MS4 permit was in the form of a watershed-based NPDES permit that included the District's other activities in the basin. The watershed-based NPDES permit included requirements

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associated with conducting a review/evaluation of the SWMP and preparing a revised SWMP to be submitted to DEQ in an Interim Evaluation Report due May 1, 2006. These specific permit requirements related to conducting a SWMP evaluation are as follows:

Schedule B,3.b.(1):

The Interim Evaluation Report must be submitted to the Department by May 1, 2006.

The Report must contain the following:

(a) An evaluation of, and proposed revisions to, the previously submitted SWMP which addresses the requirements of Schedule D, 8.b.(2) (see below) and Schedule B, 1.e.(2)(monitoring), including the rationale supporting the proposed revisions.

Schedule D, 8.b.(2): Evaluation of SWMP

The permittee must review Schedule D, 8.b.(3) and, for each component, determine whether implementation of the components in the SWMP as submitted is sufficient to reduce the discharge of pollutants to the maximum extent practicable. The permittee must submit to the Department details on how each of the components are, or will be, addressed and the rationale for the continued existing or revised level of implementation. (If certain components are not included in the plan, then the rationale for exclusion must also be submitted.)

During this evaluation, it may be found that the SWMP will need improvement and/or modification to ensure continued reduction of pollutants to the maximum extent practicable. The results of the evaluation, including any proposed revisions to the SWMP, must be reported to the Department as described in Schedule B, 3.b.(1).

As a result of the requirement to produce an Interim Evaluation Report (IER) and conduct an evaluation of the SWMP, the District hired a consultant to assist with this process. The process included an internal audit of the effectiveness of plan elements (based on best professional judgment regarding the state of the practice), financial allocations, regulatory oversight, and integration with the overall District's mission and strategy. In addition, opportunities were created for interaction with co-implementers through regular meetings and workshops of a Technical Committee of City engineers and operations staff. Drafts of the plan were made available for review and comment by the co-implementers. Stakeholder meetings were also held to invite and encourage public participation in the development of the updated plan. The public process is documented in Section 4.2:

As a result of this process, several changes were made to enhance the SWMP to ensure that it would continue to meet the MEP standard. Examples of significant SWMP revisions that occurred as a result of the IER evaluation included the following:

- Added commitment to incorporate low impact development practices in the basin
- Pollutant load calculations and establishment of benchmarks that enabled the District to focus on improving its practices to further reduce TMDL pollutant loading
- Expanded monitoring program including ambient monitoring at 15 in-stream locations

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3.3 Permit Renewal Submittal (August 2008)

The watershed-based NPDES permit requires the District to submit a permit renewal application package 180 days prior to permit expiration. The permit renewal application must include an updated SWMP that synthesizes the implementation and findings of the current permit cycle. The District's permit expires January 31, 2009. Therefore, a permit renewal application is due August 4, 2008. With respect to MS4 components of the permit renewal requirements, the permit states that the application must evaluate the adequacy of the SWMP in reducing pollutants to the maximum extent practicable. The permittees worked with DEQ to develop a template and process for evaluating MEP that included the following three factors:

- **Program Effectiveness**: Describe how the program continues to address pollutants of concern in MS4 discharges to local receiving waters.
- **Local Applicability**: Describe how the program continues to be appropriate for local conditions (climate, geology, hydrology, etc.).
- **Program Resources:** Describe how program resources are allocated appropriately.

Given that it has only been two years since the SWMP was thoroughly re-evaluated and revised, new information has not been identified that would result in any additional significant programmatic revisions to the SWMP. While significant changes were not made to the SWMP for this permit renewal process, significant work was conducted to enhance the document and to improve efforts to coordinate with co-implementers. The District hired a consultant to assist with the review of the SWMP. The SWMP was reviewed with respect to: 1) permit requirements, 2) addressing issues in EPA's 2007 MS4 Program Evaluation Guidance, and 3) state of the art practices when compared to other regional jurisdictions. The District incorporated the findings into the updated SWMP.

The District then held a series of meetings with other co-implementers to discuss the following BMP categories: 1) construction site stormwater, 2) structural and source controls, 3) operations and maintenance; 4) illicit discharges, and 5) public involvement and education. Note that the industrial stormwater program is implemented by the District across the entire service area. The findings associated with this BMP category were reviewed with District staff that implements the program.

During the meetings, the program elements were reviewed and discussions were held regarding measurable goals and tracking measures for annual reporting. As a result of this process, the following enhancements were made to the SWMP to continue to ensure the program reduces pollutants in stormwater to the MEP standard.

- The construction site stormwater BMP category was enhanced to describe the co-implementers efforts regarding inspections. The co-implementers inspect all active construction sites several times at various stages of construction;
- The description of operation and maintenance activities conducted by the co-implementers was enhanced to include key program elements, and measurable goals and tracking measures for each key program element;

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- A description of roadway de-icing activities was included and the timeframes for material pick-up;
- A description of the private water quality facilities maintenance program that the District is implementing;
- The co-implementers program for outfall and storm system retrofits;
- An enhanced description of the co-implementer's illicit discharge control program that includes on-going field screening activities;
- Inclusion of the District's program for select commercial and industrial facilities (beyond those covered by industrial stormwater NPDES permits) that have activities that result in discharges to the MS4;
- Several examples of the District's public education and outreach efforts; and
- An integrated, watershed-based monitoring program that includes ambient water quality monitoring (grab and continuous), flow monitoring, rainfall monitoring, physical monitoring, macro-invertebrate and habitat monitoring, and land use based stormwater monitoring.

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SECTION 4

Stormwater Management Plan Development Process and Public Involvement

Note: In Sections 4-8, each section begins with the applicable permit language and/or legal requirement citation. The actual program elements follow these references.

4.1 Planning Process

The SWMP shall include a comprehensive planning process which involves public participation and where necessary intergovernmental coordination to reduce the discharge of pollutants to the maximum extent practicable. The program also shall include a description of staff and equipment available to implement the program. Proposed management programs shall describe priorities for implementing controls. [40 CFR 122.26 (d)(2)(iv)]

4.1.1 Basis of Planning Process

The District is responsible for sanitary sewer service, storm, and surface water management throughout urban Washington County under the Oregon Revised Statutes Chapter 451. These responsibilities include reviewing and issuing permits for erosion control, construction, modification, connection to, and the operation and maintenance of the public sanitary and surface water management systems.

As a county-wide special service district for unincorporated Washington County, as well as 12 incorporated cities within Washington County, the District is a separately managed and financed municipal corporation. The District has the flexibility to adapt planning processes to meet the needs of its customers. The Washington County Board of Commissioners maintains oversight of its activities, acting as its Board of Directors. One of the District's strategic business initiatives is to use Integrated Water Resource Management (IWRM) strategies to ensure coordination and collaboration of planning for stormwater, conveyance, reclaimed water, water supply, surface water, and wastewater facilities. The SWMP is one piece of that integrated, watershed-based approach.

The SWMP is a stormwater management document that describes the program that will reduce the discharge of stormwater related pollutants to the maximum extent practicable. The plan is formally revised on a 5-year cycle, with annual reporting requirements and opportunities for adaptive management of specific plan elements. The planning process for development of the SWMP by the co-implementers and approval by DEQ includes a thorough internal audit of effectiveness of plan elements, financial allocations, regulatory oversight, and integration with the overall District mission and strategy. In addition, opportunities are created for interaction with co-implementers through regular meetings and workshops of a Technical Committee of City/County engineers, and operations & maintenance staff.

4.1.2 Intergovernmental Coordination

Refer to Section 2.2.

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4.1.3 Available Staff and Equipment

The District, Washington County, and the cities of Banks, Beaverton, Cornelius, Durham, Forest Grove, Hillsboro, King City, North Plains, Sherwood, Tigard, and Tualatin share responsibility for providing staff and equipment to implement this SWMP. The District and the Cities have appropriate staff and equipment to implement the plan. In most cases, staff and equipment are utilized for multiple purposes, and are not devoted solely to the implementation of the SWMP. The staff and resources applied to the stormwater management program are reviewed annually by each entity through the budget process. Adjustments, as necessary to implement the program activities and work plan, are made during this process, which is open for public comment and review.

Each MS4 Annual Report presents a summary of program expenditures for the previous year, the projected revenue for the upcoming year, and the number of staff that work in the stormwater program.

4.1.4 Implementation Priorities

Section 6 of this SWMP includes several categories of BMPs that address the specific requirements of the NPDES permit and the federal regulations. Each BMP category fact sheet highlights key program elements and includes measurable goals. For each measurable goal, the fact sheet specifies a tracking item which will be reported in the MS4 Annual Report. The measurable goals and tracking items reflect the commitments that the co-implementers have made regarding the level of implementation, in terms of expenditure, personnel, or system coverage, for each category. These commitments apply to the 5-year review cycle of the SWMP and permit, subject to annual reporting requirements and restrictions on type and magnitude of proposed changes during the interim. These commitments may change, within prescribed limits, from year to year, and will be evaluated for effectiveness at a minimum every 5 years.

It is expected that modifying priorities at this level will require observation of effectiveness over longer time frames, possibly over multiple review cycles. In some cases, best available scientific data, coupled with local observations, may change how these priorities are selected. Within each category, resources will be applied in an adaptive manner to take advantage of best available information in decision-making. Priorities will be set through a process that includes observation of effectiveness, public input, and, in some cases, review of expenditures by the District's Board of Directors.

4.2 Public Involvement

Requirement: CWS must conduct public involvement in the following manner if it proposes to modify its approved SWMP based on ongoing adaptive management or as a result of assessments required by the permit.

For the MS4 Permit Renewal Submittal the public input solicitation process must include the following:

A public notice placed in a local newspaper and, if it is actively maintained, the CWS web site outlining how the public may obtain information and provide comments on the proposed SWMP revisions. The information may also be presented to the Stormwater Advisory Committee, or other advisory group, in order to solicit input during the development of the proposed SWMP revision.

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CWS shall make copies of the proposed SWMP revisions available to interested parties upon request and make the proposed revisions available on the CWS web site if it is actively maintained.

CWS shall provide the public with a minimum of 30 days to provide comments on the proposed SWMP revisions prior to submission to the DEQ.

CWS must include in the Permit Renewal Submittal a summary of material, public comments and how these comments were addressed.

Ongoing Adaptive Management

CWS also shall implement a public review process for proposed SWMP revisions that are part on an ongoing adaptive management program. The public review process shall include one or more of the following elements.

A notice in a local paper that includes information on the proposed change and how to comment, or

Review by an advisory group that has broad community representation, or

Using some other established process described in the SWMP for obtaining public input.

This public review requirement does not apply to adding BMPs and revisions or updates to existing BMPs that do not change the substance of the BMP.

Interested Persons List

Within seven days of initiating the public involvement activities required by the permit, CWS must submit the proposed SWMP revision or a summary of the revision to DEQ for the purpose of notifying other interested persons.

Public involvement is an integral part of the District's SWMP. Members of the public have been provided an opportunity to engage in the development of the plan; and will be provided an opportunity to comment on adaptive management changes of the plan, and its implementation. The co-implementers have established programs to foster public participation at these different stages of the plan. This participation is recognized as important to the success of the program. Note also that the DEQ will maintain a list of persons interested in receiving notification about SWMP revisions and will forward any comments it receives from interested persons to the District.

4.2.1 Public Participation during SWMP Development

The public participation aspect of the SWMP development process is described in the *SWMP Update Model Planning Process* (Clean Water Services, 2008). The *SWMP Update Model Planning Process* was used to guide discussions among the co-implementers and to ensure opportunities exist for public comment during development of the SWMP. The discussions with the co-implementers are summarized in Section 3.3. The elements of the *SWMP Update Model Planning Process* related to public participation included the following:

- The District placed a public notice in a local newspaper and the District's web site outlining how the public may obtain information and provide comments on the proposed SWMP.
- The information was presented to the Clean Water Services Advisory Committee (CWAC) in order to solicit input during the development of the SWMP.

- The District made copies of the proposed SWMP available to interested parties upon request, and the proposed plan was made available on the web site.
- The District provided the public with a minimum of 30 days to provide comments on the proposed SWMP prior to submitting it to DEQ with its permit renewal application.
- A summary of public participation materials and public comments received during the development of the revised SWMP is included in Appendix D.

4.2.2 Adaptive Management Change Process

On-going adaptive management is a key component of the SMWP. Changes to BMPs as a result of adaptive management are documented in the MS4 Annual Report. Public notification is required if adaptive management results in an existing BMP being substantively revised. Public notification is not required when adding BMPs, and revising or updating existing BMPs that do not change the substance of the BMP.

Adaptive management changes that require public notification will begin with an *Adaptive Management Alert* e-mail to the individuals and organizations in the District's e-mail distribution list of "interested persons." The e-mail alert will describe the performance issue, the adaptive management change under consideration, alternatives being explored, and a timeframe for decision-making and implementation of the proposed change. A more complete description of the proposed change and alternatives under consideration will also be made available on the District's web site. Those individuals or organizations that do not use e-mail will receive a brief *Alert* postcard that includes the same information.

Respondents will have 30 days to call, e-mail, or submit written comments on the proposed change to the District. In addition, a public workshop will be held relatively early in the 30-day comment period. The workshop will include a presentation on the proposed changes and alternatives under consideration. Workshop participants will be invited to ask questions, and share their comments, concerns, and suggestions related to the proposed adaptive management alternatives.

In addition to receiving and reviewing public comment, the District will evaluate the proposed changes to identify which will be most effective. The District will take 90 days to make this determination, based on best available scientific data, operational information, and public comment.

Once this determination has been made, another e-mail/postcard will be distributed. This *Adaptive Management Decision* notice will describe the change, the timeframe for implementation, the anticipated results, and the evaluation procedure that will be used to determine its effectiveness. In addition, a more comprehensive description of the adaptive management strategy will be posted on the District's web site.

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SECTION 5

Stormwater Pollutant Loads, TMDLs, and Benchmarks

5.1 Description of Applicable TMDLs

Requirement: The requirements of this section apply to the MS4 discharges to receiving waters with established TMDLs and associated allocations as noted in the permit. It is the intent of this section to ensure pollutant discharges for those parameters listed in the TMDL are reduced to the maximum extent practicable. This would be deemed as achieving adequate progress toward achieving assigned wasteload allocations (WLAs) given in the TMDLs to these MS4 sources.

In 2001, the Oregon Department of Environmental Quality (DEQ) established total maximum daily loads (TMDLs) for the Tualatin River sub-basin applicable to the District's municipal separate storm sewer system (MS4). The TMDLs include waste load allocations in stormwater for bacteria, phosphorus, and settleable volatile solids. These waste load allocations are calculated so that the impaired water body will meet the relevant water quality standards. Each of these is discussed below.

A waste load allocation (WLA) is the amount of pollutant that a point source, such as the MS4, can contribute to the receiving water's loading capacity. A load allocation (LA) is the amount of pollutant from natural plus non-point sources assigned to a receiving water's loading capacity. Non-point sources, and therefore LAs, are not covered by this plan.

Waste load allocations are assigned to individual sub-watersheds such as the Middle and Lower Tualatin. Table 5-1 lists the creeks and streams of the sub-watersheds with WLAs for the District:

TABLE 5-1
Sub-watershed Creeks and Streams

Gales Creek Sub-watershed	
Gales Creek	Middle Gales Creek
Upper Gales Creek	Little Beaver Creek
South Fork Gales Creek	Iller Creek
Gales/Coffee	Clear Creek
Beaver Creek	
Dairy Creek Sub-watershed	
Middle McKay Creek	Middle West Fork Dairy Creek
Upper McKay Creek	Garrigus Creek
East Fork McKay Creek	Kuder Creek
Nell Creek	Witcher Creek

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TABLE 5-1
Sub-watershed Creeks and Streams

Waible Gulch	West Fork Dairy Creek
Upper Waible Gulch	Mendenhall Creek
Council Creek	Burgholzer Creek
Dairy Creek	Upper West Fork Dairy Creek
Evers Reservoir	Williams Creek
Hill Drainage District 7 Ditch	East Fork Dairy Creek
Cedar Canyon	Bledsoe Creek
Park Farms Creek	Gumm Creek
Sadd Creek	
Rock Creek Sub-watershed	
Rock Creek	Bethany Creek
Abbey Creek	Golf Creek
Johnson Creek	Bronson Creek
Willow Creek	Beaverton Creek
Upper Rock Creek	Lower Beaverton Creek
Cedar Mill Creek	Dawson Creek
Holcomb Creek	Reedville Creek
Middle Tualatin Sub-watershed	
Middle Tualatin	Rosedale Creek
Blooming Creek	Burris Creek
Cornelius	Christensen Creek
Jackson Bottoms	Jackson Reservoir
Davis Creek	Baker Creek
Jackson Slough	Heaton Creek
Butternut Creek	Jacquith Creek
Gordon Creek	Gulf Canyon
Lower Tualatin Sub-watershed	
Sylvan Creek	Chicken Creek
Ash Creek	Hedges Creek
Summer Creek	Oswego Canal
Fanno Creek	Saum Creek
Cedar Creek	

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5.1.1 Bacteria

Table 5-2 summarizes the bacteria waste load allocations during winter events assigned to Clean Water Services for each sub-watershed.

TABLE 5-2
Winter Bacteria Allocations

Sub-watershed	WLA Load (bacteria per day)	WLA Concentration (bacteria per 100 mL)
Gales Creek	9.56E+13	3,500
Dairy Creek	2.76E+14	3,500
Rock Creek	3.05E+14	700
Middle Tualatin	8.58E+14	11,000
Lower Tualatin	1.65E+15	5,000

Table 5-3 summarizes the bacteria WLAs during summer events assigned to Clean Water Services for each sub-watershed.

TABLE5-3
Summer Bacteria Allocations

Subwatershed	WLA Load (bacteria per day)	WLA Concentration (bacteria per 100 mL)
Gales Creek	3.91E+13	9,500
Dairy Creek	1.06E+14	7,000
Rock Creek	2.99E+14	3,000
Middle Tualatin	2.08E+14	12,000
Lower Tualatin	8.98E+14	12,000

The TMDL explicitly provides that bacteria concentrations may be assessed from stormwater monitoring data and provides targets for runoff quality to comply with the TMDL allocations.

5.1.2 Phosphorus

Table 5-4 summarizes the phosphorus waste load allocations assigned to Clean Water Services for each sub-watershed. These WLAs include the allocations for the Oregon Department of Transportation (ODOT) and Washington County within the service area. (Note that the District is not the Designated Management Agency with responsibilities for the loading from ODOT roadways.) Total WLA is shown because the pollutant load model calculates loads from the entire service area, which includes ODOT and Washington County.

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TABLE 5-4
Phosphorus Allocations

Sub-watershed	WLA Load Clean Water Services (pounds per season)	WLA Load ODOT (pounds per season)	WLA Load Washington County (pounds per season)	WLA Load Total (pounds per season)	WLA Concentration (mg/L)
Gales Creek	25.9	1.3	0	27	0.04
Dairy Creek	213	3.7	42.2	259	0.09
Rock Creek	2974.5	49.3	14.9	3,039	0.19
Lower Tualatin	1271.6	230.1	33.1	1,535	0.14
Middle Tualatin*	293	7.1	38.8	339	0.14

* Phosphorus loads in this subwatershed have been recalculated based on revised phosphorus concentrations for the middle Tualatin tributaries.

5.1.3 Tributary Settleable Volatile Solids

Table 5-5 summarizes the settleable volatile solids allocations assigned to Clean Water Services for each sub-watershed.

TABLE 5-5
Settleable Volatile Solids Allocations

Sub-watershed	WLA (percent reduction)
Gales Creek	30
Dairy Creek	30
Rock Creek	20
Lower Tualatin Tributaries	50
Middle Tualatin Tributaries	20

5.2 Summary of Pollutant Loading Analyses for MS4s

Appendix B describes in detail the model used to estimate pollutant loads associated with stormwater run-off, and to estimate the reduction in loads obtained from implementation of BMPs. These results are summarized in the charts below, and are compared to the TMDL WLAs.

5.2.1 Bacteria

Stormwater pollutant load modeling results for bacteria are compared to TMDL WLAs in Figure 5-1.

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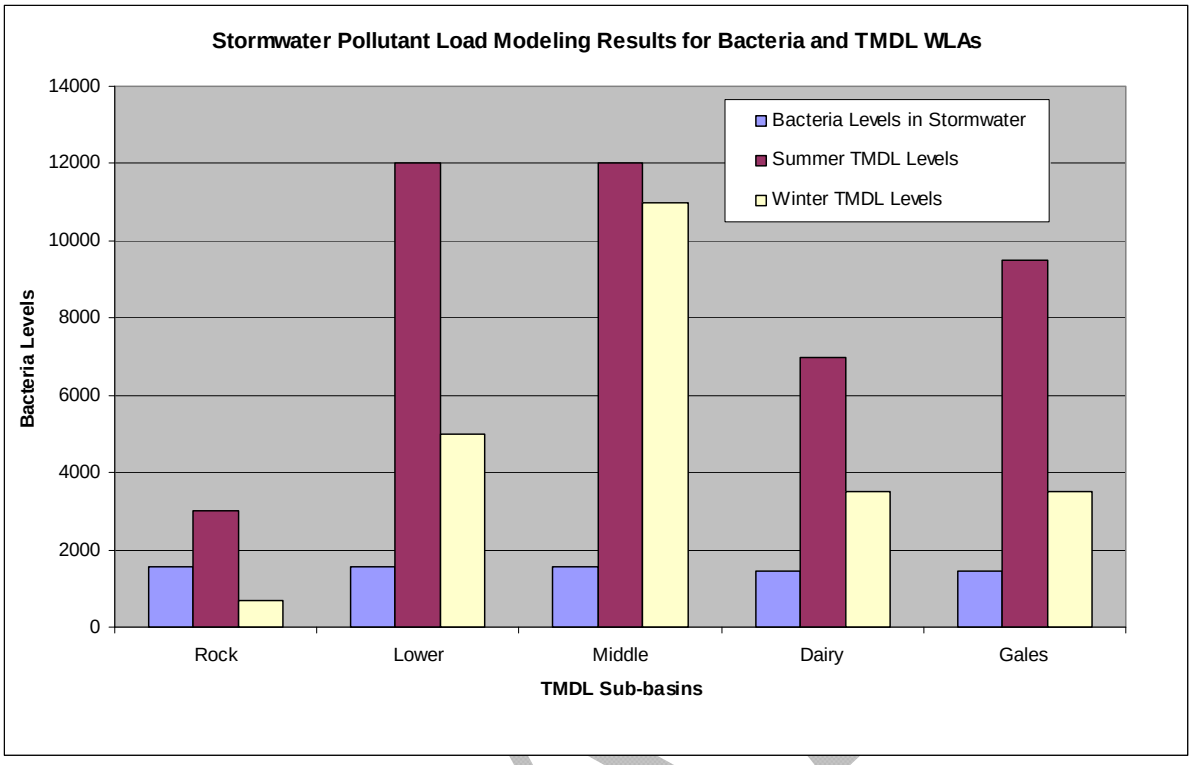

FIGURE 5-1
Stormwater Pollutant Load Modeling Results for Bacteria and TMDL WLAs

With the exception of the Rock Creek winter TMDL levels, the bacteria levels in all other sub-basins are estimated to be significantly lower than the TMDL levels. The TMDL bacteria levels for Rock Creek should be similar to the other sub-watersheds. However, in the development of the bacteria TMDL WLAs for Rock Creek, the winter base flow data used were biased to low flows, which resulted in artificially lower winter TMDL levels. If Rock Creek WLAs were similar to the other sub-watersheds, the TMDL WLAs would be met in all sub-watersheds.

Note also that the bacteria data inputs used in the stormwater pollutant loads model were similar to recent MS4 bacteria data, and data gathered in the bacteria DNA study. These data are presented in Table 5-6. As discussed in Appendix B, data used for the stormwater pollutant load modeling came from the 1990–1996 Oregon Association of Clean Water Agencies (ACWA) stormwater data.

TABLE 5-6
Bacteria Concentrations for Land Use Categories

	***E. coli* Bacteria (Median Concentration) (#/100 mL)**		
Land Use Categories	**Data from DNA Study**	**Data from MS4 Monitoring**	**Model Input Data**
New Residential BMP Influent	4,600 3,800 (duplicate)		
New Residential Effluent	1,800	1,700	1,800
High Density Residential		280	1,800
Residential			1,800
Multi-family			1,800
Commercial	580	790	1,900
Industrial			800
No Exposure Industrial			800
Multi-use			1,850
Public Open Space			1,100
Vacant			1,100
Rural			1,100

5.2.2 Phosphorus

Stormwater pollutant load modeling results for phosphorus are compared to the TMDL wasteload allocations in Figure 5-2. Since the impacts from phosphorus are expressed in the lower Tualatin, the cumulative loading from the stormwater pollutant load modeling for all sub-basins is compared to the cumulative WLAs. This is consistent with the TMDL - section 4.4.9.2 of the Tualatin Sub-basin TMDL states the following:

> *The loading capacities – and therefore the allocations – contained in this portion of the TMDL were developed to address water quality issues specific to the lower mainstem Tualatin River. As such, the aggregate loading from all sources to the lower mainstem is the critical factor. Therefore, the allocations given to each DMA in Table 49 may be met by addressing the aggregate of the 5th-field subbasin loadings for the DMA.*

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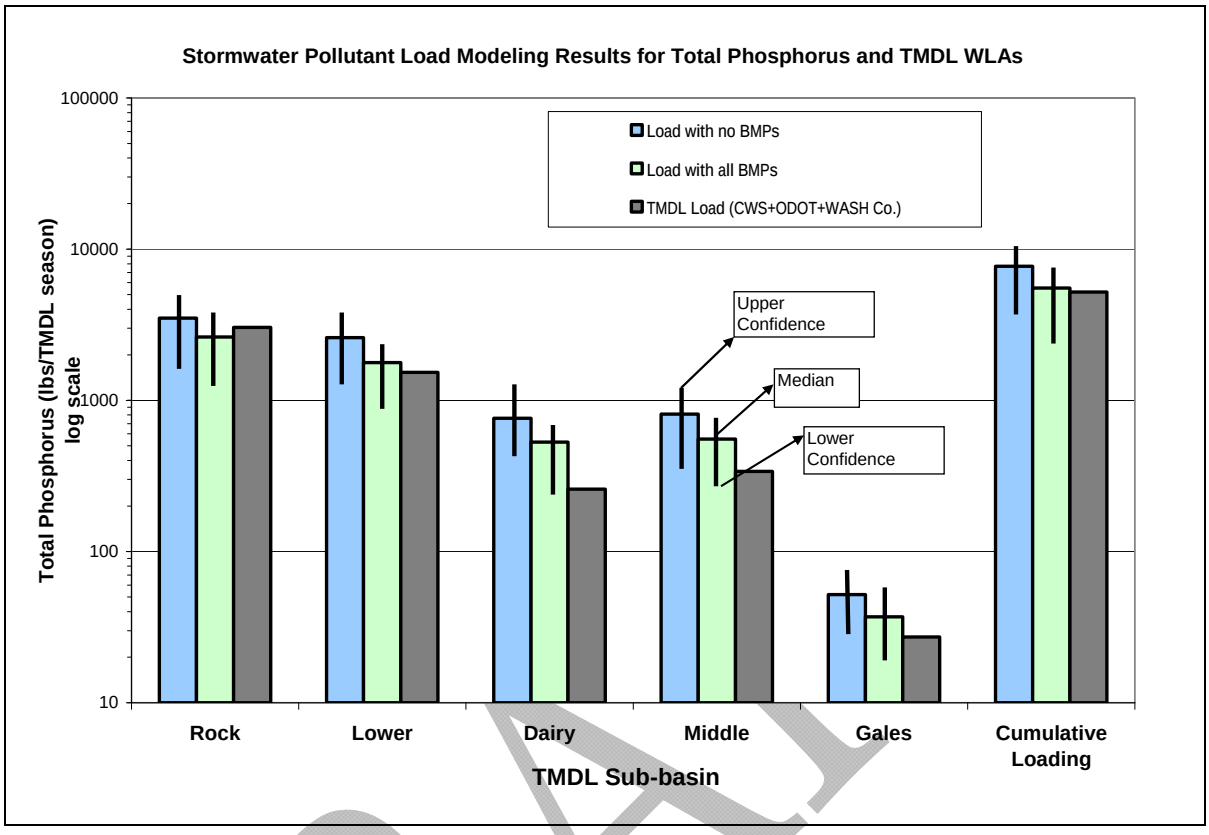

FIGURE 5-2
Stormwater Pollutant Load Modeling Results for Total Phosphorus and TMDL WLAs

5.2.3 Settleable Volatile Solids

The 2001 Tualatin Sub-basin TMDL established percent reduction allocations for settleable volatile solids (SVS) for each sub-watershed related to reducing sediment oxygen demand (SOD). This was done to improve dissolved oxygen (DO) concentrations, particularly in some of the tributary streams. These reductions were expressed in terms of settleable volatile solids (SVS) because it was assumed that settling organic matter is the primary source of SOD. However, there are no established SVS procedures, and no SVS data. Therefore, total suspended solids (TSS) was used as an available surrogate parameter, as allowed by the 2001 TMDL.

Since no data were available for SVS, the sub-watershed specific permit reduction WLAs in Table 5-5 were used to calculate TSS "TMDL" loads. The SVS percent reduction WLAs were applied to the surrogate parameter, TSS. By applying the sub-watershed based percent reductions to the land use based loads (calculated as described in Appendix B), the TSS "TMDL" loads were calculated. Figure 5-3 compares the stormwater pollutant load modeling results for total suspended solids (TSS) with the TSS "TMDL" WLAs.

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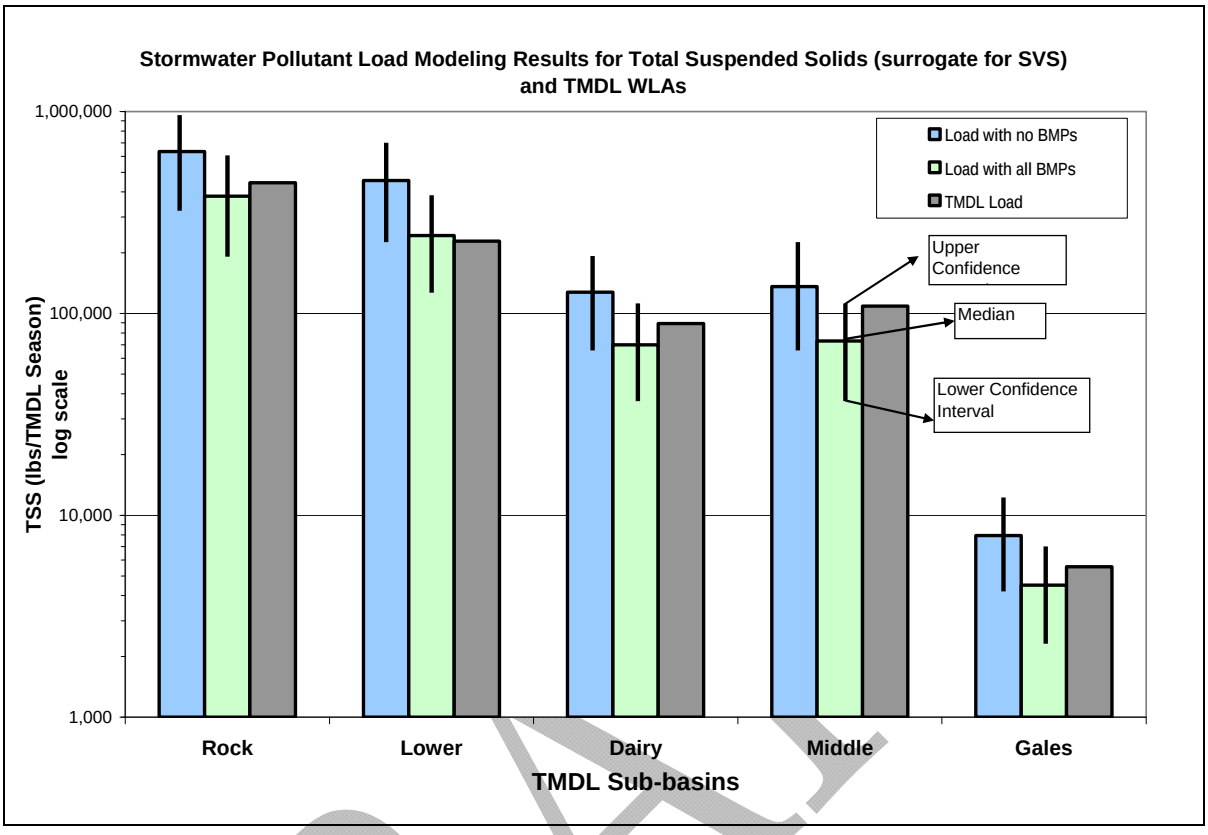

FIGURE 5-3
Stormwater Pollutant Load Modeling Results for Total Suspended Solids (surrogate for SVS) and TMDL WLAs

5.3 Pollutant Load Reduction Benchmarks

Requirement: Progress towards reducing TMDL pollutant loads must be evaluated by Clean Water Services through the use of performance measures and pollutant load reduction benchmarks developed and listed in the SWMP.

5.3.1 Performance Measures

Requirement: Performance measures are estimates of the effectiveness of various best management practices (BMPs) implemented by the permittee as per the SWMP; and are not numeric effluent limits. Performance measures must, where appropriate, be pollutant reduction estimates. The performance measures for the BMPs addressing TMDL pollutants may be based on the same metrics developed in accordance with the program effectiveness monitoring requirements in the permit.

5.3.1.1 Non-Structural BMPs

Non-structural BMPs include operation and maintenance (O&M) practices (e.g., street sweeping, storm sewer system maintenance, and illicit discharge prevention) and public education programs.

There are few or no literature data to assess the cumulative effect of O&M practices and public education programs. Most studies tend to evaluate the effectiveness of a single type of O&M practice such as street sweeping or catch basin cleaning. Furthermore, there is little or no information regarding the effectiveness of public education programs in reducing

pollutant loads. Even without information regarding the effectiveness of public education programs, using the sum of literature removal efficiencies for each O&M program that is being implemented may overestimate the effectiveness of non-structural BMPs.

One approach to gauge the effectiveness of non-structural BMPs is to compare the land use data in the original ACWA study (1993-1996) with more recent data. Since non-structural practices were in their infancy when the data for the original ACWA study was gathered, a comparison of the two land use data sets provides a method to estimate the effectiveness of non-structural BMPs. The District's and City of Portland's recent land-use-based data for phosphorus and TSS were pooled and compared with the original ACWA land use data. A reduction percent based on this comparison was applied to the land use concentrations from the original ACWA study. This approach was presumed to capture the cumulative effect of all non-structural management practices being implemented in a watershed. No reductions were assumed for bacteria because there are few or no data regarding the effectiveness of non-structural management practices in reducing bacteria levels.

For phosphorus, a 25 percent reduction was applied and a 40 percent reduction was applied for TSS. Table 5-7 compares phosphorus and TSS concentrations based on 25 percent and 40 percent reductions, respectively, to the original ACWA study land use data with the more recent land use data. Overall, this approach provides a conservative (i.e., protective) approach because percent-reduction-derived values that were selected are usually higher than the recent land use data.

TABLE 5-7
Comparison of Land Use Concentrations Based on Percent Reduction from the Original ACWA Study Data with Recent Land Use Data

Land Use Categories	Total Phosphorus		Total Suspended Solids		Source of Recent Land Use Data
	Concentrations Based on 25% Reduction of Original Land Use Data	Recent Land Use Data	Concentrations Based on 40% Reduction of Original Land Use Data	Recent Land Use Data	
Residential	0.16 mg/L	0.15 mg/L	23 mg/L	18 mg/L	Clean Water Services data; TSS value is average of median District residential data
Commercial	0.19 mg/L	0.19 mg/L	33 mg/L	34 mg/L	City of Portland data
Industrial	0.41 mg/L	0.38 mg/L	55 mg/L	68 mg/L	City of Portland data; this may be higher than industrial sites in the District area, which has very little traditional industrial area
Multi-use	0.17 mg/L	0.17 mg/L	28 mg/L	29 mg/L	Average of Residential and Commercial
Public Open Space	0.13 mg/L	0.07 mg/L	10 mg/L	9 mg/L	Best of City of Portland sites

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5.3.1.2 Structural BMPs

Table 5-8 presents BMP type, the number of BMPs in the District's database, along with BMP effluent concentrations and flow reduction percentages that are indicative of the performance of the structural BMP.

TABLE 5-8
Structural BMP Type, Number, and Effectiveness (median effluent concentration)

Description	Number of BMPs District-Wide	Total Phosphorus (mg/L)*	TSS (mg/L)*	Percent Flow Reduction*
Constructed Wetland	9	0.08	7	5%
Wet Pond	139	0.14	16	7%
Extended Dry Pond	513	0.14	16	30%
Compost Filter Facility	67	0.12	13	0%
Swale	668	0.13	13	38%
Retention Basin	21	0.14	16	7%
Unknown	130	0.14	16	5%

*ACWA Committee Recommendations.

The BMP effluent concentrations and flow reduction percentages are primarily based on information compiled by an ACWA Committee that reviewed BMP performance data from several sources. The ACWA Committee's recommendations are presented in a document titled, *Storm Water BMP Effectiveness Report* (May 9, 2005). For phosphorus and TSS, the effluent concentrations for swales were based on District data (and not the ACWA Committee's report) because the national data considered in developing the EMCs were above the land-use-based EMC values presented in Appendix B Table 1. The wet pond effluent data for phosphorus and TSS were used to represent extended dry ponds also; this is because most of the ponds in the service area are wet, vegetated ponds, even though the BMP database lists them as dry ponds.

5.3.2 Benchmarks & Implementation Strategy

Requirement: A benchmark is a total pollutant load reduction estimate for each parameter or surrogate, where applicable, for which a WLA is established at the time of permit issuance. A benchmark is used to measure the overall effectiveness of the storm water management program in making progress toward the wasteload allocation (this estimate will be related to the statistical variability of the underlying data and may be stated as a range)and is intended to be a tool for guiding adaptive management activities. A benchmark is not a numeric effluent limit; rather it is a goal that is subject to the "maximum extent practicable" standard. The implementers must provide the rationale for the proposed benchmark, which includes an explanation of the relationship between the benchmarks and the TMDL wasteload allocations. Any limiting factors related to the development of a benchmark, such as data availability and data quality, must also be included in this rationale.

Requirement: The SWMP must describe a program that includes BMPs, monitoring triggers, narrative conditions, or other elements, designed to achieve reductions in the TMDL pollutants. The SWMP must include a specific strategy for implementing monitoring designed to enable the permittee to

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gauge the effectiveness of the SWMP in reducing TMDL pollutant loads to the maximum extent practicable.

5.3.2.1 Bacteria

Information presented in Section 5.2.1 indicates that the bacteria WLAs are being met in summer and winter in all sub-basins, except in winter for Rock Creek. To better understand the sources of bacterial loading, the District conducted a DNA fingerprinting study of bacterial sources in the Tualatin Subbasin (Clean Water Services, 2006). The pie-chart Figure 5-4 shows the percentage of *E. coli* bacteria in streams and municipal stormwater runoff from various sources.

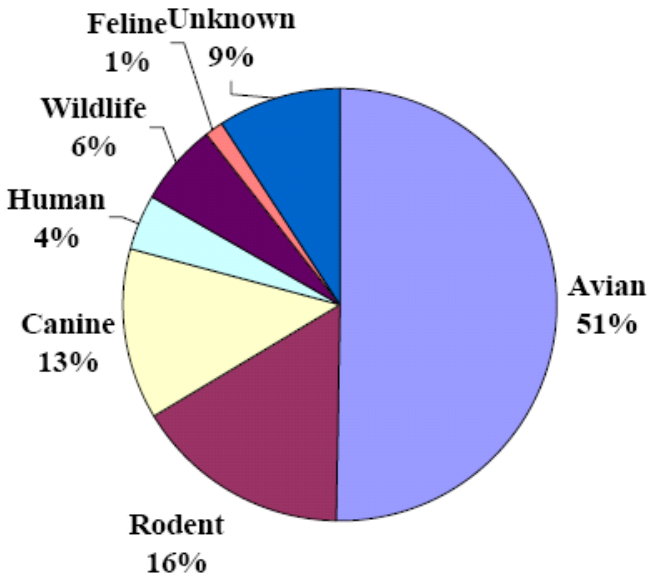

FIGURE 5-4
Summary of *E. Coli* Source Identification Data

As evident in the figure above, a significant portion of the bacteria concentrations in drainage from the MS4 system and in surface waters originates from non-human sources. The co-implementers have used this information to develop targeted BMPs to reduce bacterial contributions from anthropogenic sources because traditional BMPs are not effective at reducing bacteria loads. The co-implementers have developed public education and outreach programs regarding pet waste management and waterfowl feeding.

To encourage proper disposal of pet waste, the co-implementers sponsor the "Canines for Clean Water" campaign. Dog owners are asked to pledge that they will pick up and properly dispose of pet waste, and in return they receive a colorful bandana for their pet and have the opportunity to have their dog's photo posted on the District website.

The co-implementers are also implementing a program to discourage waterfowl feeding to reduce the avian portion of the bacterial loading. Signs have been posted in some parks that discourage people from feeding waterfowl. The co-implementers will evaluate the effectiveness of this approach to see if it can be applied for the entire service area. The co-

implementers will also evaluate other mechanisms such as replacing grassy banks with riparian vegetation to limit waterfowl gathering. A benchmark for bacteria is not proposed because it is very difficult to quantify the expected improvements from such programs.

5.3.2.2 Phosphorus

With the suite of BMPs being implemented by the co-implementers, aggregate stormwater phosphorus loads to the lower Tualatin River have been reduced during the TMDL season (see Figure 5-2). The TMDL establishes a waste load allocation of 5,199 pounds per TMDL season. This aggregate TMDL load was established to meet an in-stream phosphorus target of 0.10 mg/L in the lower Tualatin River at Stafford. Evaluation of phosphorus levels in the lower Tualatin River shows that the in-stream target levels established in the TMDL are being met. Figure 5-5 illustrates this conclusion.

Because of conservative assumptions associated with the Tualatin TMDL, the TMDL document is based on higher reductions in phosphorus loads than are necessary to meet the in-stream targets. The Tualatin TMDL establishes phosphorus waste load allocations that are about 10 percent lower than current phosphorus loading estimates for municipal stormwater discharges. The co-implementers will continue to maintain the reductions in phosphorus from municipal stormwater discharges through the continued implementation of the existing BMP activities.

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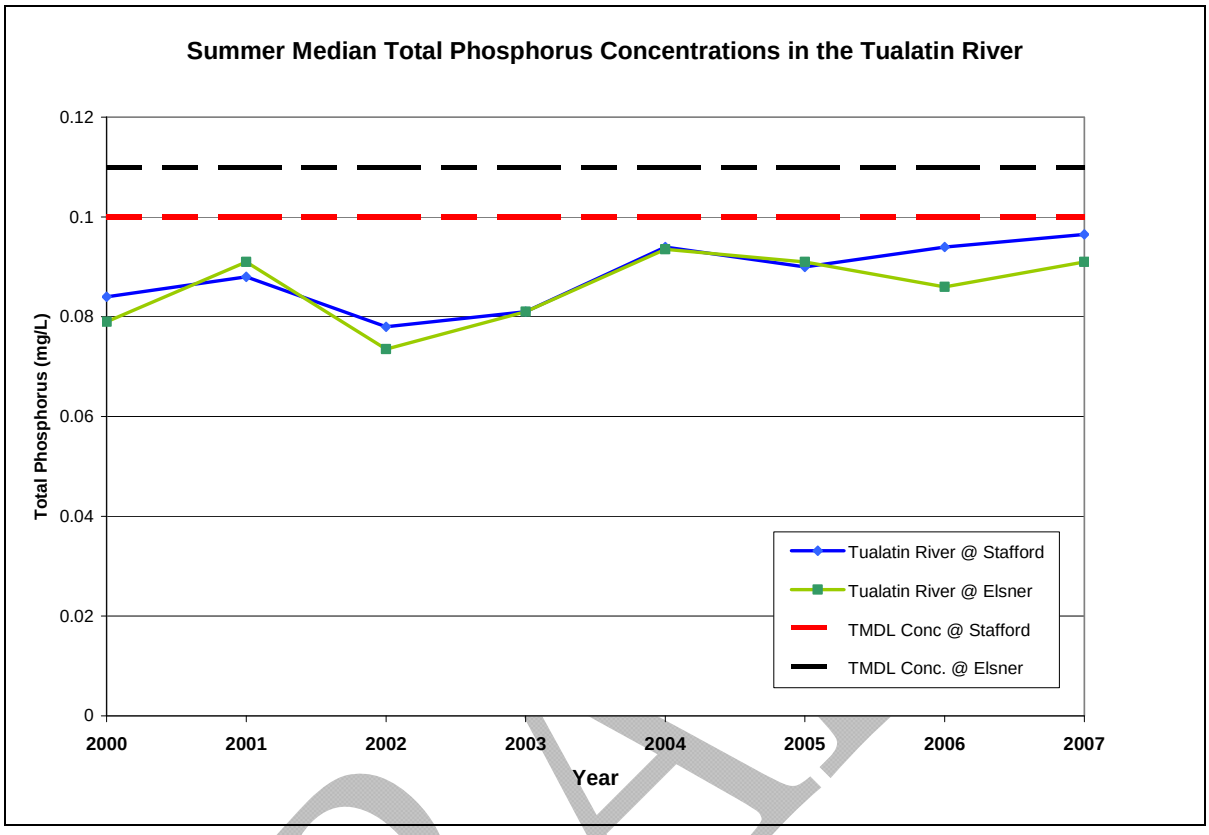

FIGURE 5-5
Comparison of Summer Median Total Phosphorus and TMDL Concentrations in the Tualatin River

As shown in Figure 5-6, the activities, BMPs, and programs implemented by the co-implementers have resulted in significant reductions in phosphorus loading to the Tualatin basin. The need to continue to work to further reduce phosphorus loading beyond the programs and activities currently being implemented is deemed to be not necessary. The co-implementers expect to achieve additional phosphorus reductions through implementation of BMPs more specifically aimed at oxygen demanding related parameters. As the co-implementers continue to address the oxygen demanding constituents associated with storm water through both structural and non-structural activities and BMPs, it is expected that there will be some continued ancillary reduction in the discharge of phosphorus.

The TMDL benchmarks for phosphorus are based on expected improvements that can be achieved as ancillary reductions associated with enhancing non-structural and structural BMPs associated with reducing sediment and oxygen demanding constituents of stormwater, along with flow reductions from LIDA. From these activities, the District anticipates reducing phosphorus loading to 5,450 and 5,200 pounds per TMDL season by 2013 and 2025, respectively.

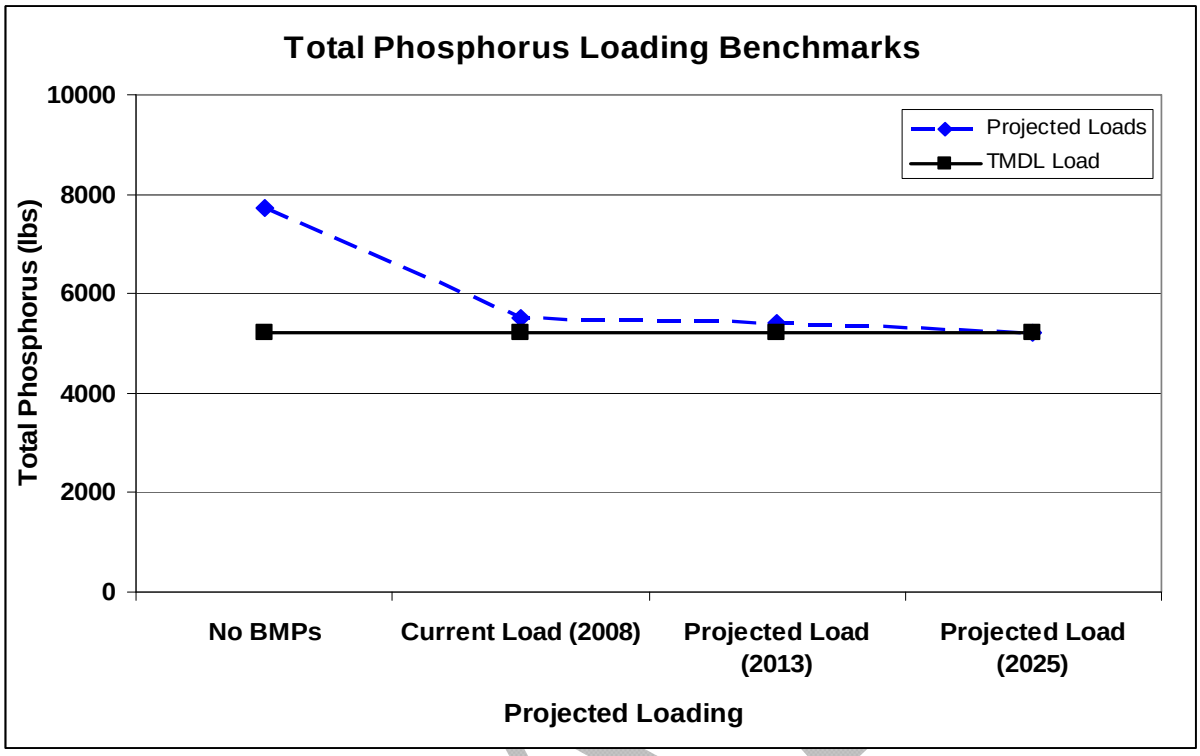

FIGURE 5-6
Total Phosphorus Loadings

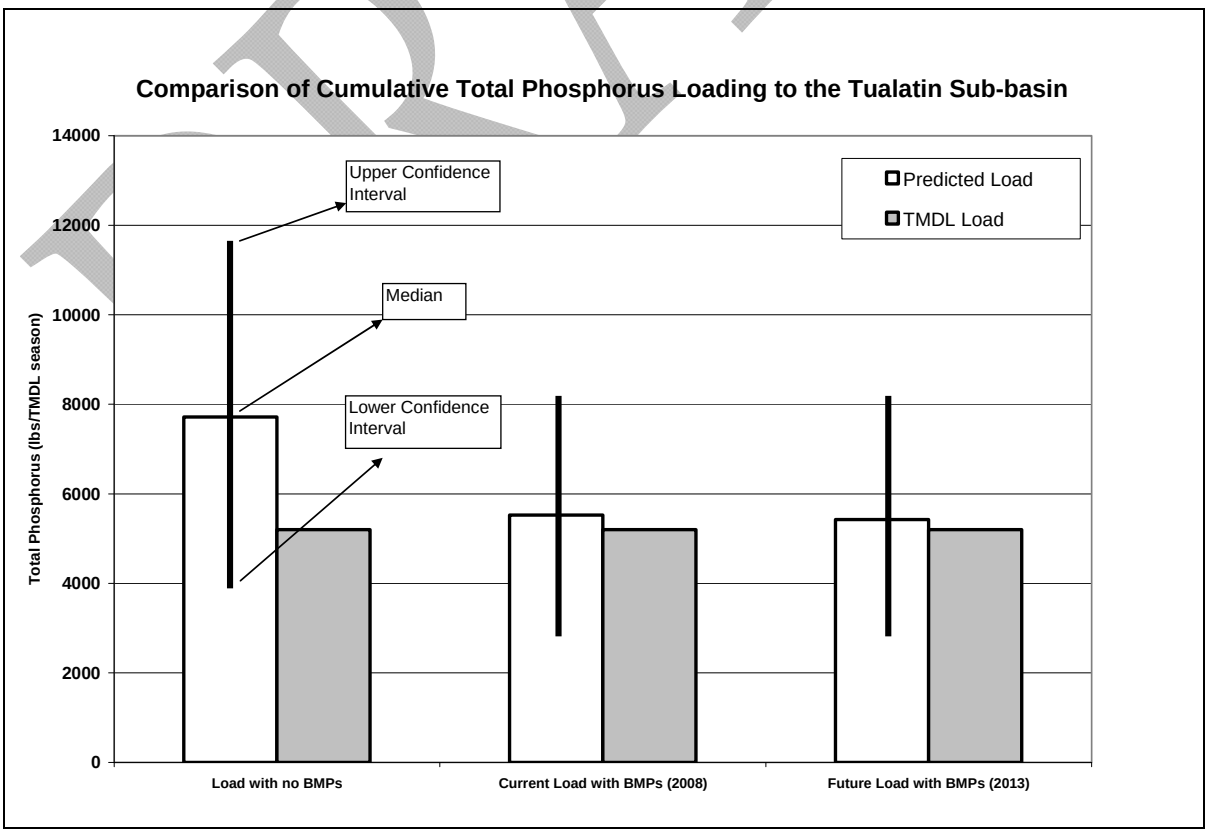

FIGURE 5-7
Comparison of Cumulative Total Phosphorus Loading to the Tualatin Sub-basin

5.3.2.3 Settleable Volatile Solids (SVS)

The TMDL established percent reduction in settleable volatile solids (SVS) allocations related to sediment oxygen demand (SOD). This was done to improve dissolved oxygen (DO) levels, particularly in some of the tributary streams. These reductions were expressed in terms of settleable volatile solids (SVS) because it was assumed that settling organic matter is the primary source of SOD. However, there are no established SVS procedures, and hence no SVS data. Therefore, total suspended solids (TSS) was used as a surrogate parameter as allowed by the TMDL. TSS data are available for EMCs and BMPs.

The model results using TSS as a surrogate appear to lead to conclusions that the TMDL WLAs are either being met or are close to being met (Figure 5-8). However, water quality monitoring observations indicate that dissolved oxygen levels in the tributaries are still impaired. Therefore the allowed use of TSS as a surrogate for SVS may not by itself adequately address the complex interactions leading to the low dissolved oxygen observations in the tributaries.

Considering that DO levels in the tributaries are still an issue, it is likely that the approach in the TMDL of linking low DO levels only to SOD is simplistic. The District believes that an integrated watershed approach to improve DO levels in the tributaries is needed rather than simply focusing on reducing SOD. Flow and riparian vegetation restoration along with reduction in oxygen consuming materials are key components of improving DO levels in the tributaries.

In an effort to better understand the potential impacts of storm water discharges on in-stream dissolved oxygen levels, the monitoring protocol has been revised to include two additional parameters, total organic carbon (TOC) and total volatile suspended solids (TVSS).

Benchmark: The development of benchmarks for this TMDL WLA is not possible at this time as there is no baseline data for TOC and/or TVSS. As monitoring data is accumulated, the development of benchmarks will be undertaken.

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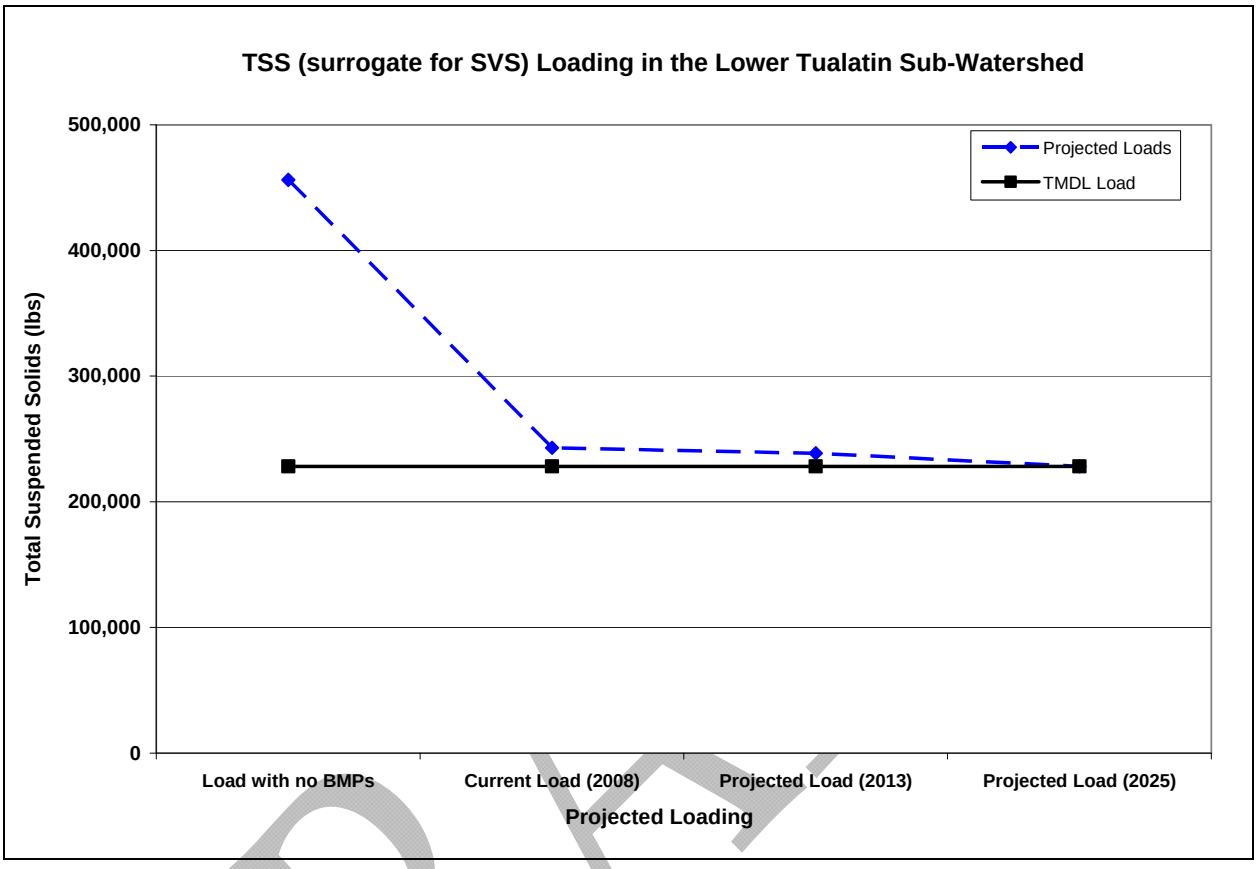

FIGURE 5-8
TSS (surrogate for SVS) Loading in the Lower Tualatin Sub-Watershed

5.4 Evaluation of Stormwater Management Plan Effectiveness

Refer to Section 8: Evaluation of Plan, Adaptive Management, and Reporting Requirements.

5.5 Establishment of TMDL Wasteload Allocations for Stormwater 3 Years after Permit Issued

Requirement: If within 3 years following permit issuance a TMDL is approved by the Environmental Protection Agency (EPA) and the TMDL has wasteload allocations assigned to storm water within the geographic area covered by this permit, Clean Water Services must, at the time of the next permit renewal application, complete a review and strategy development, and propose changes, if appropriate, to the SWMP to address the urban storm water discharges.

There have been no new TMDL wasteload allocations assigned to stormwater within the geographic area covered by the permit.

5.6 Annual Stormwater Pollutant Loads

Requirement: An updated estimate of annual stormwater pollutant loads for the original pollutants of concern in the Part 2 application, or other stormwater pollutants on the 303(d) list as directed by DEQ. The permittee will be notified of such a requirement no later than two (2) years prior to the expiration of the permit.

The original Part 2 application included pollutant load estimates for biochemical oxygen demand (BOD), chemical oxygen demand (COD), total suspended solids (TSS), total dissolved solids, nitrate, total kjeldahl nitrogen (TKN), total phosphorus, ortho-phosphate, cadmium, copper, lead and zinc. DEQ did not request any changes to this list.

The original pollutant load calculations were conducted in 1994 and were based on District stormwater sample data and supplemented by the National Urban Runoff Program (NURP) data. The updated annual pollutant load estimates were developed on a TMDL sub-basin level and are based on the following assumptions:

- Permit Area: The annual pollutant load estimates are based on the permit area at the time of permit renewal (i.e., 2008).
- Land Use Data: The annual pollutant load estimates are based on zoned land uses at the time of permit renewal. Note that this is different than the land use file used for modeling the TMDL pollutants; the TMDL pollutant land use files represent current conditions and include a "vacant" layer which is overlaid onto the zoned land uses.
- Stormwater Data: The geometric mean concentrations from the ACWA land use study were used to estimate the annual pollutant loads.
- Load Reduction from BMPs: Non-structural and structural BMPs effectiveness information was used in estimating the annual pollutant loads. Non-structural BMP effluent concentration based on 25% removal efficiency for most pollutants except TSS (40%) and TDS (0%) were used. Structural BMPs effectiveness was mostly based on work done by the ACWA Rangers and supplemented by information in the ACWA BMP database. The flow reduction percentages used in the TMDL pollutant load calculations were based on expected reductions during the TMDL season (May-October). Year-around flow reduction percentages were not available. Therefore, the annual pollutant load estimates did not include a flow reduction component for structural BMPs.

The inputs used for updating the annual stormwater pollutant load estimates are presented in Appendix B. The results of the calculations are presented in Table 5-9. It should be noted that the annual pollutant load estimates presented in Table 5-9 do not include the same assumptions as those made in the original Part 2 application and therefore, are not comparable with those in the original application.

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TABLE 5-9

Annual Pollutant Load Estimates with and without BMPs

Sub-watershed	Area (acres)	Estimated Annual Pollutant Load (lbs)											
		BOD	COD	TSS	TDS	Total Phosphorus	Ortho-phosphate	Nitrate	Total Kjeldahl Nitrogen	Cadmium	Copper	Lead	Zinc
Gales	640	7,500	33,000	37,400	101,000	260	70	820	1,080	0.3	12	10	70
Dairy	6,500	112,000	613,000	601,000	1,055,000	4,200	720	5,300	15,500	6	220	190	1,400
Middle	8,050	108,000	545,000	578,000	1,313,000	4,200	930	8,900	16,300	5	200	175	1,180
Rock	33,600	463,000	2,491,000	2,656,000	5,453,000	19,200	4,000	32,100	80,000	23	890	800	5,000
Lower	23,800	328,000	1,793,000	1,798,000	3,778,000	11,800	2,600	24,000	44,900	17	620	570	3,960
Cumulative with all BMPs	72,590	1,018,500	5,475,000	5,670,400	11,700,000	39,660	8,320	71,120	157,780	51	1,942	1,745	11,610
Cumulative with no BMPs	72,590	1,308,100	7,290,800	9,079,000	11,700,000	46,200	10,800	103,700	175,400	68	2,400	2,500	16,200

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5.7 Recent 303(d) Listed Pollutants

Requirement: The requirements of this section apply to receiving waters without established TMDL wasteload allocations. Clean Water Services must qualitatively review the pollutants that are on the 2002 303(d) list that are relevant to the Clean Water Services' MS4 discharges. The review and corresponding summary of proposed actions must be incorporated into the Interim Evaluation Report. The review and summary must do the following:

(a) Determine whether there is a reasonable likelihood for storm water discharges from the MS4 to cause or contribute to water quality degradation of receiving waters through the discharge of pollutants on the 2002 303(d) list. Provide the rationale for the conclusion, including the results of an evaluation.

(b) If the discharges from the MS4 is a contributor to specific listed pollutants, determine and describe the relationship between the 303(d) listed pollutant and the MS4 discharges.

(c) Determine whether the BMPs in the existing SWMP are effective to address the 303(d) pollutants. If not, describe how the plan could be adapted to more appropriately address these pollutants. A summary of the rationale for this determination must also be included in the report.

If sufficient information is not available to make the determinations required above, Clean Water Services must generate the additional information necessary to adequately complete these determinations.

5.7.1 Introduction

The District has reviewed the pollutants that are on the 2006 303(d) list of impaired waters that are relevant to the MS4 discharges to determine whether there is a reasonable likelihood for stormwater discharges from the MS4 to cause or contribute to the water quality degradation of receiving waters. If discharges from the MS4 contribute to specific listed pollutants, the District must determine and describe the relationship between the 303(d) listed pollutant and the MS4 discharges. Finally, the District must determine whether the BMPs in the existing SWMP are effective to address the 303(d) pollutants.

The 2004/06 303(d) listings in the Tualatin River Sub-basin include mercury in the entire Willamette River basin; iron and manganese in the mainstem Tualatin and Beaverton Creek; dieldrin in Fanno Creek; and metals in Koll Wetland. A detailed analysis of these listings and their relationship to MS4 discharges are presented below.

5.7.2 Mercury

Mercury is a naturally occurring element found in cinnabar deposits and areas of geothermal activity. In Oregon, mercury was mined commercially and used extensively in gold and silver amalgamation. Mercury has been used historically in fungicide formulations and can still be found in many commercial products including fluorescent lights, thermometers, automobile switches and dental amalgam. Mercury is also naturally present in trees and fossil fuels such as coal, natural gas, diesel fuel and heating oil. The mercury present in these fuel sources is released into the atmosphere upon combustion. This atmospheric mercury can be transported great distances and is known to be deposited on the landscape via either wet or dry deposition.

Mercury can be present in various physical and chemical forms in the environment. The majority of the mercury found in the environment is in the form of inorganic or elemental mercury but these forms of mercury can be converted to organic or methyl mercury by sulfate-reducing bacteria. Methyl mercury production is affected by a host of physical and chemical factors including temperature, redox potential, dissolved oxygen levels, organic carbon, sediment particle size, alkalinity, sulfate concentration and pH. Methyl mercury, once formed, represents the most bioaccumulative form of mercury in fish tissue and the most toxic form of mercury for human consumers *(Excerpt from Willamette TMDL, September 2006)*.

5.7.2.1 Willamette Mercury TMDL

In September 2006, DEQ published the Willamette Mercury TMDL in response to 303(d) listings based on fish consumption advisories for elevated mercury concentrations in certain fish species (northern pikeminnow and largemouth bass). The TMDL for mercury is designed to restore the beneficial use of fish consumption to the Willamette River and its tributaries.

One of the primary goals of the mercury TMDL was to establish an interim water column guidance value that would be protective of the beneficial use of fish consumption in the Willamette Basin. The interim guidance value, when attained, should eventually reduce the concentrations of mercury in fish tissue to levels that no longer pose an unacceptable health risk to consumers of the fish. In developing the TMDL, DEQ acknowledged its limitations in understanding the fate, transport, bioaccumulation, loading and sources of mercury in the Willamette Basin. DEQ also acknowledged that these limitations have the potential to influence the estimates of the loading of mercury in the Willamette system, the sector-specific source contributions, the water column guidance values, as well as the estimated reductions necessary to restore the beneficial use of fish consumption. Therefore, the TMDL established *interim* water column guidance values and sector-specific allocations based on information currently available.

DEQ is implementing a phased approach in the Willamette Mercury TMDL to increase the current understanding of mercury issues in the Willamette Basin to a level that will enable DEQ to update the TMDL in 2011. By 2011, DEQ plans to use the additional data to develop a revised TMDL that will update targets and provide allocations.

Chapter 14 of the Willamette TMDL, the Water Quality Management Plan (WQMP), describes the overall framework for implementing the Willamette Basin TMDL. It includes a description of activities, programs, legal authorities, and other measures for which Oregon Department of Environmental Quality (DEQ) and other designated management agencies (DMAs) have regulatory responsibility.

According to the WQMP, mercury is not considered a TMDL pollutant under the Phase-I MS4 permit provisions because the 2006 Willamette Mercury TMDL does not establish source-specific wasteload allocations for mercury. However, mercury is a 303(d) listed pollutant in the Willamette Basin and is therefore subject to requirements in the District's watershed-based NPDES permit. Under these requirements, the MS4 permittee must qualitatively review the 303(d) listed pollutants and address the requirements noted at the beginning of section 5.7:

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5.7.2.2 Evaluation of likelihood of MS4 discharges to add or contribute to water quality degradation

Source Categories

Source categories of mercury identified in the Willamette TMDL include: atmospheric deposition (from both local and far-field sources); erosion of native soils; historical mining activity; sediment re-suspension; and limited municipal and industrial wastewater discharges. Each of these source categories is briefly discussed below:

- Air deposition of ionic mercury (Hg^{2+}) from local and far-field sources, at a rate of 10 $\mu g/m^2$-yr (DEQ 2004b). Far-field sources include coal combustion in Asia. Near-field sources could include anything from Mt. St. Helens to broken fluorescent light bulbs to incinerators/crematoria (Krabbenhoft 2005).
- Mine wastes from cinnabar (HgS) mining and milling, and amalgam-based gold milling activities in the Cascades. These wastes include mercury-enriched soils, waste or ore rock, and water discharges from mine openings (adits).
- Soil erosion, where soil mercury concentrations in the Willamette River valley floodplain are typically 0.09 mg/kg at the surface (i.e., A-horizon) and 0.05-0.06 mg/kg in the subsurface (i.e., B-horizon) outside of mining districts (Khandoker 1997).
- Limited point sources, including industrial and municipal wastewater discharges. Mercury in municipal wastewater discharges can be traced to a large number of small sources—diet (e.g., swordfish or tuna), personal care products, pharmaceuticals, waste amalgam from dentists, broken thermometers—as well as industrial sources covered by pretreatment requirements. Most of this influent mercury is removed during wastewater treatment (Downing 2005). In preliminary results from the San Jose/Santa Clara Water Pollution Control Plant, influent mercury concentrations of 193.7 ng/L (1.3 ng/L methyl mercury) were reduced to 2 ng/L total mercury (THg) and 0.03 ng/L methyl mercury following treatment by tertiary filters.
- River sediments that reflect total mercury derived from all of these sources. A USGS compilation of Willamette Basin data from the 1990s indicates that streambed sediment averages 0.29 mg/kg, but ranges from 0.01 to 2.5 mg/kg (Rice 1999). This average value is confirmed by DEQ (2004a) for the Willamette River mainstem.

Estimated Loading

The Willamette TMDL estimates the annual mean relative source load contributions of the various inputs of mercury for the mainstem Willamette River. The load associated with the erosion of native mercury-containing soils (47.8%) and the runoff of atmospherically-deposited mercury from local and global sources (47.7%) represent the two largest mercury inputs to the mainstem Willamette River system. These two source categories include a component attributable to stormwater discharges from urbanized areas from both Municipal Separate Storm Sewer System (MS4) communities and non-MS4 communities.

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The TMDL estimated that the load associated with runoff of atmospherically-deposited mercury from urban environments at 5% and the soil erosion in urban areas at 1.2% of the total load to the Willamette River system. Seasonal variation in precipitation and snow melt can affect: flow rate, which determines whether sediment is re-suspended or deposited; wet deposition, which affects air inputs to land; and surface runoff and erosion, which together affect outputs from land to water. During winter (high flow) events, the estimated load associated with sediment re-suspension increases significantly.

Conclusion

According to the source contribution analysis in the Willamette Mercury TMDL, runoff of atmospherically-deposited mercury and erosion of native soils are two sources that result in the discharge of mercury from the MS4.

5.7.2.3 Determine and describe the relationship between mercury and the MS4 discharges

As noted above, the source contribution analysis in the TMDL states that runoff of atmospherically-deposited mercury and erosion of native soils are two primary mechanisms that result in the discharge of mercury in MS4 discharges. A secondary effect of MS4 discharges is that elevated peak flows have the potential to cause re-suspension of sediments beyond those that would naturally occur during high flow conditions.

Atmospherically-deposited Mercury

Aerially deposited mercury in the urban environment reaches aquatic systems via stormwater runoff. Brumbaugh et al. (2001) notes that urban streams that have no other specific point sources typically have elevated total mercury and methyl mercury in streambed sediments. Little is known about mercury concentrations in most tributary streams of the lower Willamette River valley (DEQ 2004a, b). Sampling by the USGS (2004) in metropolitan Portland-area creeks (Johnson, Fanno, and Beaverton Creeks) indicates that these urban creeks have both slightly higher concentrations of water column mercury and a slightly higher percentage of methyl mercury than comparable creeks in the forested basins of East Fork Dairy Creek and Lookout Creek. Dissolved mercury averaged 0.77 ng/L in urban streams (9 percent methyl mercury), and 0.62 ng/L in forest streams (6.5 percent methyl mercury). This pattern has been partially corroborated in one of the few studies to address mercury partitioning in stormwater, undertaken in the Sacramento, California, area. In the Sacramento-area study, urban and non-urban streams had comparable water column total mercury concentrations, but methyl mercury concentrations were higher in the urban streams (Archibald and Walberg 2004).

Stormwater conveyance, whether in a piped system or surface conveyances (e.g., ditches and channelized streams), is designed to get stormwater quickly off impervious surfaces in the urban environment. Therefore, urban runoff has relatively little contact time with soil where mercury can be bound up as less-reactive compounds before reaching receiving waters. This is important because "new" mercury seems to be more bioavailable than "old" mercury (Krabbenhoft 2005). New mercury is defined as mercury that has recently been deposited, has had minimal contact time with the soil, and thus is more bioavailable. New mercury is more rapidly methylated and incorporated into the aquatic food chain. MS4 systems may provide a pathway source of mercury.

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MS4 Mercury Data

A recent evaluation of data from MS4s across the nation revealed that relatively poor data are available for mercury in stormwater (Pitt et al. 2004; Pitt 2005). This data evaluation was restricted to samples from storm sewer pipes or outfalls (rather than receiving waters), so it is a more representative evaluation of MS4 system contribution. Of 3,765 samples compiled in this effort, less than one-third were analyzed for mercury. In the subset of samples analyzed, mercury was undetected at analytical detection levels of 100-300 ng/L in most samples (i.e., close to Oregon water quality standards, but well above target water column concentrations from the draft Willamette River TMDL). In the 103 samples in which mercury was detected (as total mercury), concentrations ranged from 30 to 9,200 ng/L, with the mean and median concentrations equal to 370 and 200 ng/L, respectively. No data were presented that could illuminate the partitioning of mercury between the total, dissolved, or methyl mercury fraction. The Oregon results from the compilation of samples from MS4 systems by Pitt (2005) showed mercury concentrations ranging from non-detects at 200-500 ng/L to detected values of 200-700 ng/L. The Oregon values exhibit a similar proportion of sampled/detected values as the national data compilation.

Example Calculation

Using Willamette Mercury TMDL data, the following example calculation illustrates the relative contribution of different mercury sources in the urban environment.

Air deposition runoff:

- Assume that the average mercury load to urban environments from air deposition is diluted by the average annual rainfall for the Portland metropolitan area.
- Annual mercury load from air deposition is calculated in the draft Willamette TMDL as 10 $\mu g/m^2$ (DEQ 2004a).
- Average annual rainfall is 41.22 inches, or 1.05 m (National Climate Data Center means for 1971-2000 at Oregon City, Hillsboro, Troutdale, Portland, and Beaverton averaged).
- Urban runoff from effective impervious surfaces generally ranges from 90-95% of incident precipitation (e.g., 1.05 m rainfall * 95% = 1.0 m runoff).
- Assume that there is no volatilization or other mercury losses.
- Average concentration of mercury in runoff from urban impervious surfaces in the metropolitan area is 10 $\mu g/1.0m^3$, or 10 ng/L. This is approximately one order of magnitude higher than the target water column concentration (0.92 ng/L).

Sediment re-suspension:

- Mercury concentrations in streambed sediments of the Willamette River average approximately 0.3 mg/kg (DEQ 2004b).
- Typical suspended sediment concentrations in Willamette River streams are 10 mg/L in moderate stream flows (DEQ 2004a).

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- The contribution to the water column mercury concentration from suspended sediment, assuming that it is derived from re-suspended bed sediment, would be 3 ng/L, or approximately three times the target water column mercury concentrations.

Soil erosion:

- Mercury concentrations in surface soil in the Willamette valley are approximately 0.09 mg/kg.
- Typical suspended sediment concentrations in Willamette River streams are 10 mg/L in low and moderate stream flows (DEQ 2004a). Wet weather conditions generally increase in-stream concentrations; data from the City of Portland indicate that in-stream TSS concentrations range from 30-60 mg/L during wet weather conditions.
- The contribution to the water column mercury from suspended sediment if soil erosion contributes the only source of sediment would be 0.9 ng/L during dry conditions and about 3 to 6 ng/L during wet conditions, or up to six times the target water column mercury concentration.

Conclusion

The evaluation of mercury data indicates that very little is known about the connection of urban stormwater runoff to in-stream mercury concentrations. However, urban stormwater is suspected to provide a pathway for the discharge of aerial sources of mercury to receiving waters. Elevated urban peak flows can promote re-suspension of mercury-enriched streambed sediments. Soil erosion can also contribute to elevated mercury loading in the urban environment, although erosion is estimated to be a more substantial issue in agricultural or forest harvest settings (DEQ 2004b).

5.7.2.4 Determine whether the BMPs in the existing SWMP are effective to address mercury

The goal of stormwater BMPs is to reduce the load of both mercury and methyl mercury to receiving waters. This is accomplished by reducing the mercury load in absolute terms and reducing methylation in the environment. Mercury binds strongly to sulfur-containing organic ligands such as weathered plant material, so that mercury that reaches biologically active soils tends to be well sequestered (i.e., less bioavailable for methylation). Therefore, sediment-trapping BMPs can be expected to be effective at trapping mercury and reducing methyl mercury loads.

Evaluating BMP effectiveness for mercury is more involved than simply analyzing effectiveness of structural BMPs. This is particularly true for mercury because the goal is to remove very small quantities of mercury from the aquatic environment. A holistic (i.e., life cycle) view of mercury removal is utilized by the District. Four general categories of mercury BMPs are implemented with the goal of reducing the overall mercury load – source control BMPs, erosion prevention and sediment control BMPs, non-structural BMPs, and structural BMPs. The District has also incorporated low impact development BMPs into its design and construction standards that will also serve to reduce mercury loading to the environment. The following is a discussion of each of these BMP categories.

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Source Control BMPs

The District either directly implements or participates in implementing a variety of BMPs that focus on source reduction efforts by dentists (e.g., amalgam collection), households, and other commercial interests. In response to the Willamette Mercury TMDL, the District as well as other Phase I MS4s in the Willamette River Basin will develop mercury minimization plans. The Phase 1 MS4s are working closely with ACWA to develop a *Willamette Mercury Reduction Manual*, which will present a comprehensive, standard approach for developing a mercury minimization plan with a focus on pollution prevention. The *Willamette Mercury Reduction Manual* will include a wide range of mercury reduction strategies that can be customized to the specific needs of a community. Each mercury reduction strategy will include examples of developed programs and information describing past effectiveness, predicted effectiveness, ease of implementation, cost, and other relevant factors. Once the *Willamette Mercury Reduction Manual* is developed, the District will enhance its source control BMPs to include elements specified in the manual.

Erosion Prevention and Sediment Control BMPs

The Willamette Mercury TMDL identifies the erosion of native soils as one of the mechanisms that result in the discharge of mercury from the MS4. The example calculation presented in the previous section gives an indication of the potential contribution of mercury from soil erosion. Within the Tualatin River Subbasin and the District's service area, all activities that disturb 500 sq. feet or more are subject to District regulation. The District also acts as DEQ's agent and implements the NPDES 1200-C stormwater general permit associated with construction activities that disturb one acre or more of land.

As discussed in Section 6.1, the primary goal of the Construction Site Stormwater program is to limit the erosion of soils and to employ sediment control techniques to control sediment from reaching surface streams. The Construction Site Stormwater program includes both erosion prevention and sediment control BMPs although the emphasis is placed on proactive erosion prevention techniques. Erosion prevention techniques include site planning and scheduling, retention or use of ground cover, etc. Sedimentation control measures include silt fences, sediment barriers, settling basins, etc.

Non-structural BMPs

As noted above, atmospherically-deposited mercury tends to bind to solids; BMPs that reduce solids are also effective in reducing mercury loading to receiving streams. Non-structural BMPs include operation and maintenance (O&M) practices (e.g., street sweeping, catch basin cleaning, illicit discharge prevention, etc.) and public education programs. The primary function of the O&M portion of the non-structural BMPs is to reduce the discharge of suspended solids. The District accomplishes this by optimizing its street sweeping, catch basin & water quality manhole cleaning, and storm sewer pipe cleaning activities.

There is little or no literature data to assess the effectiveness of a suite of O&M practices and public education programs implemented by the District. Most studies tend to evaluate the effectiveness of a single O&M practice such as street sweeping or catch basin cleaning. To gauge the effectiveness of non-structural practices, the District used the difference in land use based concentrations over time (from the inception of the MS4 program to recent data)

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as the cumulative effectiveness of the suite of non-structural BMPs. This approach indicated that the District's non-structural practices are reducing suspended solids loading by 40%.

Structural BMPs

Structural BMP effectiveness data for mercury are essentially non-existent; only five sites included in the ASCE International BMP database have mercury data, and for most of those observations, mercury was not detected (ASCE 2005). Because mercury data in stormwater are severely limited, the effectiveness of structural stormwater BMPs currently cannot be quantitatively assessed with any degree of certainty.

In the absence of quantitative data, structural stormwater BMPs that would conceptually be most effective at reducing mercury loads would include the following characteristics:

- Promote retention times necessary for the dissolved mercury fraction to be adsorbed to particulates.
- Trap sediment (particularly fine sediment) for alternative disposal.
- Promote reduction in flow volumes such that mercury would be incorporated into the soil matrix.
- Provide aerobic conditions that limit methylation.
- Not result in the remobilization of particulate, dissolved, or methyl mercury.

For new development and for redevelopment projects, the District requires the installation of structural BMPs. An inventory of the structural BMPs conducted in 2007 indicated that more than 1500 structural BMPs have been installed in the District's service area. Most of the structural BMPs that have been installed are swales and ponds. These BMPs exhibit many of the characteristics identified above for storm water BMPs that would be most effective at reducing mercury loads – promote retention time, trap sediment, promote reduction in flow volumes, etc.

In urban, high pollutant load land use areas that are not served by structural BMPs, the District has a capital improvements plan that identifies and prioritizes regional and retrofit opportunities, and projects, including:

- Re-vegetation and outlet modifications to improve the efficiency of existing water quality facilities
- Retrofit or reconstruction of existing manholes and catch basins to include sumps for water quality
- Conversion or upgrade of water quantity detention facilities to provide water quality treatment
- Installation of outfall pretreatment (i.e. water quality manholes) in prioritized high pollutant load areas

Implementation of these projects will further reduce the mercury discharges from the MS4.

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The purpose of Low Impact Development Approaches (LIDA) is to reduce and treat stormwater runoff at the source. This is accomplished by reducing the amount of total impervious surface and by encouraging infiltration, and occasionally by re-using stormwater for irrigation or other beneficial uses. LIDA BMPs exhibit all of the characteristics identified in the "Structural BMPs" discussion for management practices that would be most effective at reducing mercury loads – promote retention time, trap sediment, promote reduction in flow volumes, aerobic conditions, and prevent re-mobilization of particulate, dissolved, or methyl mercury. The District has incorporated LIDA into its *Design & Construction Standards*, has provided incentives for using these approaches, and has entered into public/private partnerships to demonstrate the use of these techniques.

5.7.2.5 Conclusion

The District is implementing a suite of management practices (source control, erosion prevention and sediment control, non-structural, structural, and public education/outreach) that is effective at reducing mercury loading. The District has incorporated low impact development approaches (LIDA), which would be effective in reducing mercury loading and moderating the effects of increased runoff volumes, into its Design and Construction Standards. The District has also developed a capital improvement plan to install structural BMPs in high pollutant load areas with no current structural controls. Once the *Willamette Mercury Reduction Manual* is developed, the District anticipates enhancing its current suite of source control BMPs as well. The District has added mercury to its list of pollutants monitored in storm water runoff so more local knowledge can be gained regarding the levels and sources of mercury.

5.7.3 Iron and Manganese

Iron and manganese are fundamental components of soils and the rocks from which soils are derived. Typical concentrations of iron and manganese in surficial geological materials of the Willamette River valley are 5 percent iron (i.e., 50,000 mg/kg) and 1,000 mg/kg manganese (Shacklette and Boerngen 1984). These concentrations are high compared to national averages because of the prevalence of volcanic or volcanic-derived geological materials. Soil concentrations of these elements vary by soil horizon (i.e., they are typically concentrated in subsoils) and are relatively higher where soils are derived from basalts (e.g., the Columbia River basalts, Troutdale gravels, etc.). Iron concentrations in streambed sediments in lower and middle Willamette River (below Salem) range from 3.5 to 8.5 percent; 7 percent iron content is a typical value for the lower Willamette River (Rice 1999). These sediment concentrations most likely reflect the influence of iron (and manganese) enriched bedrock[1], although there may be some anthropogenic contribution as well.

5.7.3.1 2001 Tualatin TMDL

In 1998, Fanno Creek was included on DEQ's 303(d) list for iron and manganese. Iron and manganese concentrations exceeded the secondary drinking water standard for taste and odor. While the 2001 Tualatin TMDL focused on the listing for iron and manganese in Fanno Creek, it noted that many more stream segments within the Tualatin Basin exceed the

[1] Iron enrichment in sediments between Columbia River basalt lava flows was sufficient to support turn-of-the-century iron mining in Lake Oswego and Scappoose, for instance (Orr and Orr 1999).

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water quality criteria for iron and manganese. The discussion from the 2001 Tualatin TMDL regarding iron and manganese is presented below:

Iron

Elevated iron concentrations in surface and ground water are a very common problem. Iron occurs naturally in many alluvial sediments of volcanic origin, like those found in the Tualatin River Sub-Basin. At this time there are no known health effects from elevated levels of iron in drinking water, but aesthetic water quality degradation (taste and odor) occurs at levels above 300 μg/L. According to the EPA, iron is not a known carcinogen, suspected carcinogen, or a pollutant known to be seriously toxic at low levels.

Groundwater samples containing elevated levels of arsenic typically contain elevated levels of iron and manganese and little or no dissolved oxygen. Median iron concentrations of 195 μg/L and 320 μg/L were noted in Tualatin River Sub-Basin shallow and deep groundwater, respectively. Iron concentrations for 22 bed sediment samples taken from tributaries throughout the Tualatin River Sub-Basin between 1992 and 1996. The median, minimum and maximum iron concentrations were 51.5 mg/g, 40 mg/g, and 85 mg/g, respectively. Natural background iron concentrations in Washington State average between 25.0 and 58.7 mg/g. In Clark County, just across the border with Oregon, levels average 36.1 mg/g. Based upon these comparisons, the 2001 Tualatin TMDL concluded that iron concentrations in Tualatin River Basin bed sediment are at or near background levels.

Basin-wide surface water samples collected by the District show a median iron concentration of 1080 μg/L, based upon ***2,398 samples****. This data shows that iron concentrations periodically exceed criteria throughout much of the Tualatin Basin. The 2001 Tualatin TMDL notes that while iron concentrations in Tualatin Sub-Basin surface waters are high relative to the water quality criteria, they likely reflect natural background iron concentrations (DEQ 2001).*

Manganese

High concentrations of manganese in surface and ground water is a common, naturally occurring phenomena but can also be introduced by industry. It can produce a brownish-black discoloration and can produce an unpleasant odor and taste. At this time there are no known health effects from elevated levels of manganese in drinking water, but aesthetic water quality degradation (taste and odor) occurs at levels above 50 μg/L. Manganese in drinking water is not considered a health hazard except at extremely high concentrations.

Groundwater samples containing elevated levels of arsenic typically contain elevated levels of iron and manganese and little or no dissolved oxygen. However, no data on groundwater manganese concentrations in the Tualatin Sub-Basin were readily available for inclusion in this 2001 Tualatin TMDL. Manganese concentrations in volcanically derived soils generally range between 200 μg/g and 1000 μg/g. Natural background manganese concentrations in Washington State average between 700 and 1500 μg/g. In Clark County, just across the border with Oregon, levels average 1500 μg/g. Manganese concentrations for 22 bed sediment samples were taken from tributaries throughout the Tualatin River Basin between 1992 and 1996. The median, minimum and maximum manganese concentrations were 1350 μg/g, 850 μg/g, and 2700 μg/g, respectively. Based upon these comparisons, the 2001 Tualatin TMDL concluded that manganese concentrations in Tualatin River Sub-Basin bed sediment appear to be at or near background levels.

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Basin-wide surface water samples collected by the District show a median manganese concentration of 89.1 µg/L, based upon ***2,108 samples****. This data shows that manganese concentrations periodically exceed the taste & odor secondary drinking water criteria throughout much of the Tualatin Sub-Basin. The 2001 Tualatin TMDL notes that while manganese concentrations in Tualatin Sub-Basin surface waters are high relative to the water quality criteria, they likely reflect natural background manganese concentrations (DEQ 2001).*

Conclusions from the 2001 Tualatin TMDL

Exceedances of water quality criteria for arsenic, iron and manganese are common throughout the Tualatin Sub-Basin. It appears that arsenic, iron and manganese are mobilized in Tualatin Basin groundwater due to their natural presence within local alluvial deposits and the predominance of reducing conditions within associated aquifers. Surface water concentrations of arsenic, iron and manganese appear to be a reflection of the natural geochemical environment and regional groundwater hydrology within the Tualatin Sub-Basin. While surface water concentrations are high relative to water quality criteria, they are on par with national averages and most likely reflect natural background conditions. DEQ did not believe that a TMDL for iron, manganese and arsenic was necessary. The TMDL recommended that the water quality standards for these metals be re-evaluated and possibly revised to reflect natural background concentrations as prescribed in the OARs. The TMDL further states that this work will be done in a future triennial standards review (DEQ 2001).

5.7.3.2 2004/06 303(d) list

Because the Fanno Creek was the only stream that was listed on the 303(d) list for iron and manganese, the conclusions presented in the 2001 Tualatin TMDL were limited only to that stream. Even though the 2001 Tualatin TMDL notes that iron and manganese are naturally present within local alluvial deposits and the predominance of reducing conditions with associated aquifers in the entire Tualatin Sub-basin, DEQ listed Beaverton Creek and the Tualatin River for iron and manganese in its 2004/06 303(d) list (DEQ 2006). As a result, iron and manganese are subject to requirements of the District's Watershed-based NPDES permit. Under these requirements, the MS4 permittee must qualitatively review the 303(d) listed pollutants such as iron and manganese and address the requirements noted at the beginning of section 5.7:

5.7.3.3 Evaluation of likelihood of MS4 discharges to add or contribute to water quality degradation

As noted in the 2001 Tualatin TMDL, iron and manganese are common throughout the Tualatin Sub-Basin. They are mobilized in Tualatin Basin groundwater due to their natural presence within local alluvial deposits and the predominance of reducing conditions within associated aquifers. Surface water concentrations of iron and manganese appear to be a reflection of the natural geochemical environment and regional groundwater hydrology within the Tualatin Sub-Basin. Since iron and manganese are naturally present within local alluvial deposits, MS4 runoff could potentially add or contribute to iron and manganese levels in surface waters. Available data does indicate that storm water runoff does contain iron and manganese.

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Conclusion

Since iron and manganese are naturally present within local alluvial deposits, MS4 runoff could potentially add or contribute to iron and manganese levels in surface waters during periods of heavy rainfall, which may result in elevated concentrations of suspended sediments from the transport of eroded soil or re-suspension of streambed sediments.

5.7.3.4 Relationship between iron & manganese and the MS4 discharges

Given the lack of measured iron and manganese concentrations in urban stormwater in the Portland metropolitan area, the relationship between MS4 discharges and iron and manganese cannot be quantified. However, qualitative relationships are possible, based on gross observations of urban runoff processes. Stormwater conveyance, whether in a piped system or surface conveyances (e.g., ditches and channelized streams), is designed to get stormwater quickly off impervious surfaces in the urban environment. This process provides transport of eroded soil that could be deposited on impervious surfaces from air deposition or erosion of bared soil surfaces. Urban runoff can also contribute indirectly to elevated iron and manganese concentrations in the water column by quickly increasing flows in receiving streams, resulting in either re-suspension of streambed sediments or accelerated erosion of stream banks.

Conclusion

Iron and manganese concentrations can be elevated above ambient water quality criteria as a result of natural concentrations of these parameters in soils, the amount of suspended sediment in stormwater runoff, and erosion of streambed sediments from increased runoff volumes.

5.7.3.5 Determine whether the BMPs in the existing SWMP are effective to address iron & manganese

The goal of stormwater BMPs designed to address iron and manganese should be to reduce the suspended sediment load in receiving waters and to moderate the effects of increased urban runoff volumes. The District's SWMP is already focused on sediment reduction to the maximum extent practicable through the implementation of various BMP types. Three general categories of BMPs are implemented with the goal of reducing sediment load to receiving streams – erosion prevention and sediment control BMPs, non-structural BMPs, and structural BMPs. The District has also incorporated low impact development BMPs into its design and construction standards that will also serve to not only reduce sediment loading to receiving streams but also to moderate the effects of urban runoff. The following is a discussion of each of these BMP categories.

Erosion Prevention and Sediment Control BMPs

The 2001 Tualatin TMDL notes that iron and manganese are naturally present within local alluvial deposits. MS4 runoff could potentially add or contribute to iron and manganese levels in surface waters during periods of heavy rainfall, which may result in elevated concentrations of suspended sediments from the transport of eroded soil or re-suspension of streambed sediments.

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Within the Tualatin River Subbasin and the District's service area, all activities that disturb 500 square feet or more are subject to the erosion prevention and sediment control program. The District also acts as DEQ's agent and implements the NPDES 1200-C stormwater general permit associated with construction activities that disturb one acre or more. The primary goal of the Construction Site Stormwater program is to limit the erosion of native soils and to employ sediment control techniques to control sediment from reaching surface streams. The Construction Site Stormwater program includes both erosion prevention and sediment control BMPs although the emphasis is placed on proactive erosion prevention techniques. Erosion prevention techniques include site planning and scheduling, retention or use of ground cover, etc. Sedimentation control measures include silt fences, sediment barriers, settling basins, etc.

Non-structural BMPs

BMPs that reduce solids are also effective in reducing iron and manganese loading to receiving streams. Non-structural BMPs include operation and maintenance (O&M) practices (e.g., street sweeping, catch basin cleaning, illicit discharge prevention, etc.) and public education programs. The primary function of the O&M portion of the non-structural BMPs is to reduce the discharge of suspended solids. The District accomplishes this by optimizing its street sweeping, catch basin & water quality manhole cleaning, and storm sewer pipe cleaning activities.

There is little or no literature data to assess the effectiveness of a suite of O&M practices and public education programs implemented by the District. Most studies tend to evaluate the effectiveness of a single O&M practice such as street sweeping or catch basin cleaning. To gauge the effectiveness of non-structural practices, the District used the difference in land use based concentrations over time (from the inception of the MS4 program to recent data) as the cumulative effectiveness of the suite of non-structural BMPs. This approach indicated that the District's non-structural practices are reducing suspended solids loading by 40%.

Structural BMPs

Some structural BMP effectiveness data are available with respect to iron from the International BMP database (ASCE 2005). Based on available information, structural stormwater BMPs that conceptually would be most effective at reducing iron and manganese loads would include the following characteristics:

- Collect and/or trap sediment (particularly fine sediment).
- Promote reduction in flow volumes so the sediment transport capacity of the conveyance system or receiving waters is appropriately reduced.

For new development and redevelopment projects, the District requires the installation of structural BMPs. An inventory of the structural BMPs conducted in 2005 indicated that more than 1500 structural BMPs have been installed in the District's service area. Most of the structural BMPs that have been installed are swales and ponds. These BMPs are effective at collecting/trapping sediment as well as reducing flow volumes to receiving streams.

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In urban, high pollutant load land use areas that are not served by structural BMPs, the District is implementing a capital improvements plan that identifies and prioritizes regional and retrofit opportunities, and projects, including:

- Re-vegetation and outlet modifications to improve the efficiency of existing water quality facilities
- Retrofit or reconstruction of existing manholes and catch basins to include sumps for water quality
- Conversion or upgrade of water quantity detention facilities to provide water quality treatment
- Installation of outfall pretreatment (i.e. water quality manholes) in prioritized high pollutant load areas

Implementation of these projects will further reduce sediment loads from MS4 discharges.

The purpose of Low Impact Development Approaches (LIDA) is to reduce and treat stormwater runoff at the source. This is accomplished by reducing the amount of total impervious surface and by encouraging infiltration, and occasionally by re-using stormwater for irrigation or other beneficial uses. LIDA BMPs exhibit all of the characteristics identified in the "Structural BMPs" discussion for management practices that would be most effective at reducing iron and manganese loads – trap sediment and promote reduction in flow volumes. The District has incorporated LIDA into its *Design & Construction Standards*, has provided incentives for using these approaches, and has entered into public/private partnerships to demonstrate the use of these techniques.

5.7.3.6 Conclusion

The District is implementing a suite of management practices (erosion prevention and sediment control, non-structural and structural) that is effective at controlling iron and manganese loading from MS4 sources to receiving streams. The District has incorporated low impact development approaches (LIDA), which would be effective in reducing iron and manganese loading and moderating the effects of increased runoff volumes, into its Design and Construction Standards. The District is also implementing a capital improvements plan to install structural BMPs in high pollutant load areas that are not currently served by such BMPs.

5.7.4 Pesticides (Dieldrin)

Organochlorine pesticides in the aquatic food chain are now recognized as a widely distributed problem throughout North America (USGS 1999). In the 2004/06 303(d) list, Fanno Creek was listed for dieldrin because concentrations of this compound were found in excess of ambient water quality standards. Aldrin and dieldrin are pesticides that were commonly used for agricultural purposes (corn, root crops) from the 1950s to 1970s. Aldrin breaks down quickly to dieldrin (ATSDR 2004a). Both are neurotoxins. They were banned in 1974 except for use in termite control; all uses were banned in 1987.

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Organochlorine pesticides such as dieldrin have common properties that govern their fate and transport in the environment: they are highly persistent, they bioaccumulate in the food chain, and they are highly hydrophobic (i.e., partition out of water to sediment). Furthermore, they volatilize in sufficient quantities so that they are transported by air and deposited as wet or dry deposition on land, resulting in worldwide occurrence at trace levels.

Since dieldrin is a 303(d) listed pollutant, it is subject to requirements of the District's Watershed-based NPDES permit. Under these requirements, the MS4 permittee must qualitatively review the 303(d) listed pollutants such as dieldrin and must address the requirements noted at the beginning of section 5.7:

5.7.4.1 Evaluation of likelihood of MS4 discharges to add or contribute to water quality degradation

DEQ listed Fanno Creek for dieldrin in its 2004/06 303(d) list (DEQ 2006); the listing was based on data collected by USGS at the Fanno @ Durham location (RM 1.1). USGS data collected from 3/1/1993 to 9/18/2001 was used by DEQ in listing Fanno Creek. In the 2004/06 303(d) list, DEQ notes that 4 out of 31 samples exceeded applicable water quality criteria. The data considered by DEQ along with additional data gathered since September 2001 is presented in the following table:

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TABLE 5-10

Dieldrin Data – Fanno Creek @ Durham

Sample Date	Dieldrin, unfiltered (µg/L)	Dieldrin, filtered (µg/L)	Sample Date	Dieldrin, unfiltered (µg/L)	Dieldrin, filtered (µg/L)
3/1/1993		< .001	4/11/2002		< .005
3/1/1993		M	4/16/2002		< .005
4/12/1993		< .001	4/26/2002		< .005
4/29/1993		< .001	4/30/2002		< .005
5/25/1993		< .001	5/8/2002		< .005
6/21/1993		< .001	5/16/2002		< .005
7/12/1993		< .001	5/21/2002		< .005
7/22/1993	< .001	< .001	5/30/2002		< .005
7/22/1993	0.001		6/6/2002		< .005
8/2/1993		< .001	6/13/2002		< .005
9/2/1993		< .001	6/21/2002		< .005
10/5/1993		< .001	7/2/2002		< .005
11/9/1993		< .001	7/16/2002		< .005
11/15/1993		< .001	8/13/2002		< .005
11/15/1993		< .001	9/24/2002		< .005
11/16/1993		< .001	10/22/2002		< .005
12/10/1993		< .001	10/28/2002		< .005
12/11/1993		< .001	11/14/2002		< .005
1/13/1994		< .001	11/21/2002		< .005
2/17/1994		< .001	12/9/2002		< .005
3/17/1994		< .001	12/16/2002		< .005
5/9/1994	0.001	< .001	1/8/2003		< .005
5/24/1994	< .001	< .001	2/6/2003		< .005
6/16/1994		< .001	3/12/2003		< .005
8/11/1994		< .001	3/31/2003		< .005
10/27/1994	0.002	< .001	5/1/2003		< .005
11/30/1994		< .001	5/22/2003		< .005
1/27/1995		< .001	5/30/2003		< .005
3/7/1995		< .001	6/12/2003		< .005
5/1/1995		< .001	6/26/2003		< .005
5/25/1995		< .001	7/17/2003		< .005
8/10/1995		< .001	8/12/2003		< .005
7/10/2001		< .005	9/2/2003		< .005
9/18/2001		< .005	10/27/2003		< .009
10/1/2001		< .005	1/5/2004		< .009
10/10/2001		< .005	2/4/2004		< .009
10/16/2001		< .005	2/26/2004		< .009
10/23/2001		< .005	4/13/2004		< .009
11/6/2001		< .005	4/29/2004		< .009
11/15/2001		< .005	6/1/2004		< .009
11/19/2001		< .005	7/26/2004		< .009
11/28/2001		< .005	8/11/2004		< .009
12/4/2001		< .005	10/26/2004		< .009
12/11/2001		< .005	12/6/2004		< .009
12/18/2001		< .005	2/1/2005		< .009
1/2/2002		< .005	4/15/2005		< .009
1/15/2002		< .005	6/8/2005		< .009
2/11/2002		< .005	8/2/2005		< .009
3/15/2002		< .005			
M - Presence of material verified but not quantified					

Table 5-10 shows that detectable levels of dieldrin were found in 3 unfiltered samples collected in 1993 and 1994; there were no detectable levels of dieldrin found in the nearly 100 filtered samples collected from 1993 to 2005. In the Johnson Creek TMDL, DEQ identified the sources of organochlorine compounds such as dieldrin as primarily related to streambed sediments, which themselves have an upland (soil) source (DEQ, 2006b). The USGS reports that nationally, concentrations of dieldrin are typically highest in urban areas, presumably as a result of their use to control termites (USGS, 1999). Storm water runoff has the potential to transport eroded soil to the aquatic environment, and some of this runoff

occurs via MS4 systems. Thus, there is potential for storm water discharges from the MS4 to add or contribute to dieldrin levels in receiving streams.

5.7.4.2 Relationship between dieldrin and MS4 discharges

Stormwater conveyances, whether in a piped system or surface conveyances (e.g., ditches and channelized streams), are designed to get stormwater quickly off impervious surfaces in the urban environment. Therefore, urban runoff has relatively little contact time with soil where organochlorine compounds such as dieldrin can be chemically bound up prior to reaching receiving waters. Urban stormwater systems provide transport pathways for organochlorine compounds to reach receiving waters. Elevated peak flows in urban areas can promote re-suspension of organochlorine-enriched streambed sediments, effectively moving the problem downstream. Soil erosion can also contribute to elevated organochlorine loading in the urban environment, although erosion control is a more substantial issue in agricultural or forest harvest settings (DEQ 2006b).

5.7.4.3 Determine whether the BMPs in the existing SWMP are effective to address dieldrin

The goal of stormwater BMPs is to reduce the load of sediments discharging to receiving streams. As noted in the Johnson Creek TMDL, dieldrin is primarily related to streambed sediments, which themselves have an upland (soil) source. Therefore, erosion control BMPs and sediment-trapping BMPs are expected to be effective at trapping organochlorine compounds, as well as BMPs that reduce runoff volumes in a manner that limits peak flows that cause in-stream erosion.

The District's SWMP is already focused on sediment reduction through the implementation of various BMP types. Three general categories of BMPs are implemented with the goal of reducing sediment load to receiving streams – erosion prevention and sediment control BMPs, non-structural BMPs, and structural BMPs. The District has also incorporated low impact development BMPs into its design and construction standards that will also serve to not only reduce sediment loading to receiving streams but also to moderate the effects of urban runoff. The following is a discussion of each of these BMP categories.

Erosion Prevention and Sediment Control BMPs

In the Johnson Creek TMDL, DEQ notes that dieldrin is primarily related to streambed sediments, which have an upland source. MS4 runoff could potentially contribute to dieldrin levels in surface waters during periods of heavy rainfall, which may result in elevated concentrations of suspended sediments from the transport of eroded soil or re-suspension of streambed sediments.

Within the Tualatin River Subbasin and the District's service area, all activities that disturb 500 square feet or more are subject to the erosion prevention and sediment control program. The District also acts as DEQ's agent and implements the NPDES 1200-C stormwater general permit associated with construction activities that disturb one acre or more. The primary goal of the Construction Site Stormwater program is to limit the erosion of soils and to employ sediment control techniques to control sediment from reaching surface streams. The erosion control program includes both erosion prevention and sediment control BMPs although the emphasis is placed on proactive erosion prevention techniques. Erosion

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prevention techniques include site planning and scheduling, retention or use of ground cover, etc. Sedimentation control measures include silt fences, sediment barriers, settling basins, etc.

Non-structural BMPs

BMPs that reduce solids can also be effective in reducing dieldrin loading to receiving streams. Non-structural BMPs include operation and maintenance (O&M) practices (e.g., street sweeping, catch basin cleaning, illicit discharge prevention, etc.) and public education programs. The primary function of the O&M portion of the non-structural BMPs is to reduce the discharge of suspended solids. The District accomplishes this by optimizing its street sweeping, catch basin & water quality manhole cleaning, and storm sewer pipe cleaning activities.

Public education and outreach is a key component of component of controlling the discharge of pesticides. Many of the District's s public education and outreach programs address issues associated with the application of pesticides, herbicides, and fertilizers, and the proper management and disposal of toxic materials. These are presented in section 6.6.

There is little or no literature data to assess the effectiveness of a suite of O&M practices and public education programs implemented by the District. Most studies tend to evaluate the effectiveness of a single O&M practice such as street sweeping or catch basin cleaning. To gauge the effectiveness of non-structural practices, the District used the difference in land use based concentrations over time (from the inception of the MS4 program to recent data) as the cumulative effectiveness of the suite of non-structural BMPs. This approach indicated that the District's non-structural practices are reducing suspended solids loading by 40%.

Structural BMPs

Structural BMP effectiveness data for organochlorine compounds are essentially non-existent. Only one site included in the international BMP database appears to have been sampled for organochlorine compounds for inflow and outflow, and for those observations, organochlorine compounds were either not detected or detected at low concentrations in both effluent and influent (ASCE 2005). Because data are severely limited, the effectiveness of stormwater BMPs cannot currently be quantitatively assessed. Analytical limitation—e.g., insufficiently low method reporting limits—may make effectiveness testing of BMPs for organochlorine compounds infeasible. Based on available information, stormwater BMPs that conceptually would be most effective at reducing organochlorine compounds would include the following characteristics:

- Trap sediment (particularly fine sediment) and ensure that it is not easily re-mobilized.
- Promote reduction in flow volumes so organochlorine compounds are incorporated into the soil matrix.
- Promote reduction in flow volumes so in-stream sediments are not re-suspended beyond natural perturbations.

For new development and for redevelopment projects, the District requires the installation of structural BMPs. An inventory of the structural BMPs conducted in 2007 indicated that more than 1500 structural BMPs have been installed in the District's service area. Most of

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the structural BMPs that have been installed are swales and ponds. These BMPs are effective at collecting/trapping sediment as well as reducing flow volumes to receiving streams.

In urban, high pollutant load land use areas that are not served by structural BMPs, the District is implementing a capital improvements plan that identifies and prioritizes regional and retrofit opportunities, and projects, including:

- Re-vegetation and outlet modifications to improve the efficiency of existing water quality facilities
- Retrofit or reconstruction of existing manholes and catch basins to include sumps for water quality
- Conversion or upgrade of water quantity detention facilities to provide water quality treatment
- Installation of outfall pretreatment (i.e. water quality manholes) in prioritized high pollutant load areas

Implementation of these projects will further reduce sediment loads from MS4 discharges.

The purpose of Low Impact Development Approaches (LIDA) is to reduce and treat stormwater runoff at the source. This is accomplished by reducing the amount of total impervious surface and by encouraging infiltration, and occasionally by re-using stormwater for irrigation or other beneficial use. LIDA BMPs exhibit all of the characteristics identified in the "Structural BMPs" discussion for management practices that would be most effective at reducing the discharge of dieldrin to receiving streams – trap sediment and promote reduction in flow volumes. The District has incorporated LIDA into its *Design & Construction Standards*, has provided incentives for using these approaches, and has entered into public/private partnerships to demonstrate the use of these techniques.

5.7.4.4 Conclusion

The District is implementing a suite of management practices (erosion prevention and sediment control, non-structural (O&M and public education and outreach), and structural) that is effective at controlling the discharge of dieldrin from MS4 sources to receiving streams. The District has incorporated low impact development approaches (LIDA), which would be effective in reducing the discharge of dieldrin and moderating the effects of increased runoff volumes, into its Design and Construction Standards. The District is also implementing a capital improvements plan to install structural BMPs in high pollutant load areas that are not currently served by such BMPs.

5.7.5 Koll Wetland

The 2004/06 303(d) list for the Tualatin River Subbasin lists the Koll Wetland for hexavalent chromium, copper, lead, silver, and zinc. A TMDL WLA for the Koll Wetland has not been developed. Consequently, an evaluation is required to determine whether MS4 discharges cause or contribute to water quality degradation, to describe the cause-and-effect relationships, to determine BMP effectiveness, and to propose appropriate BMP adaptations, if needed.

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There is, however, sufficient uncertainty associated with the Koll Wetland data to question the appropriateness of the 303(d) listing. The District had formally objected to the inclusion of Koll Wetland in the draft 2004 303(d) list based on the following technical merits:

- **The data in support of listing are unreliable:** The data used to support the listing were collected in 1992 before implementation of the MS4 program and sampling procedures and QA/QC information are lacking.
- **Dissolved copper levels exceed total copper:** Dissolved copper levels were significantly higher than "total" copper in 42% of the samples (5 out of 12 samples). This is an indication of the unreliability of the dataset.
- **Listing for hexavalent chromium based on total chromium data**. Total chromium has a trivalent and a hexavalent form. Total chromium is typically in the trivalent form in the ambient environment. The samples that were collected were analyzed for total chromium; the samples were not analyzed for hexavalent chromium. The listing of hexavalent chromium is the result of comparing ***total*** chromium sample results with the ***hexavalent*** chromium criteria. Thus, the listing for hexavalent chromium is erroneous.
- **Dissolved metal concentration data are at non-detect for two metals:** All of the dissolved silver and dissolved chromium data collected from Koll Wetland are less than detection. This, combined with the fact that detection limits exceeded the criterion, indicates that no conclusions can be made regarding whether the observed data violate dissolved criteria now under consideration.

Because of the above technical issues, the listing of Koll Wetland is dubious. Nonetheless, the District has conducted a qualitative review of the 303(d) listed pollutants to address the requirements noted at the beginning of section 5.7:

5.7.5.1 Evaluation of likelihood of MS4 discharges to add or contribute to water quality degradation

There are no stormwater data available specific to Koll Wetland. The Washington Square site has a similar land use as the Koll Wetland drainage; however, it does not drain to Koll Wetland. Nonetheless, it can be used as an indication of the quality of stormwater runoff from commercial areas.

The Washington Square stormwater samples analyzed were collected between 1993 and 2004. The metals data from this site were compared to the applicable state water quality criteria for the protection of aquatic life. This analysis showed that the stormwater discharges at Washington Square (and presumably Koll Wetland) are a source of copper, lead, and zinc, but not of hexavalent chromium and silver.

5.7.5.2 Relationship between the 303(d) Listed Pollutants and the MS4 Discharges

There are no recent data on stormwater that discharges to Koll Wetland. As indicated above, stormwater discharges from a nearby watershed with a similar land use to Koll Wetland show that stormwater discharges contribute copper, lead, and zinc. Based on these data, it is possible that there could be a relationship between listed pollutants copper, lead, and zinc, and MS4 discharges.

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5.7.5.3 Determine whether the BMPs in the existing SWMP are effective to address the 303(d) pollutants

Non-structural BMPs are applied in this area, as they are in other areas within the District's service boundary. Non-structural BMPs include operation and maintenance (O&M) practices such as street sweeping, catch basin cleaning, storm sewer pipeline cleaning, illicit discharge prevention, etc. The primary function of the O&M portion of the non-structural BMPs is to reduce the discharge of suspended solids, which would also be effective at reducing particulate copper, lead and zinc levels. The District accomplishes this by optimizing its street sweeping, catch basin & water quality manhole cleaning, and storm sewer pipe cleaning activities.

There are currently no structural BMPs located in the area that drains to Koll Wetland. Because the listing of Koll Wetland is dubious, the District does not intend to focus resources on water quality issues in this waterbody.

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SECTION 6

Stormwater Management Plan Best Management Practices

Stormwater management practices have been categorized into the following sections:

- Construction Site Stormwater
- Operation and Maintenance
- Structural and Source Control Measures
- Illicit and Non-stormwater Discharges
- Landfills, Hazardous Waste Sites, and Industrial Facilities
- Public Education and Outreach

Each section begins with the applicable permit language and/or legal requirement citation, and a description of the program that highlights key program elements. Each section also specifies the co-implementers that implement the BMP category. At the end of the each section, a BMP category fact sheet is included that specifies measurable goals for key program elements and the tracking measure associated with each measurable goal. For certain BMP categories, the fact sheets also specify "additional commitments" for activities that do not lend themselves to measurable goals and tracking measures. The measurable goals, tracking measures, and additional commitments will be reported in the MS4 Annual Report.

6.1 Construction Site Stormwater

A description of a program to implement and maintain structural and non-structural BMPs to reduce pollutants in storm water runoff from construction sites to the municipal storm sewer system that must include: [items noted in the each section below]
[40 CFR 122.26 (d)(2)(iv)(D)]

The District's Ordinance 27 authorizes rules and regulations for construction site stormwater management through adoption of resolutions and orders. The specific rules and regulations are in Chapter 6 (Erosion Prevention, and Sediment Control Rules) of the *Clean Water Services Design and Construction Standards for Sanitary Sewer and Surface Water Management, June, 2007.* The requirements are intended to protect the beneficial uses of waters within the Tualatin River Subbasin and the District's service boundary, and are implemented in combination with state, federal, and local laws and ordinances. Within the Tualatin River Subbasin, all activities that disturb 500 square feet or more of earth are subject to District regulation as outlined in the Tualatin Basin Rule (OAR 340-041-0345(4)). In addition, construction activities that affect areas greater than 1 acre are also regulated under NPDES Stormwater Discharge Permits (1200-C Permit). The District acts as an agent for the administration of the 1200-C program. Applicants may prepare and submit a single Erosion Prevention and Sediment Control Plan for approval under both programs, thereby streamlining the permitting process.

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To provide further specific guidance to the development and construction community, the District, in partnership with other local jurisdictions is currently updating the *Erosion Prevention and Sediment Control Planning and Design Manual*. The *Manual* provides a detailed and comprehensive description of erosion control materials and installation practices that have proven effective. An update of the *Manual* is expected to be completed in December 2008.

The erosion control program and rules include BMPs for erosion prevention and sedimentation control, with emphasis on proactive erosion prevention rather than reactive sedimentation control. Prevention techniques include site planning and scheduling, retention or use of ground cover, etc. Sediment control measures include silt fences, sediment barriers, settling basins, etc.

Administration of the District's erosion control rules and regulations, including inspection and enforcement, has been delegated to some cities by intergovernmental agreements with the District. The cities of Beaverton, Cornelius, Forest Grove, Sherwood, and Hillsboro perform permitting, inspection, and enforcement for sites within their city limits. The cities of Tigard and Tualatin review and approve erosion control plans and issue permits; the District performs inspection and enforcement. The District performs the entire program in the unincorporated areas and within the cities of Banks, Durham, Gaston, King City, and North Plains. The District also provides technical and enforcement support to all cities within the service boundary. For the purposes of section 6.1, the term co-implementers refer to the entities that implement the Construction Site Stormwater program (Beaverton, Cornelius, Forest Grove, Sherwood, Hillsboro and the District).

The Construction Site Stormwater BMP fact sheet at the end of this section contains a summary of the program, measurable goals and tracking items.

6.1.1 Site Planning Procedures

A description of procedures for site planning which incorporate consideration of potential water quality impacts. [40 CFR 122.26 (d)(2)(iv)(D)(1)]

The *Design and Construction Standards* specify the required elements that must be included in an Erosion Prevention and Sediment Control Plan (EPSCP). In addition to management practices, the EPSCP requires identification and protection of water quality sensitive areas, floodplains, and drainage hazard areas. The *Manual* describes a recommended 11-step procedure for developing and implementing an EPSCP. The EPSCP serves as a blueprint to prevent erosion and control sediment from leaving the site during construction and will require modification throughout the life of the project. The co-implementers review and approve EPSCPs prior to issuing site development erosion control permits.

At a minimum, all single-lot construction projects require perimeter control, inlet protection, and a construction entrance which are standard construction practices. The permitting process is streamlined for single-family construction and does not require an EPSCP. A detailed EPSCP is required for single-lot commercial or industrial sites.

The EPSCP is part of the Site Development Plan submittal, and a site development construction permit cannot be issued without EPSCP approval. As such, this BMP tracking will be reported in the Structural and Source Control Measures section (Section 6.3).

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6.1.2 Best Management Practices Requirements

A description of requirements for nonstructural and structural BMPs. [40 CFR 122.26 (d)(2)(iv)(D)(2)]

The program requires installation and maintenance of temporary and permanent erosion control measures on all sites in accordance with an approved EPSCP. However, compliance with the approved plan does not excuse the applicant from providing additional measures if erosion is occurring.

The *Design and Construction Standards* specify minimum erosion prevention and sediment control requirements and include BMPs for use on sites within the Tualatin Subbasin, some of which are minimum requirements. The *Design and Construction Standards* also include numerous BMPs for effective erosion prevention and sediment control. In addition to the required and allowed BMP list, the *Manual* provides designers with information regarding advantages & disadvantages, design, inspection, and maintenance requirements for a wide variety of erosion control BMPs and helps the designer choose the most appropriate measure or control for an individual site.

6.1.3 Procedures for Identifying Priorities for Site Inspections and Enforcement of Control Measures

A description of procedures for identifying priorities for inspecting sites and enforcing control measures that considers the nature of the construction activity, topography, and the characteristics of soils and receiving water quality. [40 CFR 122.26 (d)(2)(iv)(D)(3)]

All sites are inspected multiple times during various phases of construction. The co-implementers conduct three types of inspections: initial inspections, regular inspections, and final inspections. On **all** sites, erosion prevention and sediment control measures must be installed and the initial inspection completed **before** any permitted activity begins.

Regular inspections are performed **at least weekly** on **all** active site development (multi-lot/large scale) projects. Additional inspections are conducted on sites that have challenging site characteristics such as topography, proximity to sensitive areas, and the nature and complexity of the construction activity. Regular inspections are performed **at least monthly** on **all** single-lot sites (residential, commercial, and industrial). The co-implementers document the weekly inspections at site development projects and the monthly inspections at single-lot sites but often conduct more frequent inspections.

The co-implementer responsible for inspection also performs final inspections of site development projects and single-lot building sites.

As the co-implementers inspect all sites and conduct frequent follow-up inspections, the presence of inspection staff helps ensure the approved EPSCP and BMPs are being implemented. An escalating enforcement matrix is used for violations, depending on the severity and the nature of the violation. The escalating enforcement may include verbal warnings, written warnings (e.g. Deficiency Notices), Stop Work Orders, and Civil Citations. The co-implementers have the ability to bypass verbal or written warnings to address severe violations. For example, working without a proper permit results in immediate Stop Work Order and potentially a Civil Citation.

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6.1.4 Education and Training for Construction Site Operators

A description of appropriate educational and training measures for construction site operators. [40 CFR 122.26 (d)(2)(iv)(D)(4)]

The *Erosion Prevention and Sediment Control Planning and Design Manual* provides a detailed and comprehensive description of erosion control materials and installation practices that have proven effective. The *Manual* is a resource for construction site operators. It identifies the policies, permit requirements, key agencies, and acts that define and direct construction site stormwater practices. It describes the concepts, impacts, and principles of erosion and sedimentation, and explains the advantages of erosion prevention over sediment control. It guides construction site operators through the preparation of erosion prevention and sediment control plans, and provides specifications and details for implementing BMPs. The appendices offer helpful notes, sample plans, checklists, reference tables, and other useful information for construction site operators.

In 2006, the District provided a standardized EPSCP template that consolidates 1200C permit information in one place that can be shared by designers, contractors, and inspectors. This template has been used successfully and the District is committed to providing updates to the template, if needed. Training on the use of the template will be provided if the template is updated.

In 2007, the District updated the *Design and Construction Standards* to reflect technological changes in construction site management. The *Design and Construction Standards* will continue to be updated to reflect changes in technology and regulations. Public outreach and training are key companion tasks to these updates.

To help builders, contractors, and developers, the District, together with the Oregon Department of Environmental Quality, the Oregon Association of Clean Water Agencies, and others, periodically co-sponsors erosion prevention/sediment control workshops. Site operators also are encouraged to participate in professional trainings sponsored by the U.S. Environmental Protection Agency, Associated General Contractors, and the International Erosion Control Association to help the construction and development trade comply with stormwater regulations.

The District participates in the Regional Erosion Prevention Awards program, which was established in 2003. Currently, eighteen jurisdictions participate in this annual event representing various municipalities within Clackamas, Multnomah, Washington, and Marion Counties in Oregon and the City of Vancouver and Clark County in Washington. Based on the nominations by each participating jurisdiction, awards are presented to those permit holders who utilize exceptional erosion prevention BMPs. Each year, an award is presented to a single-family site and a large development site (commercial, multi-family, subdivision, or linear project). The awards encourage erosion prevention practices during construction, provide uniformity and consistency across jurisdictional boundaries, and develop strong partnerships within the building community.

Each year just prior to the Wet Weather Season, October 1st – May 31st, the co-implementers mail two letters approximately two weeks apart to all permitted site operators to remind them of their responsibilities related to wet weather erosion prevention and application of ground cover.

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BMP Fact Sheet: Construction Site Stormwater	
Introduction:	The purpose of this BMP category is to improve water quality by reducing or preventing soil erosion and implementing sediment control measures at construction sites through regulation, inspection, enforcement, and education. This BMP meets the regulatory requirements for a program to implement and maintain BMPs for construction sites, including site planning to consider water quality impacts, development of BMPs for construction sites, prioritization of inspections, conduct inspections, and enforcement and training for construction site operators.
Measurable Goals and Tracking Measures	**1: Erosion Prevention & Sediment Control (EPSC) Education and Outreach** a. Actively participate in regular education and training for public agency staff (inspection), construction contractors, engineers, and developers on erosion control standards and techniques. • Tracking measure: List of annual training sessions conducted and participating agencies. b. Provide annual inspector training on erosion control techniques and enforcement measures for continuing education. Except for inspectors that have an active EPSC certification that includes a continuing education requirement, require all other inspectors to attend annual training on erosion control techniques. • Tracking measure: Annual number of inspectors attending EPSC training. • Tracking measure: Annual number of inspectors with active EPSC certification. c. Provide annual notification of wet-weather requirements to active permit holders. • Tracking measure: Annual number of wet weather notices issued. **2: EPSC Inspection and Enforcement** a. Conduct initial, regular and final inspections for all site development projects. • Tracking measure: Annual number of site development inspections – initial, regular, and final. b. Conduct initial, regular and final inspections for all single lot construction sites. • Tracking measure: Annual number of single lot construction inspections – initial, regular, and final. c. Implement an escalating enforcement matrix which may include written warnings (e.g. Deficiency Notices or similar action), Stop Work Orders, and Civil Citations. • Tracking measure: Annual number of enforcement actions – written warnings (e.g. Deficiency Notices or similar action), Stop Work Orders, and Civil Citations.
Additional Commitments	Update ***Design and Construction Standards*** as needed to reflect changes in technology and regulations. Update the *Erosion Prevention and Sediment Control Planning and Design*

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BMP Fact Sheet: Construction Site Stormwater	
	Manual. Participate in the Regional Erosion Prevention Awards Program. Evaluate cooperative agency agreements with professional trade associations like Oregon Associate of Clean Water Agencies, Associated General Contractors, and Home Builders Association.
Relationship to TMDLs:	**Phosphorus.** The District's Erosion Control program was established under the Tualatin Basin Rule (OAR 340-041-0345(4)) to meet the phosphorus allocations in the 1988 Tualatin TMDL. **Settleable Volatile Solids.** Erosion Control BMPs significantly reduce the discharge of organic matter associated with soil erosion, which could result in sediment oxygen demand in the receiving waters.
Public involvement opportunities:	The District regularly updates the Design and Construction Standards, which include its erosion control standards, and regulations for enforcement and penalties, to reflect changes in rules and new technologies. Public input to development of Standards will occur according to the District's established public involvement practices of notification, information, and reiterative processes of opportunities for comment and response to comments.
Related documents:	*Erosion Prevention and Sediment Control Planning and Design Manual* (USA, 2000 or updated version) *Design and Construction Standards for Sanitary Sewer and Surface Water Management* (Clean Water Services, 2007 or updated version)

6.2 Operation and Maintenance Activities

A description of practices for operating and maintaining public streets, roads and highways and procedures for reducing the impact on receiving waters of discharges from municipal storm sewer systems, including pollutants discharged as a result of deicing activities. [40 CFR 122.26 (d)(2)(iv)(A)(3)]

Public streets, roads, highways, and other transportation corridors within the service boundary are maintained by jurisdictions, including Washington County, the Cities, Clean Water Services, and ODOT. Among these, ODOT holds its own permit for discharge of stormwater and manages street operations and maintenance in accordance with the permit and local land use laws. The co-implementers work closely to review and verify operation and maintenance procedures with respect to water quality impacts, advocating active management of pollutants by frequent street sweeping, cleaning of storm sewer pipes and ditches within public rights-of-way, and removal of debris (such as leaves) before entry into the storm sewer system.

The cities of Beaverton, Cornelius, Forest Grove, Sherwood, Hillsboro, Tigard and Tualatin perform the "local" storm sewer maintenance programs with some exceptions. Generally, the "local" program includes the maintenance of the entire public storm sewer system. The District does the entire storm sewer maintenance program in King City, Banks and Durham. In North Plains, the District does most of the storm sewer maintenance program, and the City does street sweeping and water quality facility maintenance. For the purposes of section 6.2, the term co-implementers refer to the entities that implement the Operations

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and Maintenance program (Beaverton, Cornelius, Forest Grove, Sherwood, Hillsboro, Tigard, Tualatin, North Plains (with the limitations noted above) and the District).

6.2.1 Street O&M Practices

The key operation and maintenance (O&M) program activities include street sweeping, leaf pickup, catch basin cleaning, water quality manhole cleaning, storm sewer line cleaning, TV inspections of the storm sewer systems, and structural water quality facility maintenance. Each of these activities is discussed below. A complete list of the O&M activities, maintenance frequencies and the performance standards are presented in the "*Sanitary Sewer and Surface Water Management Work Programs, Performance Standards, Priorities and Policies*" *(R&O 07-46)*.

The maintenance frequencies for key program elements were initially based on an analysis for coordinated, on-going, and efficient delivery of storm sewer system maintenance services for the entire service area conducted in 1998. Maintenance frequencies were established to enhance storm water quality, and retain the function and capacity of the storm sewer system. The District has updated the frequencies and added new maintenance program elements on an on-going basis.

Street Sweeping: Street sweeping improves storm water quality by removing pollutants and fine particles from curbed public streets. Sweeping also keeps material out of catch basins and storm water conveyances systems to retain function and capacity. All public curbed streets within the service area are swept once per month. Sweepers are used that effectively remove fine sediment (regenerative air sweepers or equivalent water quality sweepers). Sweepers are run at optimum speeds, and a recording device documents speed while sweeping, miles swept, and hours swept.

Leaf Pickup: The leaf pickup program enhances storm water quality and retains function and capacity of the storm water conveyance system. The fall leaf pickup program includes one or more of the following components: a curbside leaf pick up program, increased recycling, and leaf drop off day(s).

Catch Basin Cleaning: Catch basin cleaning enhances storm water quality and retains function and capacity of the storm sewer system. Co-implementers clean sumped and un-sumped catch basins. The activities associated with each are described below:

- Un-sumped catch basins: un-sumped catch basin cleaning consists of removing sediment, gravel and other debris from the inlet grate of the catch basin. Public un-sumped catch basins are inspected annually for obstructions and debris, and are cleaned as needed. Un-sumped catch basins are evaluated more frequently in areas with historically higher loadings.

- Sumped catch basins: sumped catch basin cleaning consists of removing sediment, gravel and other debris from the inlet grate and the sumped areas of the catch basin. All public sumped catch basins within the service area are cleaned once per year. Sumped catch basins are evaluated more frequently in areas with historically higher loadings.

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Water Quality Manhole Cleaning: Water quality manhole cleaning enhances storm water quality. Water quality manholes allow easy access for sediment removal and are typically located upstream of structural water quality facilities (e.g. swales, ponds, etc.). Water quality manholes may also be located in areas that do not have structural water quality facilities. Public water quality manholes are cleaned twice per year, and more frequently where necessary.

Storm Line Cleaning: Sediment and debris are removed from public storm sewer lines to improve storm water quality and to ensure the design capacity of the conveyance system. The public storm sewer lines within the service area are cleaned on a four year cycle; areas with a history of maintenance issues are cleaned more frequently.

TV Inspections of Storm Sewer System: The public storm water lines within the service area are inspected using a TV camera. TV inspections are closely coordinated with storm line cleaning and typically occur within a week after line cleaning. TV inspections determine the condition of the stormwater conveyance system by locating broken pipes, separated joints, roots, protruding pipes, illicit discharges, and to check the effectiveness of line cleaning activities. The public storm sewer lines within the service area are inspected using a TV camera once every 7 years. Storm lines that have a history of maintenance issues are inspected more frequently.

Structural water quality facility maintenance: The maintenance activities associated with structural water quality facilities are discussed in the next section (Section 6.2.2).

The Operation and Maintenance BMP Category Fact Sheet at the end of this section contains a brief summary of the operation and maintenance program, measurable goals for the key program elements, and tracking items for each measurable goal.

6.2.2 Maintenance of Stormwater Facilities

A description of maintenance activities and a maintenance schedule for structural controls to reduce pollutants (including floatables) in discharges from municipal separate storm sewers. [40 CFR 122.26 (d)(2)(iv)(A)(1)]

The co-implementer's maintenance activities are limited to public water quality facilities (structural controls) that are designed and constructed to public standards. The larger communities (Forest Grove, Cornelius, Hillsboro, Beaverton, Tigard, Tualatin, and Sherwood) operate and maintain the local stormwater facilities within their boundaries under an intergovernmental agreement with the District. The District operates and maintains these facilities for the smaller cities (North Plains, Durham, Banks, and King City) and in unincorporated areas within the service area.

Routine maintenance of structural water quality facilities includes: mowing, trimming, levee/bank maintenance, inlet/outlet maintenance, removal of debris, visual inspections during the wet season to ensure functionality, watering, fertilizing, and herbicide application. Non-routine maintenance activities include planting vegetation, reshaping/reconstructing, and silt and sediment removal. Except for the proprietary systems discussed below, a structural water quality facility is typically visited 4-6 times per year and maintenance activities are conducted as needed. Since the duration of these visits may vary considerably, the co-implementers will track the number of water quality facilities

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visited/maintained as well as the number of hours spent maintaining them. The co-implementers also maintain proprietary systems such as filter vaults; filter vaults are inspected one to two times per year, and filters are replaced yearly or as determined by inspection.

Maintenance of private water quality facilities is discussed in Section 6.3, Structural and Source Control Measures.

6.2.3 Deicing Materials

*A description of practices for operating and maintaining public streets, roads and highways and procedures for reducing the impact on receiving waters of discharges from municipal storm sewer systems, **including pollutants discharged as a result of deicing activities** (emphasis added). [40 CFR 122.26 (d)(2)(iv)(A)(3)]*

A number of jurisdictions apply anti-skid/anti-icing materials to roadways within the service area, including the cities, county, ODOT, and Tri-Met. Typically, crushed, graded aggregate (i.e. sanding rock) is applied to highways, arterials, collectors, and other roadways with steep grade. In addition, anti-icing materials such as magnesium chloride are also applied – mostly at bridges and overpasses. Typically sanding rock is picked up within 3 to 5 days of application or at the next regularly scheduled sweeping. Many co-implementers pick up the sanding rock and have it processed at an external facility to be re-used.

The Port of Portland's Hillsboro Airport is within the service area. However, there are no deicing activities conducted at the Hillsboro Airport.

6.2.4 Pesticide, Herbicide, and Fertilizer Pollutant Reduction Program

A description of a program to reduce to the maximum extent practicable, pollutants in discharges from municipal separate storm sewers associated with the application of pesticides, herbicides and fertilizer that will include, as appropriate, controls such as educational activities, permits, certifications and other measures for commercial applicators and distributors, and controls for application in public right-of-ways and at municipal facilities. [40 CFR 122.26 (d)(2)(iv)(A)(6)]

A pesticide is any substance or mixture intended to prevent, destroy, repel, or mitigate any pest. Pesticides include insecticides, herbicides, fungicides, and other substances such as a plant regulator, defoliant, or desiccant. Pesticide use is regulated primarily by the Federal Insecticide, Fungicide and Rodenticide Act, the Oregon Pesticide Control Law (Oregon Revised Statutes - Chapter 634), or the Oregon Pesticide Regulations (Oregon Administrative Rules, Chapter 603, Division 57).

The co-implementers employ an integrated management strategy to reduce storm water pollutants stemming from the use of pesticides, herbicides, and fertilizers in landscaping, water quality facility maintenance, and public facility maintenance as described in the following subsections.

6.2.4.1 Stormwater Quality Facilities

The co-implementers maintain hundreds of public stormwater quality facilities in the service area in an *ongoing, routine* maintenance program that ensures the facilities continue to function as originally intended. The following criteria apply to the use of pesticides in public stormwater quality facilities:

- Restricted use pesticides are generally not used in public stormwater quality facilities.
- Label instructions for application are followed; lower concentrations of chemicals than those specified on the product label are used to create a more dilute spray whenever possible.
- Generally, only hand spraying equipment is used; meteorological conditions (rainfall, wind, temperature, etc.) are considered when spraying.
- Signs are not posted except when restricted use pesticides are used because stormwater quality facilities are not public areas and they are fenced or otherwise separated from access to the general public.
- OSHA guidelines are followed for the storage, transportation and disposal of the used chemicals and containers.

6.2.4.2 Public Right-of-Ways/Municipal Facilities

The co-implementers use pesticides and fertilizer at public right-of-ways and municipal facilities according to the manufacturer's instructions and all applicable local, state, and federal laws. Appropriate safety measures are used when applying any chemical product. The co-implementers are committed to further reviewing pesticide and fertilizer use, and will develop an Integrated Pest Management (IPM) plan or similar program to avoid unnecessary application of these materials. The plan or program will balance costs, benefits, public health and environmental quality.

6.2.4.3 Educational Activities

Public education and outreach are key to reducing the discharge of pesticides, herbicides, and fertilizer to stormwater. The District provides extensive education and outreach about the use of pesticides, herbicides, and fertilizers. For example:

- An annual public awareness campaign promotes alternatives to pesticides, herbicides and fertilizers via newspaper, cable TV, radio, billing inserts and online advertisements (www.cleanwaterservices.org/tips) [Campaign: *Healthy Lawns, Healthy Families*.]
- The District promotes the use of native plants by distributing the Gardening with Native Plants brochure and promoting the online Native Plant Finder webpage. [Campaign: *Go Native: Less Water, Fewer Chemicals, Healthy Streams*.]

Other public education and outreach includes collaborations with the Department of Environmental Quality, Metro, the District and co-implementers to disseminate information on disposal of unusable or unwanted pesticides. In addition, the Washington County Cooperative Recycling Program advertises waste pesticide collection events in the region. Measurable goals and tracking measures for these educational activities are specified in the Public Education and Outreach Best Management Practice Category (Section 6.6).

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BMP Fact Sheet: Operations and Maintenance	
Introduction:	The purpose of this BMP category is to improve water quality by implementing appropriate operations and maintenance practices.
Measurable goals and tracking measures:	a. Street Sweeping: Public curbed streets to be swept once per month. • Tracking measure: Curb miles of street swept and total number of curbed street miles; and amount of material collected. b. Catch Basin Cleaning: Public sumped and un-sumped catch basins to be cleaned once per year. • Tracking measure: Number of sumped catch basins cleaned; and total number of sumped catch basins. • Tracking measure: Number of un-sumped catch basins inspected; number of un-sumped catch basins inspected and cleaned; and total number of un-sumped catch basins. c. Water Quality Manhole Cleaning: Public water quality manholes to be cleaned twice per year. • Tracking measure: Number of public water quality manholes cleaned; and total number of public water quality manholes. d. Storm Line Cleaning: Public storm sewer lines to be cleaned on a four year cycle. • Tracking measure: Miles of public storm sewer lines cleaned; and total miles of public storm sewer lines. e. TV Inspections: Public storm sewer lines to be inspected using a TV camera once every 7 years. • Tracking measure: Miles of public storm sewer lines inspected; and total miles of public storm sewer lines. f. Structural Water Quality Facility Maintenance: Public structural water quality facilities to be maintained to ensure functionality (at least 4 visits annually). • Tracking measure: total number of water quality facility maintenance visits; total number of water quality facilities; and maintenance hours spent.
Additional Commitments	Review pesticide and fertilizer use and develop an Integrated Pest Management (IPM) plan or similar program.
Relationship to TMDLs:	**Phosphorus.** The District's design and construction standards are developed to remove phosphorus. Efficiency is contingent on maintaining the constructed systems to operate as designed. **Bacteria.** Through appropriate maintenance and inspection of both the sanitary and storm sewer systems, cross connections and other illicit sources of bacterial contamination will be identified and corrected. This will result in lower bacteria concentrations in stormwater. **Settleable Volatile Solids.** Adequate maintenance of the stormwater system will reduce the discharge of settleable volatile solids that accumulate in the system.

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BMP Fact Sheet: Operations and Maintenance	
Public involvement opportunities:	The intergovernmental agreements negotiated with the cities must be responsive to their stakeholders. Public input to development of these documents will occur according to the District's established public involvement practices.
Related documents:	"*Sanitary Sewer and Surface Water Management Work Programs, Performance Standards, Priorities and Policies (R&O 07-46)* or as amended.

6.3 Structural and Source Control Measures

The SWMP must include a description of structural and source control measures to reduce pollutants from runoff from commercial and residential areas that are discharged from the municipal storm sewer system that are to be implemented during the life of the permit, accompanied with an estimate of the expected reduction of pollutant loads and a proposed schedule for implementing such controls. At a minimum, the description must include: [40 CFR 122.26 (d)(2)(iv)A]

6.3.1 New Development and Redevelopment

A description of planning procedures including a comprehensive master plan to develop, implement and enforce controls to reduce the discharge of pollutants from municipal separate storm sewers that receive discharges from areas of new development and significant redevelopment. Such a plan must address controls to reduce pollutants in discharges from municipal separate storm sewers after construction is completed. [40 CFR 122.26 (d)(2)(iv)(A)(2)]

6.3.1.1 New and Re-development Projects

Stormwater runoff quality for new and redevelopment projects within the service area is regulated through the *Clean Water Services Design and Construction Standards for Sanitary Sewer and Surface Water Management, June, 2007 (Design and Construction Standards)*. The District maintains the *Design and Construction Standards*, which the co-implementers follow. For the purposes of section 6.3, the term co-implementers refer to the District, cities and the county.

The *Design and Construction Standards* are reviewed and modified regularly for compatibility with relevant planning and regulatory requirements. The *Design and Construction Standards* describe specific design requirements for construction of water quality and quantity control facilities for the MS4 system and stormwater treatment to capture pollutants after construction is completed.

A site development permit is required for all new and re-development projects. A site development plan application requires detailed engineering plans for sufficient sanitary and stormwater infrastructures for the site. As related to the MS4 system, all site development plan applications include:

- A plan for water quality and quantity management
- Construction Erosion Prevention and Sediment Control Plans
- Drainage Reports, including the basis for the stormwater facilities design
- A maintenance plan to address long-term functionality of private stormwater facilities

A site development permit (including the erosion prevention and sediment control permit) is issued after the plans are reviewed and all issues are addressed. Typically, stormwater facilities that provide treatment to multiple properties are designated "public" facilities and are maintained by the co-implementers that implement the Operations & Maintenance BMPs (section 6.2). All facilities, public or private, are designed and constructed to meet the *Design and Construction Standards*. Proper maintenance is ensured by performance bonding requirements throughout the warranty or maintenance assurance period.

6.3.1.2 Low Impact Development Approaches

In addition to traditional stormwater treatment facilities such as water quality swales and ponds, the District has incorporated Low Impact Development Approaches (LIDA) in the *Design and Construction Standards* to minimize runoff and provide flexibility for development projects. The predominance of clay soils in the service area requires careful planning and designing of many infiltration-based LIDAs, but techniques such as eco-roofs and flow-through BMPs are effective for stormwater treatment. The *Design and Construction Standards* also include strong incentives for small in-fill development projects where effective LIDAs can achieve stormwater treatment requirements.

The District continues to partner with school districts, parks departments, and private property owners with large impervious areas to evaluate how best to use LIDAs in the service area.

The *LIDA Guidance Handbook* addresses concerns about integration with building, plumbing, and maintenance departments. This *Handbook* will complement other resources on low impact development practices. The District will re-evaluate this *Handbook* annually and incorporate new technologies as appropriate.

6.3.1.3 Private Water Quality Facilities

Private water quality facilities are generally on single lot commercial, industrial, and multi-family residential sites. The majority of single family residential water quality facilities constructed after 1993 are publicly maintained. However, some "older" and a few newer facilities are maintained by Home Owners Associations. To address new and existing private water quality facility maintenance, the co-implementers are enhancing the Private Water Quality Facilities Management Program. The Private Water Quality Facilities Management Program consists of:

- Inventory
- Active outreach and education
- Inspection
- Enforcement

Typically, on-site LIDAs are constructed after the public facilities are in place. Therefore, it is essential that on-site LIDAs are properly constructed by builders and maintained by property owners. The District is coordinating closely with Building Departments to ensure public facilities and on-site LIDAs are designed and constructed as planned. Close

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coordination with the Building Departments is critical because these private facilities are inspected by building and plumbing inspectors.

Maintenance requirements for on-site LIDAs may differ from more traditional ponds and swales. Therefore, public education is a key element of the Private Water Quality Facilities Management Program to help inform owners how to properly maintain facilities to maximize water quality benefits cost effectively.

The co-implementers will also update the measurable goals and tracking measures associated with the inspection program component of the Private Water Quality Facilities Management Program as they gain additional experience with this program. Updates to the measurable goals and tracking measures will be provided in the MS4 Annual Report.

6.3.1.4 Database Management

An inventory of the public stormwater system is maintained and updated regularly using the District's GIS database. Table 6-1 summarizes the stormwater facilities within the service area. The initial GIS database has some inaccuracies and omissions. The District has been and will continue to enhance the inventory and refine the database.

TABLE 6-1
Structural BMP Type and Quantity

Description	Quantity for Clean Water Services and Cities
Constructed Wetland	9
Wet Pond	139
Extended Dry Pond	513
Compost Filter Facility	67
Swale	668
Retention Basin	21
Unknown*	130

*The "Unknown" BMP type lists BMPs that were installed but were not classified into a specific category. Where possible and as information becomes available, the District has been re-classifying these BMPs into one of the other types.

6.3.2 Retrofitting of Flood Management Facilities for Pollutant Removal

A description of procedures to assure that flood management projects assess the impacts on the water quality of receiving water bodies and that existing structural flood control devices have been evaluated to determine if retrofitting the device to provide additional pollutant removal from storm water is feasible. [40 CFR 122.26 (d)(2)(iv)(A)(4)]

Retrofitting for Incorporation of Water Quality Treatment

A limited number of true "flood control devices" are within the service area, and most were constructed prior to water quality treatment requirements. The co-implementers work to develop and maintain an inventory of these facilities in the MS4. The co-implementers develop a Capital Improvements Plan (CIP) that is updated annually based on observation of the system performance during high flow events, inspection of facilities, and periodic

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evaluation of hydraulic and hydrologic behavior in existing and expected land use conditions. The CIP process includes an assessment of the pollutant removal capacity of existing structures compared to other facilities with respect to basin size, land use, age, structural integrity, etc., to determine priority and feasibility for retrofitting facilities to improve pollutant removal.

When the CIP includes a proposal to retrofit a flood management facility, a water quality component is included in the project scope. When the CIP includes a proposal for a new flood management facility, impacts to water quality of receiving water bodies are evaluated during conceptual planning and design of the facility. Generally, co-implementers incorporate water quality treatment as much as possible; the use of proprietary treatment systems is considered at locations with very limited site availability.

It should be noted that the pace of design and construction of capital projects is subject to external constraints, including delays in permitting and weather conditions. As preliminary project planning proceeds, conditions may warrant a shift in priorities or a delay in construction of a particular project. The CIP is reviewed and revised on an annual basis to reflect current conditions and best allocation of resources.

Outfall and Storm System Retrofits

The co-implementers outfall retrofit program includes modification of existing facilities and construction of new treatment facilities where none exists. An inventory conducted in 2007 identified more than 170 major outfalls which were prioritized for retrofitting based on the ability to obtain easements, land use, receiving water quality, contributing drainage area, percent of drainage area not currently treated, and coordination with other planned infrastructure projects. The co-implementers are committed to moving forward with these projects. The co-implementers are committed to working on actively retrofitting (planning, designing, and/or constructing) six outfalls per year. Note that the commitment to conduct six outfall retrofits per year includes outfalls identified in the May 2008 prioritization of retrofit needs as well as opportunistic projects that result from other work done by the co-implementers in the service area.

The co-implementers also retrofit un-sumped catch basins that have structural or capacity issues. These catch basins are replaced with sumped catch basins that are designed to capture and temporarily store sediment and debris from the drainage basin. The co-implementers will continue to maximize retrofitting as feasible. Note that as the co-implementers continue to implement this program, the number of catch basins that will need to be retrofitted will steadily decrease; thus, the measurable goals for this program will be updated periodically.

As part of CIP, the District will update the Stormwater Sub-Basin Management Plans, which will combine water resources project needs that have been identified by various studies. In the context used here, the term "Sub-Basin" refers to topographically-defined portions of the service area where infrastructure and treatment needs can be evaluated and modeled. The Stormwater Sub-Basin Management Plan updates will identify areas where there are no structural treatment facilities. These areas will be put on a priority list for placement of water quality manholes. Construction of these water quality manholes will be scheduled once planning activities are completed.

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BMP Fact Sheet: Structural and Source Controls

Introduction:	The purpose of this BMP category is to improve water quality by developing and applying appropriate design and construction standards to development and by constructing capital improvements in previously developed areas.
Measurable Goals and Tracking Measures	**<u>1: Development Services</u>** a. Implement *Design and Construction Standards* that require water quality facilities to be built as part of new development and redevelopment with a goal to provide treatment for 100% of new and re-development areas with the exception of the fee-in-lieu projects. • Tracking measure: New and re-development area (in acres) added annually within the service area. • Tracking measure: New and re-development area (in acres) added annually with structural controls within the service area. • Tracking measure: Percentage of the service area served by structural controls. b. Conduct annual training session for public agency personnel—Clean Water Services, City, and County—and private engineering/design personnel to educate them about the water quality standards and water quality facility design. • Tracking measure: List of annual training sessions on design of water quality facilities, participating agencies, and number of staff attending training sessions. **<u>2: Low Impact Development Approaches (LIDA)</u>** a. Incentives for using LIDA are available for projects that treat more than 75% of site impervious area with LIDA. Promote the use of LIDA with a goal of at least two projects that consider using LIDA for the projects. • Tracking measure: Annual number of new and re-development projects using LIDA to treat more than 75% of site impervious area. b. Participate in private-public partnership to implement LIDA projects with a goal to implement at least two projects per year. • Tracking measure: Annual number of private-public partnerships. **<u>3: Private Water Quality Facilities Management</u>** a. Maintain active inventory (including LIDAs) of private water quality facilities. Inventory should include location, type, and area served by the facility. • Tracking measure: Number of private water quality facilities added annually to the service area. • Tracking measure: Total number of private water quality facilities in the service area. • Tracking measure: Total area (in acres) being treated with private water quality facilities in the service area. b. Implement education program for proper maintenance of private water quality facilities and provide annual notices to all facility owners in the inventory.

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BMP Fact Sheet: Structural and Source Controls	
	• Tracking measure: Description of outreach program; number of annual reminders mailed. c. Implement an inspection program for private water quality facilities. • Tracking measure: Annual number of inspections conducted of private water quality facilities; percent of total private water quality facilities inspected. **4: Capital Improvement Program** a. Incorporate projects identified in the outfall retrofit program to identify areas with limited structural treatment facilities (e.g., prioritized high load areas) with a goal of actively working on six outfalls per year for the service area. This goal may be updated as the Stormwater Sub-Basin Management Plans are completed. • Tracking measures: Number of outfalls retrofitted and identify treatment BMP used, including locations and area treated with retrofit. b. Incorporate water quality treatment component to all new flood management projects whenever feasible. • Tracking measure: Number of flood management projects constructed; number of flood management projects constructed that included a stormwater quality component. c. Retrofit or reconstruct at least 75 existing manholes and catch basins to include sumps for water quality annually (NOTE: as the co-implementers implement this program, the number of catch basins that will need to be retrofitted will steadily decrease; thus, the measurable goals for this program will be updated periodically). • Tracking measure: Number of existing manholes and catch basins that were retrofitted or reconstructed to include sumps for water quality.
Additional Commitments	Implement treatment projects with funds collected for development projects not providing treatment (fee-in-lieu) with the goal of expending 100% of these funds. Evaluate the appropriateness of LIDA concepts and practices in the *Design and Construction Standards*. Complete *LIDA Guidance Handbook*; conduct an annual review of the *LIDA Guidance Handbook* and update as needed. Update one Stormwater Sub-Basin Management Plan annually to determine areas with no structural treatment. Identify locations for placement of water quality manholes where there are no structural treatment facilities as part of the Stormwater Sub-Basin Management Plan updates. Construction of these water quality manholes will be scheduled once planning activities are completed. Continue to maintain a geographical information system (GIS) database describing structural control type, construction date, and estimated drainage area.

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BMP Fact Sheet: Structural and Source Controls	
Relationship to TMDLs:	**Phosphorus**. The District's design and construction standards for water quality facilities are designed for phosphorus removal from 100 percent of the runoff from newly constructed impervious surfaces. **Settleable Volatile Solids**. Structural controls can reduce the discharge of settleable volatile solids through various detention and retention processes.
Public involvement opportunities:	Public input is critical to the development of this BMP, and will be elicited according to the District's established public involvement practices.
Related documents:	*Clean Water Services Design and Construction Standards for Sanitary Sewer and Surface Water Management, June, 2007* Annual Capital Improvements Plan

6.4 Illicit & Non-Stormwater Discharges

The SWMP must include a description of a program, including a schedule, to detect and remove (or require the discharger to the municipal separate storm sewer to obtain a separate NPDES permit for) illicit discharges and improper disposal into the storm sewer. The proposed program must include: [40 CFR 122.26 (d)(2)(iv)(B)]

This section presents the programs to address non-storm water discharges, and illicit discharges (i.e., cross-connections, illegal dumping and spills) to the municipal separate storm sewer system. This section has two parts; the first is the program to evaluate and, if necessary, control non-storm water discharges to the MS4, and the second is the program to identify, investigate, control and/or eliminate illicit discharges to the MS4. For the purposes of section 6.4, the term co-implementers refer to the District, cities and the county.

6.4.1 Non-Storm Water Discharges

A description of a program, including inspections, to implement and enforce an ordinance, orders or similar means to prevent illicit discharges to the municipal separate storm sewer system; this program description must address all types of illicit discharges, however the following category of non-storm water discharges or flows must be addressed where such discharges are identified by the municipality as sources of pollutants to waters of the United States: water line flushing, landscape irrigation, diverted stream flows, rising ground waters, uncontaminated ground water infiltration, uncontaminated pumped ground water, discharges from potable water sources, start up flushing of groundwater wells, aquifer storage and recovery (ASR) wells, potable groundwater monitoring wells, draining and flushing of municipal potable water storage reservoirs, foundation drains, air conditioning condensation, irrigation water, springs, water from crawlspace pumps, footing drains, lawn watering, individual residential car washing, flows from riparian habitats and wetlands, dechlorinated swimming pool discharges, street wash waters, discharges of treated water from investigation, removal and remedial actions selected or approved by the Department pursuant to Oregon Revised Statute (ORS) Chapter 465, the state's environmental cleanup law; and discharges or flows from emergency fire fighting activities where discharges or flows from fire fighting are identified as not significant sources of pollutants to the waters of the state. [40 CFR 122.26 (d)(2)(iv)(B)(1)]

NPDES Permit Condition., Controls and Limitations for Storm Water Discharges from MS4, 3): The following non-storm water discharges need not be addressed by the illicit discharge program if appropriate control measures, if needed, to minimize the impacts of such sources are developed under the SWMP:

Water line flushing

Landscape irrigation
Diverted stream flows
Rising ground waters
Uncontaminated groundwater infiltration
Uncontaminated pumped groundwater
Discharges from potable water sources
Start up flushing of groundwater wells
Aquifer storage and recovery wells
Potable groundwater monitoring wells
Draining and flushing of municipal potable water storage resources
Foundation drains
Air conditioning condensate
Irrigation water
Springs
Water from crawl space pumps
Footing drains
Lawn watering
Individual residential car washing
Flows from riparian habitats and wetlands
Dechlorinated swimming pool discharges
Street wash waters
Discharges of treated water from DEQ approved investigation, removal, and remedial actions
Discharges from emergency fire fighting activities where discharges are not a significant source of pollutants

The NPDES permit identifies the non-storm water discharges to be addressed in the illicit discharge program where such discharges are identified as sources of pollutants to waters of the United States. The NPDES permit also states that non-storm water discharges identified in the permit need not be addressed by the illicit discharge program if appropriate control measures are developed under the SWMP, if needed, to minimize the impacts of such sources.

The co-implementers do minimize the impact of non-storm waters discharges by implementing a program within their own facilities, encouraging other public entities and large private facilities to manage these discharges responsibly, and providing public education to encourage citizens to protect receiving waters.

Non-storm water discharges that have the potential to enter the MS4 are listed in Table 6-2. Potential non-storm discharges to the MS4 have been reviewed and categorized as "No adverse impacts" and "Program in place." For those with a program in place, the agency that developed the program is identified and the "Notes" briefly describe the approach to minimizing impacts.

TABLE 6-2
Controls and Limitations—Non-Stormwater Discharges

Non-Stormwater Discharge	Status	Notes
Water line flushing	Program in place (DEQ)	Addressed by the DEQ's BMP entitled *Management Practices for the Disposal of Chlorinated Water* (DEQ, 2007).
Landscape irrigation/Lawn Watering/Irrigation Water	Program in place (District)	The District addresses reduction of potential pollutants from lawn watering, irrigation water, and landscape irrigation into MS4 through two public education

TABLE 6-2
Controls and Limitations—Non-Stormwater Discharges

Non-Stormwater Discharge	Status	Notes
		campaigns: • Go Native: Less Water, Fewer Chemicals, Healthy Streams. • Healthy Lawns, Healthy Families. The campaign is implemented in partnership with Metro, cities of Tigard and Tualatin, Tualatin Valley Water District, and DEQ. The District advocates the use of the integrated pest management and good irrigation scheduling practices described in *Environmentally Responsible Landscaping: A Best Management Practices Guide for Landscape Businesses* (Pollution Prevention Outreach Team, 2003).
Diverted stream flows	Program in place (DSL, COE, District)	Diverting stream flows into the MS4 system is a very uncommon occurrence. Where deemed appropriate by permitting authorities that regulate in-water work, the District may allow the temporary diverted stream flows into the MS4 provided it meets applicable requirements.
Rising groundwater	No adverse impact	
Uncontaminated groundwater infiltration	No adverse impact	
Uncontaminated pumped groundwater	Program in place (District)	Groundwater pumped to the MS4, such as from excavation dewatering, requires District approval, verification that it is uncontaminated, and may require flow controls to prevent detrimental effects on receiving streams.
Discharge from potable water sources	Program in place (DEQ)	Addressed by DEQ's BMP entitled *Management Practices for the Disposal of Chlorinated Water* (DEQ, 2007).
Start up flushing of groundwater wells	Program in place (District, DEQ)	Requests for the discharge of start-up well flushing activities are reviewed to ensure that the discharge would not result in impacts to surface waters. Where there is potential for surface water impacts, treatment is required or discharge to sanitary sewer.
Aquifer storage and recovery wells	Program in place	Similar to well-flushing.
Potable groundwater monitoring wells	Program in place	Similar to well-flushing.
Draining and flushing of municipal potable water storage resources	Program in place (DEQ)	Addressed by the DEQ's BMP entitled *Management Practices for the Disposal of Chlorinated Water* (DEQ, 2007).
Foundation drains/Footing drains	No adverse impact	
Air conditioning condensate	No adverse impact	Commercial and industrial units are regulated by the Oregon Plumbing Code. Per this code, systems that require outlet piping would be required to connect to a legal point of disposal, specifically sanitary sewer lines.
Springs	No adverse impact	

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TABLE 6-2
Controls and Limitations—Non-Stormwater Discharges

Non-Stormwater Discharge	Status	Notes
Water from crawl space pumps	No adverse impact	
Individual residential car washing	Program in place (District)	The District does not regulate individual residential car washing, but has an education program that encourages the use of professional car washes that drain to sanitary systems.
Flows from riparian habitats and wetlands	No adverse impact	
Dechlorinated swimming pool discharges	Program in place (DEQ)	The District advocates the BMPs set forth in *Management Practices for the Disposal of Chlorinated Water from Swimming Pools and Hot Tubs* (DEQ, 1999).
Street wash waters	Program in place (District)	Street washing activities are typically conducted near construction sites. The pertinent BMPs for this activity are included in the *Erosion Prevention and Sediment Control Planning and Design Manual* (USA et al., 2000).
Discharges of treated water from DEQ approved investigation, removal, and remedial actions	Program in Place (District)	Initial discharge is to the sanitary sewer, under the Pretreatment Program, *Source Control Pretreatment Program Implementation Manual* 2003, § III Procedures. No discharges shall occur without prior District approval and NPDES permit, if applicable.
Discharges from emergency fire fighting activities where discharges are not a significant source of pollutants	Program in Place (TVF&R)	Stormwater protection measures are implemented by the Tualatin Valley Fire and Rescue (TVF&R) when possible.

COE = U.S. Army Corps of Engineers
DSL = Oregon Department of State Lands
TVF&R = Tualatin Valley Fire and Rescue

6.4.2 Illicit Discharges

A description of procedures to conduct on-going field screening activities during the life of the permit, including areas or locations that will be evaluated by such field screens. [40 CFR 122.26 (d)(2)(iv)(B)(2)]

A description of procedures to be followed to investigate portions of the separate storm sewer system that, based on the results of the field screen, or other appropriate information, indicate a reasonable potential of containing illicit discharges or other sources of non-storm water (such procedures may include: sampling procedures for constituents such as e-coli, surfactants (MBAS), residual chlorine, fluorides and potassium; testing with fluorometric dyes; or conducting in storm sewer inspections where safety and other considerations allow. Such a description must include the location of storm sewers that have been identified for such evaluation). [40 CFR 122.26 (d)(2)(iv)(B)(3)]

As noted above, the co-implementer's illicit discharge program addresses cross-connections, illegal dumping, and accidental spills to the MS4. The primary field screening method to detect illicit discharges is the routine, on-going TV inspections. TV inspections are integral to the co-implementer's operation and maintenance program, and effective for detecting illicit discharges. The measurable goal and tracking measure associated with TV inspections are included in Section 6.2, Operation and Maintenance Activities.

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The co-implementer's program to identify, investigate, control and/or eliminate illicit discharges to the MS4 is discussed below.

6.4.2.1 Cross Connections

The co-implementer's program to address illicit discharges as a result of cross connections includes: Prevention, Screening and Investigation, and Abatement.

Prevention

The co-implementer's actions to prevent cross-connections include: construction standards for the design of the storm and sanitary sewer system; Ordinances and Resolution & Orders that prohibit cross connections; inspection of the public storm and sanitary system built by developers; submittal of "as-built" and a "certification" from developers that they built the system as designed; and, the inspection of house laterals.

Screening and Investigation

The co-implementer's primary field screening methods are TV inspections and observations during routine infrastructure maintenance such as storm line cleaning, catch basin and water quality manhole cleaning, and water quality facility maintenance. The co-implementers also respond to complaints regarding possible sewage in the storm system.

The co-implementers investigate potential cross-connections by dispatching a field crew that typically conducts TV inspections of the storm system to find the source.

Abatement

Once a cross-connection is identified, contact is immediately initiated with the property owner or responsible party (e.g. contractor) and the cross-connection is typically corrected within two to three days. If the cross-connection is not corrected, the co-implementers can correct the problem and bill the responsible party, or initiate corrective action through a code enforcement process.

6.4.2.2 Illegal Dumping and Accidental Spills

Descriptions of procedures to prevent, contain, and respond to spills that may discharge into the municipal separate storm sewer. [40 CFR 122.26 (d)(2)(iv)(B)(4)]

The dumping of a liquid such as oil, paint, solvent, etc. into the MS4 systems constitutes illegal dumping. The co-implementers address illegal dumping and accidental spills through public outreach and its Water Quality Investigation program.

Many of the co-implementer's public education and outreach programs address the proper management and disposal of used oil and toxic materials. Key program activities include regular articles on proper disposal of oil, household hazardous waste and litter and yard debris in billing inserts, electronic newsletters, and website; and, the storm drain marking program and distribution of educational door hangers about proper disposal of yard debris and toxic materials. Measurable goals and tracking measures for these programs are presented in the Public Education and Outreach section.

The Water Quality Investigation program addresses illegal dumping and accidental spills to the MS4. When possible and where appropriate, the discharged materials are contained,

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responsible parties are identified, mitigation is required, and enforcement actions are initiated. Each city has developed its own spill response plan which is equivalent to the District's program. When requested, the District provides support to the cities to address spills within their jurisdiction.

6.4.3 Controls to Limit Sanitary Sewer Ex-filtration into Separate Storm Sewers

A description of controls to limit infiltration of seepage from municipal sanitary sewers to municipal separate storm sewer systems where necessary. [40 CFR 122.26 (d)(2)(iv)(B)(7)]

The sanitary sewer maintenance and rehabilitation program, which is designed primarily to reduce inflow and infiltration (I and I) from rainfall and groundwater entering the sanitary sewer system, also reduces ex-filtration from the sanitary sewer system and potential contamination of the MS4 system. Two ongoing programs identify areas where defects in the sanitary sewer system may allow ex-filtration to the storm system. One is the TV inspection of the sanitary sewer system on a 7-year cycle to identify defects. The other is flow monitoring in the sanitary sewer system using 35 permanent and 25 portable flow monitors.

When defects are identified in the sanitary sewer system, several programs are available to correct them. For areas with sewers with deteriorated joints, a full-time line sealing crew seals joints with pressure grouting. For point defects, construction crews use a full range of repairs including dig and replace, pipe lining, and pipe bursting. For entire neighborhoods with deteriorated sewer pipes, sewer rehabilitation projects replace or line the mainline sewer and the house laterals.

BMP Fact Sheet: Illicit & Non-Stormwater Discharges	
Introduction:	The purpose of this BMP category is to improve water quality by proactively investigating and removing illicit discharges to the stormwater system. This BMP meets the regulatory requirements for a program to detect and remove illicit discharges and improper disposal to the storm sewer system.
Measurable goals and tracking measures:	**1: Illicit Discharge (Cross Connections) -** Ensure that all identified cross connections are abated in a timely manner. • Tracking measure: Number of cross connections identified and number abated. **2: Illicit Discharge (Illegal Dumping and Accidental Spills)** a. Respond to incidents of illegal dumping and accidental spills. • Tracking measure: Annual number of complaints. • Tracking measure: Annual number of field investigations (follow-up to complaints). • Tracking measure: Annual number of resolved field investigations. b. Take enforcement actions when appropriate in response to acts of illegal dumping and accidental spills. • Tracking measure: Annual number of enforcement actions taken as a result of water quality investigations.
Relationship to TMDLs:	**Bacteria.** This BMP is significant to reducing the human-related sources of bacteria by identifying and removing any cross-connections or other illicit

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BMP Fact Sheet: Illicit & Non-Stormwater Discharges	
	discharges of bacteria contaminated water into the MS4 system. **Phosphorus.** This BMP will reduce the discharge of organic matter into the MS4 system and into the streams directly, which will result in the reduction of phosphorus. **Settleable Volatile Solids.** This BMP will reduce the discharge of organic matter into the MS4 system and into the streams directly, which will result in the reduction of sediment oxygen demand.
Public involvement opportunities:	Public input to development of this BMP will occur according to the District's established public involvement practices.
Related documents:	None.

6.5 Landfills, Hazardous Waste Sites, and Industrial Facilities

40 CFR 122.26(d)(2)(iv): A description of a program to monitor and control pollutants in storm water discharges to municipal systems from municipal landfills, hazardous waste treatment, disposal and recovery facilities, industrial facilities that are subject to Section 313 of Title III of the Superfund Amendments and Reauthorization Act of1986 (SARA), and industrial facilities that the municipal permit applicant determines are contributing a substantial pollutant loading to the municipal storm sewer system. [40 CFR 122.26 (d)(2)(iv)(C)]

There are no municipal landfills, or hazardous waste treatment, disposal, and recovery facilities within the service area. Stormwater discharges from industrial facilities that are subject to Section 313 of Title III of the Superfund Amendments and Reauthorization Act of 1986 (SARA) and other industrial facilities are managed through the 1200-Z NPDES Stormwater General Permit assigned to industrial facilities by the DEQ.

The District's industrial stormwater program operates under a memorandum of agreement (MOA) with DEQ to manage industrial facilities requiring an NPDES Permit. In the State of Oregon, this is the 1200-Z Stormwater General Permit for industrial facilities. Under the current MOA, the District acts as DEQ's agent in managing industrial facilities that discharge to the MS4 and are required to have a 1200-Z permit. The District implements the industrial stormwater program for the entire service area.

The District performs the following activities for the 1200-Z facilities:

- Identification of facilities requiring industrial stormwater permits
- Industrial stormwater permit application review
- SWPCP review
- Technical assistance
- Facility inspections
- Review of industrial Discharge Monitoring Reports (DMRs)
- Coordination with DEQ on enforcement matters

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In addition to the program for industrial facilities that are covered by the 1200-Z stormwater general permit, the District implements a program for select industrial and commercial facilities using local regulatory controls. This program includes select facilities that have oil/water separators, conduct washing operations, and other activities that result in discharges to the MS4 system.

With respect to the discharge from washing operations, the District's program consists of the following:

- Identification of facilities that discharge process waters from washing operations to the MS4
- Providing technical assistance to eliminate these discharges to the MS4
- Permit and require necessary controls for discharges to the sanitary sewer
- Annual inspections of permitted facilities

To address illicit discharges to the MS4 (e.g. discharges from paint cleaning activities, carpet cleaners, mobile restaurants, etc.), the District implements the Water Quality Investigation program. Where possible and practicable, the discharged materials are contained, responsible parties are identified, and mitigation is required. The District also provides education and outreach to prevent such discharges to the MS4 and takes enforcement actions when appropriate. The measurable goal and tracking measure associated with the Water Quality Investigation program are specified in Section 6.4, Illicit and Non-Stormwater Discharges, of the SWMP.

The District sponsors the Eco-Logical Business certification program, which encourages residents to patronize certified businesses. The Eco-Logical Business certification program includes auto repair shops and other businesses that have met rigorous standards that ensure their policies and procedures protect water resources.

6.5.1 Priorities and Procedures for Inspections and Control Measures

Identify priorities and procedures for inspections and establishing and implementing control measures for such discharges. [40 CFR 122.26 (d)(2)(iv)(C)(1)]

Industrial facilities are identified and contacted through the Sewer Use Information Card survey program. Industrial facilities are then classified by Standard Industrial Classifications (SICs). After these facilities are identified as needing a permit, the District directs these industrial sites to apply for the 1200-Z permit.

Inspections are performed annually at all 1200-Z permitted facilities. In addition to the regular annual inspections, the District conducts technical assistance inspections at facilities that need additional help and provides "no exposure" certifications to facilities that do not have industrial activities that are exposed to storm water. The District also conducts periodic inspections of facilities that have been granted "no exposure" certifications to determine whether the facility continues to qualify for the certification.

6.5.2 Monitoring of Industrial Storm Water Discharges

Describe a monitoring program for storm water discharges associated with the industrial facilities identified in the NPDES permit, to be implemented during the term of the permit, including the submission of quantitative data on the following constituents: any pollutants limited in effluent guidelines subcategories, where applicable; any pollutant listed in an existing NPDES permit for a

facility; oil and grease, COD, pH, BOD5,TSS, total phosphorus, total Kjeldahl nitrogen, nitrate plus nitrite nitrogen; and any information on discharges required under 40 CFR § 122.21(g)(7)(vi)and (vii). [40 CFR 122.26 (d)(2)(iv)(C)(2)]

As noted earlier, there are no municipal landfills, or hazardous waste treatment, disposal, and recovery facilities present within the service area. Industrial facilities subject to the 1200-Z permit are required to submit monitoring results for pollutants specified in the permit on an annual basis. The District receives and reviews the monitoring reports from each of the 1200-Z industrial permittees in its service area. This information is evaluated for accuracy, completeness, and compared to the Quality Assurance and Quality Control (QA/QC) laboratory data that is submitted per requirements of the 1200-Z permit.

BMP Fact Sheet: Select Industrial and Commercial Facilities	
Introduction:	The purpose of this BMP category is to improve water quality by regulating select industrial and commercial discharges to the storm sewer system. This is accomplished by identifying facilities subject to industrial permitting requirements, reviewing storm water pollution control plans, conducting inspections, reviewing discharge monitoring data and providing technical assistance.
Measurable goals and tracking measures:	a. Identify industrial facilities that need a 1200-Z storm water general permit. • Tracking Measure: Number of newly permitted 1200-Z facilities in the service area. b. Review SWPCPs for 1200-Z facilities. • Tracking Measure: Annual number of SWPCPs reviewed. c. Conduct annual inspections for all 1200-Z facilities. • Tracking Measure: Number of 1200-Z facilities in the service area; annual number of compliance inspections. d. Provide technical assistance and “no exposure” certifications for 1200-Z facilities as needed. • Tracking Measure: Number of technical assistance inspections; number of “no exposure” certifications. e. Review monitoring reports from all 1200-Z facilities. • Tracking Measure: Number of monitoring reports reviewed; number of facilities with benchmark exceedances; number of action plans approved.
Relationship to TMDLs:	Implementation of this BMP and the related implementation of the 1200-Z permitting program reduce the potential discharge of all of the TMDL parameters.

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BMP Fact Sheet: Select Industrial and Commercial Facilities	
Public involvement opportunities:	Public input to development of this BMP will occur according to the District's established public involvement practices.
Related documents:	*Stormwater Pollution Control Manual* (Clean Water Services, 1999)

6.6 Public Education and Outreach

The District implements the education and outreach program throughout the services area and has typically taken the lead in crafting education and outreach messages. Therefore, the discussion below mentions the District as the entity that implements the program. However, it should be noted that the District, Cities and County are co-implementers that share responsibility for education and outreach.

The District's Strategic Communications Plan is based on established communication principles including open 2-way communication, community problem solving, and strong and consistent messages.

The District's primary message is: protect and enhance watershed health. The District uses a variety of print, electronic and other media to encourage stream-healthy behaviors -- newspaper, cable TV, radio, billing inserts, signage, brochures, community events, workshops, vehicle murals, electronic newsletters and the website. Partnerships are a key factor in the success of the District's public education and outreach programs. As a member of the Regional Coalition for Clean Rivers and Streams and the Tualatin Basin Public Awareness Committee, the Tualatin River Watershed Council, and other groups working to inform people about water quality, the District has leveraged dollars and resources to have greater reach and impact.

The public education and outreach components of the SWMP are in four categories. Key program activities in each category are presented in the discussion below. The co-implementers conduct public education and outreach activities beyond those mentioned in each of the categories. These activities are summarized at the end of this section.

6.6.1 Pesticide, Herbicide and Fertilizer Educational Activities

"A program to reduce to the MEP, pollutants in discharges from MS4s associated with the application of pesticides, herbicides and fertilizer that will include, as appropriate, controls such as educational activities…"40 CFR 122.26(d)(2)(iv)(A)(6)

Many of the District's s public education and outreach programs address issues associated with the application of pesticides, herbicides, and fertilizers. Key program activities include:

- Promoting the use of alternatives to pesticides, herbicides and fertilizers via the annual public awareness campaign with newspaper, cable TV, radio, billing inserts and online advertisements (www.cleanwaterservices.org/tips)
- Promoting the use of native plants by distribution of *Gardening with Native Plants* brochure and promoting the online Native Plant Finder webpage.

6.6.2 Reporting of Illicit Discharges & Water Quality Impacts

"Programs to promote, publicize, and facilitate public reporting of the presence of illicit discharges or water quality impacts associated with discharges from the MS4."40 CFR 122.26(d)(2)(iv)(B)(5)

The District promotes, publicizes, and facilitates public reporting of illicit discharges and water quality impacts. Key program activities include:

- Brochures, billing inserts and electronic newsletters that include regular articles on watershed protection and enhancement, proper disposal practices, and reporting information for illicit discharges and water quality impacts.
- Brochures with contact information and "Report a problem" page on the District's website at www.cleanwaterservices.org invite people to report illicit discharges and water quality problems. In addition, the Cities and County main phone numbers and websites are the entry points for reporting problems.

6.6.3 Used Oil and Toxic Materials Management

"Educational activities, public information activities, and other appropriate activities to facilitate the proper management and disposal of used oil and toxic materials."40 CFR 122.26(d)(2)(iv)(B)(6)

Many of the District's public education and outreach programs address the proper management and disposal of used oil and toxic materials. Key program activities include:

- Regular articles on proper disposal of oil, household hazardous waste and litter and yard debris in billing inserts, print and electronic newsletters, and websites.
- Storm drain marking program and distribution of educational door hangers regarding the proper disposal yard debris and toxic materials.

6.6.4 Training for Construction Site Operators

(iv)(4) "Appropriate educational and training measures for construction site operators."40 CFR 122.26(d)(2)(iv)(D)(4)

Education and training measures for construction site operators are presented in the Construction Site Stormwater section.

6.6.5 Additional Public Education and Outreach Activities

In addition to the public education and outreach activities noted above, the District conducts a host of activities beyond those specified in the NPDES permit. Examples include:

Customer Surveys

An integral component of the District's Communications Strategy is to conduct regular customer surveys. These surveys are conducted by a professional research firm that provides statistically valid and reliable results of customer attitudes and behaviors related to water quality. The surveys include questions about behavior changes related to protecting water resources. The District uses the survey results to measure the effectiveness of programs in changing behaviors related to water quality and to establish trends over time. Programs that prove to be ineffective in encouraging water quality-behavior change

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are modified as necessary to result in a greater level of responsible behavior from those who live and work in the Tualatin River Subbasin.

Education Campaigns

The District developed the Tualatin River Rangers classroom presentation to teach elementary students the impact of daily activities on water quality. Schools throughout the Tualatin watershed host the River Rangers, and children learn how to protect water quality by reducing the use and proper disposal of toxic materials including fertilizers and herbicides, and reporting illicit discharges. The students are encouraged to share this information with their parents through a take-home exercise that engages parents in identifying toxic household materials and putting a sticker on them for proper disposal. This award-winning program has been marketed throughout the United States.

Outreach Program to Spanish Speaking Residents

The District has provided Spanish translations of select water quality education tools, and run advertisements in Spanish-language publications. The District will continue to seek opportunities to collaborate with opinion leaders in the Spanish-speaking community to identify opportunities for sharing information about water quality protection.

Community Events

District staff talks with individuals about water quality protection at numerous community events including the Washington County Fair & Rodeo, Public Works Fair, Earth Day events, and Children's Clean Water Festival. The District provides brochures, pens, post-its, magnets, temporary tattoos, River Ranger comic books, and many other giveaways that help reinforce water quality messages.

Streamside Education

The District builds relationships with streamside homeowners who have the greatest impact on water quality. The District has identified and sends targeted mailings to streamside property owners; the mailings contain information, and offer technical assistance and native plants to protect water quality.

Financial Support

The District has provided organizational, financial and technical support to stream and wetland "friends" groups in the Tualatin Basin for more than a decade. These groups use newsletters, websites, tours and activities to convey water quality messages to larger audiences.

Certification/Pledges

The District sponsors the Eco-Logical Business certification program, which encourages residents to patronize certified businesses. The Eco-Logical Business certification program includes auto repair shops and other businesses that have met rigorous standards that ensure their policies and procedures protect water resources.

The District sponsors the "Canines for Clean Water" campaign to encourage proper disposal of pet waste. Dog owners are asked to pledge that they will pick up and properly dispose of

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pet waste, and in return they receive a colorful bandana for their pet and have the opportunity to have their dog's photo posted on the District website. This popular program puts heart and humor into water quality education.

BMP Fact Sheet: Public Education and Outreach	
Introduction:	The purpose is to inform and educate the public, business, industry, and government about the causes of stormwater pollution, the effects on local streams and rivers, and to promote stream healthy behavior. These BMPs encourage behavior change and participation that will reduce stormwater pollution and promote the health of the Tualatin River Watershed.
Measurable goals and tracking measures:	**1: Promote the use of alternatives to pesticides, herbicides and fertilizers via the annual public awareness campaign.** • Tracking measure: summarize awareness campaign activities on an annual basis. **2: Promote the use of native plants by distribution of *Gardening with Native Plants* brochure and promoting the online Native Plant Finder webpage.** • Tracking measure: Summarize outreach efforts on an annual basis. **3: Use a variety of outreach mechanisms (i.e. print, electronic and other media) to regularly publish articles on watershed protection and enhancement, proper disposal practices, and reporting information for illicit discharges and water quality impacts.** • Tracking measure: summarize activities on an annual basis. **4: Facilitate public reporting of illicit discharges and water quality problems on the "Report a problem" page on the District's and other co-implementer's websites.** • Tracking measure: summarize activities on an annual basis. **5: Use a variety of outreach mechanisms (i.e. print, electronic and other media) to regularly publish articles on proper disposal of oil, household hazardous waste and litter and yard debris in billing inserts, print and electronic newsletters, and websites.** • Tracking measure: summarize activities on an annual basis. **6: Storm drain marking program and distribution of educational door hangers regarding the proper disposal of yard debris and toxic materials.** • Tracking measure: Number of drains marked and door hangers distributed. **7: Additional public education and outreach activities.** • Tracking measure: summarize activities on an annual basis.

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BMP Fact Sheet: Public Education and Outreach	
Relationship to TMDLs:	**Phosphorus.** Public education regarding the proper application and usage of phosphorus containing products is critical to the overall reduction in phosphorus in the watershed. **Bacteria**. Public education about pet waste management and feeding waterfowl, such as ducks and geese, and other wildlife is important to reducing the concentration of bacteria in stormwater discharges. The District's strategy to reduce bacteria is greatly dependent on this BMP. **Settleable Volatile Solids**. Public education and awareness is very important to reducing the loading of settleable volatile solids from the MS4. These include education about the proper use of landscaping materials, leaf disposal, etc.
Public involvement opportunities:	Public input is an ongoing, reiterative element of this BMP category and will occur according to the District's established public involvement and education practices.
Related documents:	*Clean Water Services Strategic Communications Plan* (Clean Water Services, 2005)

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SECTION 7

Monitoring

Requirement:

(1) CWS must review and, if necessary, update the monitoring components of the SWMP. The updated monitoring component of the SWMP must be designed to track the long-term progress of the SWMP towards achieving improvements in receiving water quality, including progress towards meeting pollutant load reduction benchmarks associated with TMDL parameters.

(2) CWS must update the monitoring component of the SWMP and explain how the proposed monitoring program fulfills each of the primary program components listed in (a) through (f) below:

(a) Determine the status of implementing the components of the SWMP;

(b) Evaluate the effectiveness of BMPs for specific source controls;

(c) Evaluate the source of specific pollutants;

(d) Assess the chemical, biological, and physical effects of MS4 runoff on receiving waters;

(e) Characterize MS4 runoff discharges; and

(f) Evaluate long-term trends in receiving water quality associated with storm water discharges.

(3) The updated monitoring component must include some level of MS4 discharge monitoring and in-stream monitoring unless the permittee demonstrates that alternative sources of data can support conclusions associated with the 6 objectives listed in the previous section.

(4) The updated monitoring component must address ongoing long-term monitoring and may address short-term special studies.

(5) The following information shall be included in the monitoring component of the SWMP:

(a) Program monitoring:

i A list of activities to be monitored, and

ii A list of monitored performance indicator metrics (e.g., number of miles of streets swept, number of cross-connections found, tons of material removed from storm sewers, etc.).

(b) Environmental monitoring:

i A list of monitoring sites;

ii A list of constituents to be analyzed;

iii The media sampled;

iv Sample collection frequency and any targeted conditions (such as hydrologic or meteorological); and

v Protocols for quality assurance/quality control for sample collection and analysis must be consistent with the DEQ's 2004 303(d) List/Delist Data Submittals Minimum Data Requirements.

The District performs a variety of activities (including environmental and program monitoring) as part of this SWMP. Some of these activities are performed to satisfy specific permit requirements, but others are performed in the interest of obtaining insights that will

help the District make management decisions regarding the wise, effective use of resources it spends on stormwater management practices and procedures.

The monitoring program described herein is designed to fulfill each of the primary program components listed in (a) through (f) below:

a. Determination of the status of implementing the components of the SWMP

b. Evaluation of the effectiveness of BMPs for specific source controls

c. Evaluation of the source of specific pollutants

d. Assessment of the chemical, biological, and physical effects of MS4 runoff on receiving waters

e. Characterization of MS4 runoff discharges

f. Evaluation of long-term trends in receiving water quality that may incorporate data from an in-stream monitoring component

This section first presents the monitoring program, and then discusses how data from this monitoring program will be used to fulfill each of the primary program components listed above.

7.1 Monitoring Program

The monitoring program described herein is a combination of stormwater runoff monitoring, in-stream water quality monitoring (grab and continuous), physical monitoring (stream width, depth, riparian condition, etc.), continuous flow and rainfall monitoring, and biological monitoring (macro-invertebrate surveys). The monitoring plan in the SWMP is designed to meet two primary purposes. The first is to assess the overall program effectiveness through ambient monitoring of water quality in the Tualatin River and its tributaries. The second element is to add to the robustness of the land-use-related stormwater characterization database.

Monitoring is conducted at 15 in-stream sites (9 on the Tualatin River, 6 on tributaries to the Tualatin River); 6 in-stream continuous sites; 10 stream flow sites; 5 rainfall sites; 15 macro invertebrate and habitat sites (every other year); and 5 land use based stormwater runoff sites.

The District will continue to collaborate and cooperate with the other six Phase 1 MS4 permittees and co-permittees in the State. The permittees have worked very closely on numerous monitoring and BMP effectiveness studies in the past and will continue this collaboration in the future. These efforts result in a far more robust database regarding various aspects of stormwater management and stormwater characterization. The District believes that this a cost-effective approach to developing the data and understanding necessary to effectively and adaptively manage the respective stormwater management programs across the State.

The District continually reviews its monitoring programs to ensure that they support permit requirements and objectives.

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The remainder of this section describes the monitoring program, and is divided into in-stream water quality monitoring, physical monitoring, biological monitoring, and MS4 discharge monitoring.

7.1.1 In-stream Water Quality Monitoring

The ambient monitoring program described here is designed to meet the ambient monitoring requirements and objectives specified in the permit. Ambient in-stream monitoring is conducted six (6) times per year at 15 locations in the watershed. Three (3) samples are collected during the summer, which is defined as May 1 – October 31, and three (3) samples during the winter, which is defined as November 1- April 30. Nine (9) of the monitoring locations are on the Tualatin River and six (6) are on tributaries to the Tualatin River. The monitoring plan allows the flexibility to change specific ambient in-stream locations, without revising the SWMP, as long as the number and type of sites remain the same.

Sampling methods and parameters are listed in Table 7-1.

TABLE 7-1

SAMPLING METHODS AND PARAMETERS FOR IN-STREAM MONITORING

Water Quality Parameter	Sample Type
Temperature	Grab
Dissolved Oxygen	Grab
pH	Grab
Specific Conductance	Grab
E. coli	Grab
Total Suspended Solids	Grab
Total Organic Carbon (non purgable)	Grab
Total Phosphorus as P	Grab
Dissolved Ortho-phosphorus as P	Grab
Nitrite + Nitrate as N	Grab
Hardness	Grab
*Mercury, Total	Grab
Iron, Total Recoverable and Dissolved	Grab
Manganese, Total Recoverable, and Dissolved	Grab
Copper, Total Recoverable and Dissolved	Grab
Lead, Total Recoverable and Dissolved	Grab
Zinc, Total Recoverable and Dissolved	Grab

*Quarterly

The protocols used for quality assurance/quality control for sample collection follow those described in the Laboratory Services Division, Water Quality Lab, *Quality Assurance/Quality*

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Control Program Document and are consistent with DEQ's quality assurance/quality control protocols.

In addition to the in-stream monitoring program described above, the District conducts a monitoring program using continuous recording devices in the Tualatin River and its tributaries. Continuous recording devices are located at two (2) sites in the main stem Tualatin River and four (4) sites on tributaries to the Tualatin River. The continuous recording devices provide hourly data for the following parameters: water temperature, pH, dissolved oxygen and specific conductance.

7.1.2 Biological and Physical Monitoring

Biological and physical monitoring is conducted throughout the Tualatin Basin. Monitoring is conducted at 15 sites once every two years and 50 sites every six years. Monitoring consists of macroinvertebrate sampling and an assessment of the physical conditions (e.g., wetted width, bank condition (eroding & undercut), percent canopy cover, large wood rating).

In addition to the biological and physical monitoring noted above, continuous flow and precipitation monitoring is conducted in the watershed. Flow monitoring is conducted at four (4) locations on the Tualatin River and in six (6) tributary sites. Rainfall is monitored at five (5) sites in the urbanized portion of the Tualatin Basin.

7.1.3 MS4 Stormwater Runoff Monitoring

Stormwater sampling is conducted at the following five land use sites:

- 1 for older (pre-1990 development) residential land use
- 1 for newer (post 1990 development) residential land use
- 1 for high density development
- 1 for industrial office park
- 1 for commercial land use

The monitoring plan allows the flexibility to change specific stormwater runoff monitoring locations (while always maintaining at least one monitoring site in each of the above land use categories) without revising the SWMP.

Monitoring frequency will consist of three storms per year. The storms selected for monitoring will represent normal rainfall patterns for this geographic region. Sampling methods and parameters are listed in Table 7-2.

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TABLE 7-2

SAMPLING METHODS AND PARAMETERS FOR STORMWATER MONITORING

Water Quality Parameter	Sample Type
E. coli	Grab
Total Suspended Solids	Composite
Total Volatile Suspended Solids	Composite
Total Organic Carbon (non purgable)	Composite
Specific Conductance	Composite
Total Phosphorus as P	Composite
Dissolved Ortho-phosphorus as P	Composite
Nitrite + Nitrate as N	Composite
Hardness	Composite
Mercury, Total	Composite
Iron, Total Recoverable and Dissolved	Composite
Manganese, Total Recoverable and Dissolved	Composite
Copper, Total Recoverable and Dissolved	Composite
Lead, Total Recoverable and Dissolved	Composite
Zinc, Total Recoverable and Dissolved	Composite

Based on the results of recent studies conducted in the Portland Metropolitan area, the District will monitor for the following current use urban pesticides.

Chlorinated herbicides (including 2,4-D (2,4-Dichlorophenoxy acetic acid) – active ingredient in "weed & feed" fertilizers)

The District is working with DEQ and other municipalities on the pesticide monitoring issue and will update this list as necessary to reflect the results of the discussions.

7.2 Determination of the Status of Implementing the Components of the SWMP

Program monitoring is conducted to determine the status of implementing the components of the SWMP. The major components of the SWMP are expressed by the BMP categories listed in Section 6. Stormwater management practices have been categorized into the following sections:

- Construction Site Stormwater
- Operation and Maintenance

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- Structural and Source Control Measures
- Illicit and Non-stormwater Discharges
- Landfills, Hazardous Waste Sites, and Industrial Facilities
- Public Education and Outreach

Each section includes a description of the BMP program category and highlights key program elements. At the end of each section, a BMP category fact sheet is included that specifies measurable goals for key program elements and the tracking measure associated with each measurable goal. The measurable goals and tracking measures will be elements that will be reported in the MS4 Annual Report.

7.3 Evaluation of the Effectiveness of BMPs for Specific Source Controls

The effectiveness of BMPs for specific source controls will be evaluated using a combination of the scientific literature and site-specific monitoring data. The effectiveness of structural BMPs will be addressed through examination of the literature for the performance of those BMPs at similar sites. The effectiveness of non-structural BMPs is not as easily defined through the literature, and will be evaluated through the use of site-specific monitoring data defining runoff quality from sites currently subject to these BMPs.

7.4 Evaluation of the Source of Specific Pollutants

In order to target stormwater-related pollution prevention efforts, evaluations will be conducted, as necessary, to identify specific sources contributing to observed elevated stormwater pollutant concentrations. This will be accomplished through a three-step process: (1) The scientific literature will be consulted initially to identify sources expected to contribute to elevated concentrations, (2) site-specific monitoring data will then be used, if necessary, to better define the sources, and (3) scientific literature will be consulted to determine the BMPs that can be specifically targeted to address the sources.

7.5 Assessment of the Chemical, Biological, and Physical Effects of MS4 Runoff on Receiving Waters

Information from ambient and continuous in-stream water quality monitoring, biological and physical monitoring, and stormwater monitoring as well as scientific literature data will be used to assess the impacts of stormwater runoff on receiving streams.

7.6 Characterization of MS4 Runoff Discharges

Characterization of individual discharges is accomplished via direct monitoring as described in Section 7.1.3. All MS4 runoff data collected will be stored in an electronic database and statistically characterized. Results will be presented in raw tabular form (and included in the annual report), and characterized in terms of average, variance, and correlation to storm size (permit renewal report).

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7.7 Evaluation of Long-term Trends in Receiving Water Quality

Historical trends in water quality will be evaluated both graphically and through statistical analysis. Graphic display will consist of historical time series plots for several Tualatin River and tributary stations, showing observed wet-weather concentrations over the entire period of data collection. Regression analyses (adjusted for seasonality as necessary) will also be conducted to determine if any statistically significant trends in concentration over time exist. This information is presented in the application for renewal of the watershed-based NPDES permit.

7.8 Report Circumstances Preventing Data Collection or Analyses

In the event the District is unable to collect or analyze any sample or pollutant parameter due to circumstances beyond its control, a written explanation of the circumstances that prevented the collection or analysis will be submitted to the Oregon Department of Environmental Quality in the annual report. The District will exercise due diligence in collecting and analyzing all samples.

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SECTION 8

Evaluation of the Plan, Adaptive Management, and Reporting Requirements

Evaluation and adaptive management of the SWMP BMPs and program policies and procedures are important to the successful reduction of pollutant discharges in the Tualatin Subbasin. This approach will be documented in the MS4 annual reports.

8.1 Evaluation of the Plan

Requirement: CWS must review the required SWMP elements established and determine whether the SWMP will reduce the discharge of pollutants to the maximum extent practicable.

CWS must submit to DEQ a detailed explanation and rationale for each component of the SWMP.

Each component of the SWMP must, when practicable, have measurable performance indicators to assist with the reporting on the status of implementation.

The results of this evaluation, including any proposed revision to the SWMP, must be reported to DEQ.

The co-implementers track and evaluate MS4 BMPs to refine their stormwater management programs on an ongoing basis as trends are identified. This process is intended to identify the most successful practices, to gather information that will enable co-implementers to ensure their BMPs are useful, and to make changes based on identified trends so that pollutant discharges can be minimized to the maximum extent practicable.

On the basis of a workshop that included a broad range of technical, legal, public information, and management personnel, the co-implementers established two methods of program evaluation that can be applied separately or in combination:

1. Before implementing a BMP, define the target levels of effort. Define the level of effort that staff will be assigned and the budget to perform the work.
2. Track BMP implementation. Observe specific BMP implementation activities, using self-auditing and record-keeping procedures to determine the level of effort that was actually expended.

The measurable goals and tracking methods selected for each BMP category are specified in a fact sheet at the end of each BMP category in Section 6.

8.2 Adaptive Management

Requirement: Adaptive management is the appropriate process for assessing new opportunities for improving program effectiveness in controlling stormwater pollution to the maximum extent practicable. The permittee is required to use adaptive management to assess options for improving controls on stormwater discharges. The permittee must use the monitoring data and analyses required under this permit as well as applicable information from other sources in the adaptive management process. Where TMDL wasteload allocations have been established for pollutant

parameters associated with the permittee's MS4 discharges, the permittee must use the estimated pollutant load reductions (benchmarks) established in the SWMP to guide the adaptive management process. The permittee must also use the evaluation of progress towards these TMDL benchmarks, due with the permit renewal submittal to guide the adaptive management process in the next permit term. Any revisions to BMPs derived from the adaptive management process must be implemented by the permittees, to the maximum extent practicable. Adaptive management requires the permittee to assess and modify, as necessary, any or all existing SWMP components and adopt new or revised SWMP components to optimize reductions in stormwater pollutants to the maximum extent practicable, through an iterative process. The iterative process includes routine assessment of the need to further improve water quality and protection of beneficial uses, review of available technologies and practices to accomplish the needed improvement, and evaluation of resources available to implement the technologies and practices. Changes to the SWMP are considered a part of adaptive management, and such changes do not require modification of this permit, unless the DEQ determines the changes meet the criteria specified in the permit.

Adaptive management is the strategy that is used to make changes in stormwater management practices that result from performance feedback, and which will be reflected in future improvements of this SWMP. Through an adaptive management process, the co-implementers will evaluate on an annual basis how well each of the SWMP's strategies is working, and make adjustments to those strategies if they are not performing as anticipated. This evaluation will be conducted at the BMP category level identified in Section 6 of the SWMP. Changes to BMP categories as a result of adaptive management will be documented in the MS4 Permit Annual Report.

Figure 8-1 illustrates the decision logic of the adaptive management process. The public notification and outreach procedures for the adaptive management process are described in Section 4.2.2.

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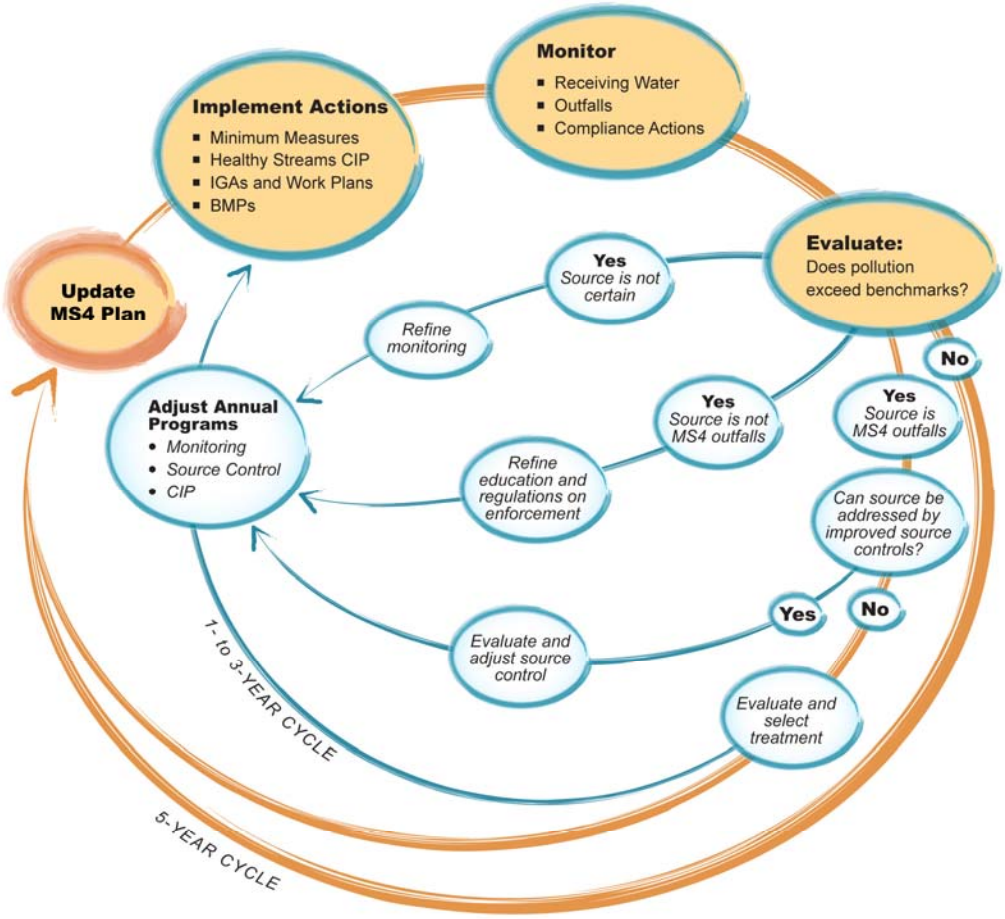

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FIGURE 8-1
Adaptive Management Process Decision Logic

8.3 MS4 Annual Report

Requirement: Clean Water Services shall prepare an annual system-wide MS4 report for the time period July 1 through June 30 and submit that report to DEQ. Each annual report must contain:

The status of implementing the components of the storm water management program;

Proposed changes to the storm water management plan components. Such proposed changes shall be consistent with 40 CFR § 122.26(d)(2)(iii). A timeline for implementing new BMPs also must be included in the report;

A summary of total storm water program expenditures and funding sources over the reporting fiscal year, and those anticipated in the next fiscal year;

A summary of data, including monitoring data, that is accumulated throughout the reporting year;

A summary describing the number and nature of enforcement actions, inspections, and public education programs;

Identification of water quality improvements or degradation;

A demonstration of continued legal authority to implement the programs outlined in the SWMP;

An overview, relating to MS4 discharges, of concept planning, land use changes and new development activities that occurred within the Urban Growth Boundary expansion areas during the previous year, those forecast for the following year and an evaluation for consistency with the requirements of the permit.

The District submits an annual system-wide MS4 report that contains the requirements specified above. The measurable goals and tracking measures specified in the fact sheet for each BMP category is evaluated and reported in the MS4 Annual Report. The MS4 Annual Report also includes an evaluation and adaptive management of the SWMP BMPs and program policies and procedures that are an important component to the successful reduction of pollutant discharges in the Tualatin River Subbasin. The co-implementers will continue their approach of focusing attention and resources toward practices and procedures that have the highest likelihood of protecting the beneficial uses of the receiving waters from any adverse effects from MS4 discharges.

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SECTION 9

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APPENDIX A
Legal Authority

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APPENDIX B

Stormwater Pollutant Load Modeling

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APPENDIX C

Intergovernmental Agreements

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APPENDIX D

Public Participation Materials

(to be included with final document)

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APPENDIX E
Maps

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