



# Stormwater Management

## NPDES Permit Compliance

---



## 2005/2006 Annual Report

November 1, 2006

*Prepared for the*  
**Oregon Department of Environmental Quality**

Prepared by:  
**URS**

**National Pollutant Discharge Elimination System (NPDES)  
Municipal Stormwater System Annual Report**

I, the undersigned, hereby submit this National Pollutant Discharge Elimination System (NPDES) Municipal Stormwater System Annual Report in accordance with NPDES Permit Number 101348. I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person, or persons, who manage the system, or those persons directly responsible for gathering the information, the information is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for known violations.



Name: Paul Shirey  
Title: Engineering Director  
City of Milwaukee

## TABLE OF CONTENTS

1.0	Introduction and Permit Background.....	1
2.0	Implementation of the City of Milwaukie's SWMP.....	3
3.0	Additional Annual Report Requirements.....	23
3.1.	Summary of Expenditures.....	23
3.2.	Demonstration of Continued Legal Authority.....	23
3.3.	Overview of planning, land use changes and development activities within the UGB.....	24
4.0	Environmental Monitoring.....	25
4.1.	Summary of Comprehensive Clackamas County Monitoring Plan.....	25
4.2.	Summary of Environmental Monitoring Data Collected.....	25
4.3.	Discussion of water quality improvements or degradations.....	28

## TABLES

Table 2-1 - Structural and Source Control BMPs to Reduce Pollutants from Commercial and Residential Areas

Table 2-2 - BMPs to Detect and Remove Illicit Discharges and Improper Disposal Into the Storm Sewer System

Table 2-3 - A Program to Monitor and Control Pollutants from Industrial Facilities

Table 2-4 - A Program to Reduce Pollutants in Stormwater Discharges from Construction Sites

Table 2-5 - Public Education, Coordination, and Public Involvement

Table 4-1 - Environmental Monitoring Results–Minthorn Springs Creek at Harmony Road

Table 4-2 - Environmental Monitoring Results – Brookside Outfall to Johnson Creek

## APPENDICES

Appendix A - Outfall Inventory for Use in Illicit Discharge Inspections

Appendix B - Summary of Milwaukie 1200-Z Permits

Appendix C - Comprehensive Clackamas County Stormwater Monitoring Plan

## 1.0 Introduction and Permit Background

The Oregon Department of Environmental Quality (DEQ) regulates stormwater runoff from the City of Milwaukie through the Municipal Separate Storm Sewer System Discharge Permit No. 101348 (MS4 Permit), issued to Clackamas County and its co-permittees. Clackamas County co-permittees include the City of Milwaukie along with a number of other smaller jurisdictions including the cities of Lake Oswego, Oregon City, West Linn, Gladstone, Wilsonville, Happy Valley, Johnson City, Rivergrove, and the Oak Lodge Sanitary District. Each co-permittee is a relatively small community, most having populations between 15,000 and 25,000 with some (Johnson City, Rivergrove) having populations significantly smaller.

As required under Schedule B(2)(a) of the MS4 Permit, each co-permittee must submit an annual report, summarizing accomplishments and implementation of the Municipal Stormwater Management Plan (SWMP). This annual report is for permit year 11 (or permit year 2 under the renewed permit dated 2004) documents activities from July 1, 2005 to June 30, 2006 as related to the City of Milwaukie's stormwater management efforts under their MS4 Permit and associated SWMP.

With respect to annual reporting requirements, this annual report contains the following items per Schedule B(2)(a) of the MS4 permit:

- i) *The status of implementing components of the stormwater management program;*

See Section 2.0 for a summary of the performance measures and program monitoring requirements as documented in the City's current SWMP.

- ii) *Proposed changes to the SWMP components, including new BMPs identified through implementing adaptive management. A timeline for implementation of new BMPs must also be included in the report;*

See Section 2.0 for a summary of the City's current SWMP, which was approved by DEQ July 31, 2006. This recently updated SWMP contains the most current changes to BMPs as a result of adaptive management. Thus, no additional changes are proposed for BMPs at this time.

- iii) *A summary of total stormwater program expenditures and funding sources over the reporting fiscal year, and those anticipated in the next fiscal year;*

See Section 3.1 for a summary of stormwater related expenditures.

- iv) *A summary of data, including monitoring data that is accumulated throughout the reporting year;*

See Section 2.0 for a summary of the program monitoring results. See Section 4.2 for a summary of the environmental monitoring data collected.

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

See Section 2.0 for a summary of the program monitoring activities.

- vi) *Identification of water quality improvements or degradation;*

See Section 4.3 for a brief summary of water quality characteristics within the City limits.

- vii) *Demonstration of continued legal authority to implement the programs outlined in the SWMP; and*

See Section 3.2 for the letter of continued legal authority.

- viii) *An overview, as related to MS4 discharges, of concept planning, land use changes and new development activities that occurred within the Urban Growth Boundary (UGB) expansion areas during the previous year, those forecast for the following year, and an evaluation for consistency with the requirements of Schedule D(2)(c)(i)(2).*

See Section 3.3 for the discussion of development activities.

Each section of this report, as described above, corresponds to the specific permit requirements in Schedule B(2)(a). The report emphasizes efforts and activities associated with individual Best Management Practices (BMPs) from the City's SWMP (summarized in Section 2.0). Again, the City's SWMP was approved by DEQ on July 31, 2006, after permit year 12 was already initiated. As a result, sufficient time was not available to report on some of the performance measures listed for this annual reporting year, number 11. Section 2.0 contains the performance measures and program monitoring activities that could be completed for the annual reporting year 11.

## **2.0 Implementation of the City of Milwaukie's SWMP**

Tables 2-1 through 2-5 summarize the performance measures and program monitoring activities associated with the City of Milwaukie's BMPs, in accordance with each of the required components of a SWMP. The five SWMP components are as follows:

- Component #1: Structural and Source Control BMPs to Reduce Pollutants from Commercial and Residential Areas
- Component #2: A Program to Detect and Remove Illicit Discharges and Improper Disposal Into the Storm Sewer System
- Component #3: A Program to Monitor and Control Pollutants from Industrial Facilities
- Component #4: A Program to Reduce Pollutants in Stormwater Discharges from Construction Sites
- Component #5: Public Education, Coordination, and Public Involvement BMPs

**TABLE 2-1 - Structural and Source Control BMPs to Reduce Pollutants from Commercial and Residential Areas**

BMP Implementation Summary	Annual Performance Measures	SWMP Implementation		
<p><b>NPDES Permit Requirement</b> – (1) Maintenance activities and a maintenance schedule for structural controls to reduce pollutants (including floatables) in discharges from municipal separate storm sewers.</p>				
<p><b>BMP – Conduct Stormwater Conveyance System Cleaning and Maintenance</b></p>				
<p><b>BMP Owner:</b> City of Milwaukie Public Works Department  <b>Permit Year:</b> Ongoing  <b>Implementation Activities:</b> The City of Milwaukie inspects their stormwater conveyance system including manholes, storm system pipes, culverts, and ditches as needed. Conveyance system components are inspected for accumulated sediment and debris that may prompt flooding and broken system components in need to repair.</p>	<p>(1) Estimate the volume of debris removed during conveyance system cleaning activities.                      (2) Track the conveyance system repair efforts conducted.</p>	<p><b>2005/2006</b>                      (1) The following volumes of debris were removed during conveyance cleaning activities:  <ul style="list-style-type: none"> <li>• Drywells = 168 cub. Yds.</li> <li>• Sedimentation manholes = 39 cub. Yds.</li> </ul>                     Volumes of debris removed during pipe cleaning activities are not possible to record. The City performed TV inspection on 4,822 feet of pipe during permit year 11.                      (2) The following maintenance/repairs were conducted during permit year 11:  <ul style="list-style-type: none"> <li>• 4 manholes cleaned</li> <li>• 2 storm main repairs</li> <li>• 1 baffle installed in manhole</li> <li>• 3 drywells raised to surface</li> <li>• 9 repaired manhole lid/cover</li> <li>• 2 replaced manhole lids due to damage</li> <li>• 3 riser rings repaired</li> <li>• 30 storm main TV inspections</li> <li>• 8 manholes inspected</li> <li>• 557 drywell inspected</li> <li>• 22 outfalls cleared of brush &amp; debris</li> </ul> </p>	<p><b>2006/2007</b></p>	<p><b>2007/2008</b></p>

BMP Implementation Summary	Annual Performance Measures	SWMP Implementation		
<b>BMP – Conduct Catch basin Cleaning and Maintenance</b>				
<p><b>BMP Owner:</b> City of Milwaukie Public Works Department</p> <p><b>Permit Year:</b> Ongoing</p> <p><b>Implementation Activities:</b> The City of Milwaukie cleans all public catch basins once every two years, more frequently if needed.</p>	<p>(1) Track the number of catch basins maintained.</p> <p>(2) Track the volume of debris removed during cleaning activities.</p>	<p><b>2005/2006</b></p> <p>(1) During permit year 11, twelve catch basins were maintained/repared.</p> <p>(2) The following volume of debris was removed during catch basin cleaning activities:</p> <ul style="list-style-type: none"> <li>• Catch basins = 42 cub. Yds.</li> </ul>	<p><b>2006/2007</b></p>	<p><b>2007/2008</b></p>
<b>BMP – Conduct Structural Control Facility Cleaning and Maintenance</b>				
<p><b>BMP Owner:</b> City of Milwaukie Public Works Department</p> <p><b>Permit Year:</b> Ongoing</p> <p><b>Implementation Activities:</b> The City of Milwaukie inspects public structural water quality facilities annually on average. Facility maintenance is conducted every two years.</p>	<p>(1) Track the number of structural facilities inspected and maintained.</p> <p>(2) Track the volume of debris removed during cleaning activities.</p>	<p><b>2005/2006</b></p> <p>(1 and 2) The following maintenance/ repairs were conducted during permit year 11:</p> <ul style="list-style-type: none"> <li>• 5 detention ponds - removed brush only from perimeter, ponds them selves were ok.</li> <li>• 1 vault - removed 1.2 cubic yards of debris</li> <li>• 1 weir - removed approx 1 yd of debris</li> </ul>	<p><b>2006/2007</b></p>	<p><b>2007/2008</b></p>

BMP Implementation Summary	Annual Performance Measures	SWMP Implementation		
<p><b>NPDES Permit Requirement</b> – (2) <i>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. Controls to reduce pollutants in discharges from municipal separate storm sewers containing construction site runoff are addressed in paragraph Schedule D(2)(c)(iv).</i></p>				
<p><b>BMP – Conduct Master Planning for Stormwater Quality Improvement</b></p>				
<p><b>BMP Owner:</b> City of Milwaukie Development Department  <b>Permit Year:</b> Ongoing  <b>Implementation Activities:</b> The City of Milwaukie recently conducted Master Planning efforts to identify and prioritize future capital improvement projects for flood control and water quality benefits. The City's current master plan includes 15 CIPs to be implemented over an approximately 25-year period. Six of these CIPs were identified specifically for water quality purposes.</p>	<p>(1) Track master planning activity (new plans or revisions to older plans).  (2) Track the number of CIP projects implemented each year and discuss the added benefit (flood control, water quality, habitat restoration, etc) of each.  (3) Map the location and drainage area of CIPs.</p>	<p><b>2005/2006</b></p> <p>(1) No master planning activities were conducted during this permit year.  (2) The following capital improvement projects were implemented during permit year 11:</p> <ul style="list-style-type: none"> <li>• 42<sup>nd</sup> Ave. Street Improvements – Project for traffic and pedestrian safety, to reduce localized street flooding, and to reduce the amount of roadside erosion and sediment transport within the Johnson Creek Watershed.</li> <li>• North Main Bio-Swale – Project for onsite retention and infiltration of stormwater from a mixed-use, redevelopment project.</li> </ul> <p>(3) The locations of CIPs are currently mapped. The delineation and mapping of drainage areas to CIPs is currently being initiated for implementation during the next permit year.</p>	<p><b>2006/2007</b></p>	<p><b>2007/2008</b></p>

BMP Implementation Summary	Annual Performance Measures	SWMP Implementation		
<b>BMP – Implement Municipal Development Codes</b>				
<p><b>BMP Owner:</b> City of Milwaukie Development Department</p> <p><b>Permit Year:</b> Ongoing</p> <p><b>Implementation Activities:</b> The City of Milwaukie reviews all new and redevelopment plans through the building permit process.</p> <p>The City is currently reviewing various jurisdictions (City of Oregon City, Clackamas County) stormwater design standards in order to add more specific design criteria into the Development Code, as related to stormwater facility design (for both treatment and detention), water quality design storms, and approved facilities for stormwater treatment.</p>	<p>(1) Track the number of development applications reviewed and approved for compliance with the stormwater regulations.</p> <p>(2) Track any code modifications by ordinance.</p>	<p><b>2005/2006</b></p> <p>(1) Development applications including drainage reports are routinely reviewed proper compliance with stormwater regulations. The following number of applications were reviewed during permit year 11:</p> <ul style="list-style-type: none"> <li>• Commercial (New) = 10</li> <li>• Commercial (Additions) = 7</li> <li>• Residential (New) = 15</li> <li>• Residential (Additions) = 32</li> </ul> <p>(2) The City of Milwaukie is developing their stormwater design standards and has obtained scopes of work from consultants to assist in the development of water quality design standards. The City expects to complete this work during the permit year 12.</p>	<p><b>2006/2007</b></p>	<p><b>2007/2008</b></p>

BMP Implementation Summary	Annual Performance Measures	SWMP Implementation																																												
<b>NPDES Permit Requirement</b> – (3) 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.																																														
<b>BMP – Conduct Street Sweeping and Roadway Repair Activities</b>																																														
<b>BMP Owner:</b> City of Milwaukie Public Works Department <b>Permit Year:</b> Ongoing <b>Implementation Activities:</b> The City of Milwaukie conducts road maintenance and repair activities continuously throughout the year to prevent erosion and excessive transport of sediment and organics into the stormwater system.	(1) Track the number of sweeps per year. (2) Track the number of miles swept per year. (3) Track the volume of debris removed during sweeping activities.	<b>2005/2006</b> (1-3) The following street sweeping activities occurred during permit year 11: <table border="1" data-bbox="905 594 1215 1320"> <thead> <tr> <th>Month</th> <th>Miles</th> <th>Debris (CY)</th> </tr> </thead> <tbody> <tr><td>Jul '05</td><td>310</td><td>45</td></tr> <tr><td>Aug '05</td><td>227</td><td>40.5</td></tr> <tr><td>Sep '05</td><td>343</td><td>61.5</td></tr> <tr><td>Oct-05</td><td>363</td><td>104.5</td></tr> <tr><td>Nov '05</td><td>517</td><td>206</td></tr> <tr><td>Dec '05</td><td>366</td><td>127.5</td></tr> <tr><td>Jan '06</td><td>370</td><td>62.5</td></tr> <tr><td>Feb '06</td><td>195</td><td>45.5</td></tr> <tr><td>Mar '06</td><td>168</td><td>36</td></tr> <tr><td>Apr '06</td><td>278</td><td>65.5</td></tr> <tr><td>May '06</td><td>77</td><td>15.5</td></tr> <tr><td>Jun '06</td><td>142</td><td>28.5</td></tr> <tr><td><b>Total</b></td><td><b>3,356</b></td><td><b>838.5</b></td></tr> </tbody> </table>	Month	Miles	Debris (CY)	Jul '05	310	45	Aug '05	227	40.5	Sep '05	343	61.5	Oct-05	363	104.5	Nov '05	517	206	Dec '05	366	127.5	Jan '06	370	62.5	Feb '06	195	45.5	Mar '06	168	36	Apr '06	278	65.5	May '06	77	15.5	Jun '06	142	28.5	<b>Total</b>	<b>3,356</b>	<b>838.5</b>	<b>2006/2007</b>	<b>2007/2008</b>
Month	Miles	Debris (CY)																																												
Jul '05	310	45																																												
Aug '05	227	40.5																																												
Sep '05	343	61.5																																												
Oct-05	363	104.5																																												
Nov '05	517	206																																												
Dec '05	366	127.5																																												
Jan '06	370	62.5																																												
Feb '06	195	45.5																																												
Mar '06	168	36																																												
Apr '06	278	65.5																																												
May '06	77	15.5																																												
Jun '06	142	28.5																																												
<b>Total</b>	<b>3,356</b>	<b>838.5</b>																																												
<b>NPDES Permit Requirement - (4) 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.</b>																																														
<b>See BMP “Conduct Master Planning for Stormwater Quality” under Requirement 2 for applicable BMP and performance measures.</b>																																														

BMP Implementation Summary	Annual Performance Measures	SWMP Implementation		
<b>NPDES Permit Requirement - (5)</b> <i>A program to monitor pollutants in runoff from operating or closed municipal landfills or other treatment, storage or disposal facilities for municipal waste. The description must identify priorities and procedures for inspections and establishing and implementing control measures for such discharges (this program can be coordinated with the program developed under Schedule D (2)(c)(iii)).</i>				
There are no open or closed landfills or other municipal waste handling facilities within the City of Milwaukie.	N/A	<b>2005/2006</b> N/A	<b>2006/2007</b>	<b>2007/2008</b>
<b>NPDES Permit Requirement - (6)</b> <i>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.</i>				
<b>BMP – Minimize Water Quality Impacts Associated with Landscape Maintenance Practices</b>				
<b>BMP Owner:</b> City of Milwaukie Public Works Department and Clackamas County Parks Department <b>Permit Year:</b> Ongoing <b>Implementation Activities:</b> The City of Milwaukie conducts a variety of activities to minimize water quality impacts associated with conducting pest management activities on public properties.	(1) Track any policy and/or procedural changes associated with pest management activities within the City.	<b>2005/2006</b> (1) There have been no policy or procedural changes regarding pest management activities during permit year 11.	<b>2006/2007</b>	<b>2007/2008</b>

**TABLE 2-2 - BMPs to Detect and Remove Illicit Discharges and Improper Disposal Into the Storm Sewer System**

BMP Implementation Summary	Annual Performance Measures	SWMP Implementation		
<p><b>NPDES Permit Requirement - (1)</b> 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 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 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.</p> <p><b>NPDES Permit Requirement - (2)</b> 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;</p> <p><b>NPDES Permit Requirement - (3)</b> 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.</p>				
<b>BMP – Implement the Illicit Discharge Elimination Program</b>				
<p><b>BMP Owner:</b> City of Milwaukie Public Works Department</p> <p><b>Permit Year:</b> Ongoing</p> <p><b>Implementation Activities:</b> The City of Milwaukie conducts illicit discharge inspections, monitoring, and investigations annually during dry-weather conditions (typically between July and September) on all major outfalls (20) and select minor outfalls (44).</p>	<ol style="list-style-type: none"> <li>(1) Track any updates and modifications to the inspection procedures.</li> <li>(2) Track the number and location of outfalls inspected annually.</li> <li>(3) Summarize inspection results and indicate outfalls requiring monitoring (sampling) and/or investigations.</li> <li>(4) Indicate the outcome and resolution of any investigation activities conducted.</li> </ol>	<p><b>2005/2006</b></p> <p>(1) There have been no updates or modifications to the illicit discharge inspection procedures during permit year 11.</p> <p>(2-4) 64 outfalls (20 major and 44 minor) were inspected during the dry weather season. None were found to have evidence of cross connections or any waste other than stormwater or groundwater. The outfalls are plotted in GIS. The addresses of the outfalls are included in Appendix A.</p>	<p><b>2006/2007</b></p>	<p><b>2007/2008</b></p>

BMP Implementation Summary	Annual Performance Measures	SWMP Implementation		
<b>BMP – Minimize Water Quality Impacts Related to Water Line Flushing</b>				
<p><b>BMP Owner:</b> City of Milwaukie Public Works Department</p> <p><b>Permit Year:</b> Ongoing</p> <p><b>Implementation Activities:</b> The City of Milwaukie conducts periodic water line flushing throughout the City to ensure the quality of the water system. The City of Milwaukie requires all chlorinated water associated with the flushing of new and existing waterlines to be dechlorinated to a maximum allowable residual chlorine concentration of 0.1 mg/L or less, in accordance with DEQs requirements for discharge.</p>	<p>No performance measures were proposed for reporting for this BMP.</p>	<p><b>2005/2006</b></p> <p>N/A</p>	<p><b>2006/2007</b></p>	<p><b>2007/2008</b></p>

BMP Implementation Summary	Annual Performance Measures	SWMP Implementation		
<b>NPDES Permit Requirement - (4) Procedures to prevent, contain, and respond to spills that may discharge into the municipal separate storm sewer.</b>				
<b>BMP – Implement the Spill Response Program</b>				
<p><b>BMP Owner:</b> City of Milwaukie Public Works Department and Clackamas County Fire District No. 1 Hazardous Materials Team</p> <p><b>Permit Year:</b> Ongoing</p> <p><b>Implementation Activities:</b> The City of Milwaukie Public Works Department responds to non-hazardous spills within the City. For non-hazardous materials (oil and grease, paint, sewage), spills are generally reported by citizens or observed by Public Works staff. Clackamas County Fire District No. 1 Hazardous Materials Team responds to chemical and hazardous waste spills within the City.</p>	<p>(1) Indicate the number of spills responded to by the Public Works Department.</p> <p>(2) Indicate sources, causes, and resulting water quality problems resulting from spill activities.</p>	<p><b>2005/2006</b></p> <p>(1 and 2) The City of Milwaukie did not have any large spills in 2005/2006. There were some small spills related to vehicles leaking transmission fluid, brake fluid or hydraulic fluid which none entered the infrastructure or any waterways.</p> <p>Only one spill incident was reported to OERS (incident #2005-3087). This particular leak originated from a dump truck that was working in SE Portland but had driven through Milwaukie to access Interstate 205. The truck discharged hydraulic fluid on route to Interstate 205. However, the sun had dissipated the fluid before it could reach the infrastructure or waterway.</p>	<p><b>2006/2007</b></p>	<p><b>2007/2008</b></p>
<b>NPDES Permit Requirement - (5) A program to promote, publicize, and facilitate public reporting of the presence of illicit discharges or water quality impacts associated with discharges from municipal separate storm sewers.</b>				
<b>A Description of the City's Public Reporting Program including performance measures is included in Component #5, Table 2-5.</b>				
<b>NPDES Permit Requirement - (6) Educational activities, public information activities, and other appropriate activities to facilitate the proper management and disposal of used oil and toxic materials.</b>				
<b>A Description of the City's Public Informational Activities regarding management of hazardous materials including performance measures is included in Component #5, Table 2-5.</b>				

BMP Implementation Summary	Annual Performance Measures	SWMP Implementation		
<b>NPDES Permit Requirement - (7) Controls to limit infiltration of seepage from municipal sanitary sewers to municipal separate storm sewer systems where necessary</b>				
<b>BMP – Control Infiltration and Cross Connections to the Stormwater Conveyance System</b>				
<p><b>BMP Owner:</b> City of Milwaukie Public Works Department and Engineering Department</p> <p><b>Permit Year:</b> Ongoing</p> <p><b>Implementation Activities:</b>  The City of Milwaukie implements an inflow and infiltration (I&amp;I) abatement program for the sanitary sewer system.</p> <p>The City's Engineering Department reviews new and re-development plans for possible cross-connections, and if cross connections are discovered, they are eliminated. The City's illicit discharge program also works to control and prevent any cross-connections during their outfall inspections and dry-weather field screening activities.</p>	<p>(1) Indicate whether any cross-connections were discovered during illicit discharge investigations, and describe follow-up activities.</p>	<p><b>2005/2006</b></p> <p>(1) Per results of the illicit discharge inspections, no cross connections were observed.</p>	<p><b>2006/2007</b></p>	<p><b>2007/2008</b></p>

**TABLE 2-3 - A Program to Monitor and Control Pollutants from Industrial Facilities**

BMP Implementation Summary	Annual Performance Measures	SWMP Implementation		
<p><b>NPDES Permit Requirement</b> - (1) Identify priorities and procedures for inspections and establishing and implementing control measures for such discharges.  <b>NPDES Permit Requirement</b> - (2) Describe a monitoring program for storm water discharges associated with the industrial facilities identified in Schedule D(2)(c)(iii), to be implemented during the term of the permit, including, at a minimum, the submission of quantitative data on the pollutant parameters included in the Department's NPDES 1200-Z industrial general stormwater permit.</p>				
<b>BMP – Conduct Industrial Inspections and Enforcement</b>				
<p><b>BMP Owner:</b> City of Milwaukie Public Works Department  <b>Permit Year:</b> Ongoing  <b>Implementation Activities:</b>                      The City of Milwaukie will update and maintain an inventory of all industrial facilities in the permit area that are covered by a 1200-Z permit.                      Onsite industrial inspections occur annually at selected facilities discharging directly to the City's municipal stormwater system through the City's Pretreatment Program (via an IGA with Clackamas County Service District No 1), and through the City's illicit discharge program. The City may potentially conduct periodic inspections of other high priority facilities not previously inspected under the other above-mentioned programs if specific concerns arise or are reported through citizen complaints.</p>	<ol style="list-style-type: none"> <li>(1) Track the number of permitted (1200-Z) industrial facilities within the City.</li> <li>(2) Note any water quality concerns identified during the review of 1200-Z monitoring data.</li> <li>(3) Track the number of industrial inspections conducted.</li> <li>(4) Report status and abatement measures required for any industry found to be inappropriately discharging to the municipal stormwater system.</li> </ol>	<p><b>2005/2006</b></p> <ol style="list-style-type: none"> <li>(1) The City of Milwaukie queried the active 1200-Z permits within the city limits from DEQs website. There are currently 5 active 1200-Z permits within the City's MS4 permit boundary.</li> <li>(2) The City of Milwaukie requested and received the submitted 1200-Z monitoring data from DEQ for the active 1200-Z permits within the city limits.                       Per submitted monitoring data for permit year 11, it appears that no data was submitted for two of the permits (although one permit is relatively new). One permit has a sampling waiver in place. Monitoring data was found for the remaining two permits, and each did not appear to exceed benchmarks during any of the monitored events.</li> </ol>	<p><b>2006/2007</b></p>	<p><b>2007/2008</b></p>

BMP Implementation Summary	Annual Performance Measures	SWMP Implementation		
		<p>(3 and 4) During permit year 11, no specific industrial inspections were initiated. However, while conducting storm system maintenance, an unauthorized vehicle wash area was observed at a nearby facility. City maintenance staff notified the owners that wash water could potentially enter the storm system, which would not be permissible, and the wash area was removed.</p>		

**TABLE 2-4 - A Program to Reduce Pollutants in Stormwater Discharges from Construction Sites**

BMP Implementation Summary	Annual Performance Measures	SWMP Implementation		
NPDES Permit Requirement – (1) Procedures for site planning which incorporate consideration of potential water quality impacts. NPDES Permit Requirement – (2) Requirements for nonstructural and structural best management practices.				
<b>BMP – Implement Erosion Control for New and Redevelopment</b>				
<p><b>BMP Owner:</b> City of Milwaukie Public Works Department and Development Department</p> <p><b>Permit Year:</b> Ongoing</p> <p><b>Implementation Activities:</b>                      The City of Milwaukie reviews all site plans for new and redevelopment for compliance with the City’s Erosion Control Standards, which define requirements for erosion control plans including the implementation of structural and non-structural BMPs. The City recommends the use of the Clackamas County “<i>Erosion Prevention and Sediment Control Planning and Design Manual (2000)</i>” in preparing the erosion control plans.</p>	<p>(1) Report any updates or modifications to the “<i>Erosion Prevention and Sediment Control Planning and Design Manual (2000)</i>”.</p> <p>(2) Record the number of erosion control plan reviews completed.</p>	<p><b>2005/2006</b></p> <p>(1) There have been no updates to the “<i>Erosion Prevention and Sediment Control Planning and Design Manual</i>” during permit year 11. An updated edition is expected to be released during 2007.</p> <p>(2) During permit year 11, there were 47 erosion control plan reviews completed.</p>	<p><b>2006/2007</b></p>	<p><b>2007/2008</b></p>

BMP Implementation Summary	Annual Performance Measures	SWMP Implementation		
<b>NPDES Permit Requirement</b> - (3) <i>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</i>				
<b>BMP – Conduct Erosion Control Inspections</b>				
<b>BMP Owner:</b> City of Milwaukie Public Works <b>Permit Year:</b> Ongoing <b>Implementation Activities:</b> The City of Milwaukie's Stormwater Specialist initially inspects all new and redevelopment sites for proper implementation of erosion control measures.	(1) Record the number of erosion control inspections conducted annually. (2) Report the number of notices of non-compliance issued during inspections and the number of stop work orders issued annually.	<b>2005/2006</b> (1) There were 73 erosion control inspections conducted during permit year 11. (2) There were 30 non-compliance notices issued during permit year 11.	<b>2006/2007</b>	<b>2007/2008</b>
<b>NPDES Permit Requirement</b> - (4) <i>Appropriate educational and training measures for construction site operators.</i>				
<b>A Description of the City's Educational Program for Construction Site Operators is included in Component #5, Table 2-5</b>				

**TABLE 2-5 – Public Education, Coordination, and Public Involvement**

BMP Implementation Summary	Annual Performance Measures	SWMP Implementation		
<p><b>NPDES Permit Requirement, Component 1</b> - (6) 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.</p>				
<p><b>NPDES Permit Requirement, Component 2</b> - (5) A program to promote, publicize, and facilitate public reporting of the presence of illicit discharges or water quality impacts associated with discharges from municipal separate storm sewers.</p>				
<p><b>NPDES Permit Requirement, Component 2</b> - (6) Educational activities, public information activities, and other appropriate activities to facilitate the proper management and disposal of used oil and toxic materials.</p>				
<p><b>BMP – Provide Public Education and Outreach Materials regarding Stormwater Management</b></p>				
<p><b>BMP Owner:</b> City of Milwaukie Public Works Department  <b>Permit Year:</b> Ongoing  <b>Implementation Activities:</b>                      The City of Milwaukie continues to implement a number of public education and public awareness activities aimed at reducing the discharge of pollutants associated with a variety of activities including but not limited to:</p> <ol style="list-style-type: none"> <li>1. The application of pesticides, herbicides and fertilizers by citizens.</li> <li>2. Illicit discharges and dumping of waste materials into the storm drainage system.</li> <li>3. Disposal of waste oil and toxic materials.</li> </ol>	<ol style="list-style-type: none"> <li>(1) Track the number, types, and topics of public educational materials dispersed to the public.</li> <li>(2) Indicate any large-scale public educational campaigns.</li> <li>(3) Track coordinated public outreach activities with local co-permittees.</li> <li>(4) Record the number of catch basins stenciled in a given year.</li> <li>(5) Record the number of storm manhole lids that have been retrofit annually.</li> </ol>	<p><b>2005/2006</b></p> <ol style="list-style-type: none"> <li>(1) Stormwater- related public educational materials are made available to the public at various City locations including the public library, city hall, and public works. For permit year 12, the City will track the number of material orders placed to gage the level of distribution.</li> </ol> <p>(2 and 3) The City of Milwaukie is actively partnered with a number of other jurisdictions to form the Regional Coalition for Clean Rivers and Streams, in order to develop regional advertising campaigns to promote healthy streams. In addition, during permit year 11, the City of Milwaukie conducted its first annual “Leaf Drop” program.</p>	<p><b>2006/2007</b></p>	<p><b>2007/2008</b></p>

BMP Implementation Summary	Annual Performance Measures	SWMP Implementation	
		<p>This program allowed citizens to dispose of their leaves at a central location for no disposal fee. This program encouraged citizens to maintain and clean their lawns, thus minimizing the amount of debris entering the storm system and reducing the risk of flooding due to debris clogging catch basins.</p> <p>(4) Approximately 1600 catch basins have been stenciled to date.</p> <p>(5) During permit year 11, 95 storm manhole lids have been retrofit with "Dump no Waste to Streams" lids.</p>	

BMP Implementation Summary	Annual Performance Measures	SWMP Implementation		
<b>BMP – Conduct Staff Training in Spill Response</b>				
<p><b>BMP Owner:</b> City of Milwaukie Public Works Department</p> <p><b>Permit Year:</b> Ongoing</p> <p><b>Implementation Activities:</b> The City of Milwaukie provides training to City staff that initially respond to non-hazardous spills. Training is generally conducted at least once per year, in combination with City safety meetings, and new employees are trained at hire. Employees are educated on proper spill reporting and documentation, clean-up procedures and devices, and additional spill response contacts.</p>	<p>(1) Indicate the number of spill response training opportunities offered annually.</p>	<p><b>2005/2006</b></p> <p>(1) The City is currently in the process of formalizing and scheduling staff training related to spill response. A summary of the training activities will be included in the annual report for permit year 12.</p>	<p><b>2006/2007</b></p>	<p><b>2007/2008</b></p>

BMP Implementation Summary	Annual Performance Measures	SWMP Implementation		
<b>NPDES Permit Requirement, Component 4 – (4) Appropriate educational and training measures for construction site operators.</b>				
<b>BMP – Provide Educational Information to Construction Site Operators</b>				
<p><b>BMP Owner:</b> City of Milwaukie Public Works Department</p> <p><b>Permit Year:</b> Ongoing</p> <p><b>Implementation Activities:</b> The City of Milwaukie makes available their technical guidance manual, the <i>Clackamas County Erosion Prevention and Sediment Control Planning and Design Manual</i> (revised Dec. 2000) to engineers, contractors, and the general public. The City of Milwaukie continues to partner with Clackamas County Water Environment Services (WES), the City of Oregon City, and the Homebuilders Association of Portland to provide the Erosion Control Certification program, which includes a four-hour course in erosion control fundamentals and biannual refresher courses for contractors.</p>	<p>(1) Track the number of contractors receiving a discount on erosion control permit fees.</p>	<p><b>2005/2006</b></p> <p>(1) During permit year 11, no contractors applied for this discount.</p>	<p><b>2006/2007</b></p>	<p><b>2007/2008</b></p>

BMP Implementation Summary	Annual Performance Measures	SWMP Implementation		
<b>Additional Coordination Efforts</b>				
<b>BMP – Participate in Intergovernmental Coordination Efforts</b>				
<p><b>BMP Owner:</b> City of Milwaukie Public Works Department</p> <p><b>Permit Year:</b> Ongoing</p> <p><b>Implementation Activities:</b> The City of Milwaukie will continue to meet periodically to coordinate with other Clackamas County co-permittees regarding regional water quality efforts. Areas for coordination include monitoring, public education, and BMP effectiveness studies. The City of Milwaukie also participates with a variety of federal, state, and local agencies and groups involved with a broad range of water quality issues including stormwater</p>	<p>(1) Indicate groups, committees, and organizations with which the City is currently participating.</p>	<p><b>2005/2006</b></p> <p>(1) The City of Milwaukie is currently involved with the following groups and organizations:</p> <ul style="list-style-type: none"> <li>• Clackamas County NPDES Co-permittees</li> <li>• Johnson Creek Watershed Council</li> <li>• Oregon Association of Clean Water Agencies</li> <li>• Johnson Creek Interjurisdictional Committee</li> <li>• American Public Works Association</li> <li>• ACWA Stormwater Spill Committee</li> </ul>	<p><b>2006/2007</b></p>	<p><b>2007/2008</b></p>

### 3.0 Additional Annual Report Requirements

#### 3.1. Summary of Expenditures

The following summary outlines total stormwater expenditures for permit year 11 (2005-2006) and projected expenditures for permit year 12 (2006-2007).

##### 2005/2006

---

Personnel Services / 3.85 FTEs	383,562.00
Materials and Services	676,399.00
Capital Outlay	515,923.00
Transfers	713,381.00
<u>Contingency</u>	<u>13,719.00</u>

Total 2,302,984.00

##### 2006/2007

---

Personnel Services / 3.85 FTEs	337,376.00
Materials and Services	698,442.00
Capital Outlay	15,000.00
Transfers	578,189.00
<u>Contingency</u>	<u>86,316.00</u>

Total 1,715,323.00

#### 3.2. Demonstration of Continued Legal Authority

The City of Milwaukie maintains authority over stormwater per the City of Milwaukie Municipal Code (MMC). Below is an excerpt from the MMC:

##### **Chapter 13.14 STORMWATER MANAGEMENT**

##### **13.14.010 Purpose.**

---

The city finds and declares that absent effective maintenance, operation, regulation and control, existing stormwater drainage conditions in all drainage basins and subbasins within the city constitute a potential hazard to the health, safety and general welfare of the city. The city council further finds that natural and man-made stormwater facilities and conveyances together constitute a stormwater system and that the effective regulation and control of stormwater can best be accomplished through formation, by the city, of a stormwater utility. (Ord. 1755 § 6 (part), 1994)

The City of Milwaukie is currently updating its Stormwater and Erosion Control standards to provide better guidance to staff and developers concerning BMPs for stormwater management.

### 3.3. Overview of planning, land use changes and development activities within the UGB

The City of Milwaukie has identified and mapped Water Quality Resource Areas, including wetlands and wetland buffers, for consideration when development is proposed.

The City of Milwaukie is revitalizing its downtown area to include higher density, mixed use development. Capital and Public Improvement Projects are reviewed by Planning and Engineering staff to ensure that BMPs are employed to ensure post-development runoff is treated on-site to the maximum extent practicable through the use of natural infiltration, detention, and drywells for residential roof runoff. Erosion control permits are issued and enforced for projects where the potential for erosion exists.

Consideration for stormwater runoff is an integral part of the planning and construction of the downtown North Main Village project, including the construction of a bio-swale to filter and attenuate runoff. North Clackamas Park has undergone extensive changes with the construction of a baseball complex. Special consideration was given to this project to ensure protection of Mt. Scott and Kellogg Creeks through permeable soil amendments, bio-swales, pollution control structures and enhancements to existing wetlands.

Current development activities mainly involve in-fill and redevelopment of existing properties ranging from single-family homes to larger commercial developments. The City of Milwaukie lies entirely within the UGB and any City expansion will not encroach upon the UGB due to the City being surrounded by other jurisdictions within the UGB. Any annexations will include properties already within the UGB. Recent annexation efforts have focused on properties that lie within or near the Johnson Creek floodplain, especially those properties that have on-site sewage disposal systems. City code requires hookup to public sewer upon annexation.

## **4.0 Environmental Monitoring**

### **4.1. Summary of Comprehensive Clackamas County Monitoring Plan**

As part of the National Pollutant Discharge Elimination System (NPDES) Municipal Separate Storm Sewer System (MS4) permit requirement, the City of Milwaukie, along with Clackamas County and its other co-permittees, are required to develop and implement a stormwater monitoring program. Specific stormwater monitoring requirements and objectives are defined in Schedule B of the Clackamas County NPDES MS4 permit (number 101348).

The NPDES stormwater monitoring program requires two components. The first component is program monitoring, which involves the tracking and assessment of programmatic activities, as described in the individual permittees Stormwater Management Plans (SWMP), through the use of performance indicators or metrics (see Section 2.0 of the City of Milwaukie's annual report). The second component is environmental monitoring which includes the actual collection and analysis of samples.

Given the magnitude of effort associated with implementing an effective environmental monitoring program that adequately meets all permit requirements and objectives, Clackamas County (i.e., CCSD#1 and SWMACC) and six of its co-permittees including the City of Milwaukie agreed to consolidate efforts and prepare one comprehensive stormwater monitoring plan. This plan was prepared for submittal with the November 1, 2006 NPDES Permit Annual Compliance Reports and is attached with this document. Based on approval from DEQ, the planned is intended for implementation beginning July 1, 2007.

### **4.2. Summary of Environmental Monitoring Data Collected**

Until implementation of the Comprehensive Clackamas County Stormwater Monitoring Plan, the City of Milwaukie continued to conduct independent environmental monitoring activities consistent with previous years efforts. The City of Milwaukie currently monitors two locations: one instream location at Minthorn Springs Creek at Harmony Road, prior to discharge in Kellogg Creek, and one outfall location at the Brookside outfall, prior to discharge in Johnson Creek. Samples are collected quarterly at each site. Results of the monitoring effort are summarized below:

**TABLE 4-1 Environmental Monitoring Results–Minthorn Springs Creek at Harmony Road**  
**Limits**

Sample Date	8/16/2005	11/15/2005	3/21/2006	No Sample	S>E	Else
	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l
Total Diss Solids	168	151	160		?	?
Total Susp Solids	9	2	5			
Cadmium	<.01	0.00002	<.005		0.039	0.039
Chromium	<.01	0.0004	<.005		0.016	0.016
Copper	<.01	0.002	<.010		0.018	0.018
Lead	<.01	0.00039	0.002		0.082*	0.082*
Nickel	<.01	0.0018	0.02		1.4*	1.4*
Zinc	<.01	0.0108	0.0183		0.12*	0.12*
E. Coli	613 MPN/100ml	58 MPN/100ml	84 MPN/ 100 ml	517 MPN / 100ml	460 Col/100ml	460 Col/100ml
Ammonia Nitrogen	0.07	0.05	0.04		?	?
Nitrate	0.18	0.47	1.55		none	none
Orthophosphate	0.12	0.07	0.04		none	none
Total Phosphate	0.2	0.11	0.07		Tualatin: .07	Tualatin: .07
Oil & Grease	<5.0	<5.0	10.4		?	?
COD	<5.0	<5.0	<5.0		none	none
Hardness	97	83	87		none	none
Alkalinity						

**Field Test**

Temp	19.2	11	10.8		12.8	17.8
ph	6.56	7.01	7.08		6.5 - 8.5	6.5 - 8.5
DO-mg/l	4.56	7.6	8.88		11	8
DO-%	49.8	71	79.4			

**S>E** = Time period between spawning to emergence of fry.

**N.M.**= No Measurable Amount

**Else** = Time period other than S>E.

? = Parameters not set at this time

\* Hardness Dependent

**TABLE 4-2 Environmental Monitoring Results – Brookside Outfall to Johnson Creek**

Sample Date	<i>Limits</i>					
	8/16/2005	11/15/2005	3/21/2006	No Sample	S>E	Else
	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l
Total Diss Solids	227	188	175		?	?
Total Susp Solids	1	<1.0	2			
Cadmium	<.010	0.00002	<.005		0.039	0.039
Chromium	<.010	0.0006	<.005		0.016	0.016
Copper	<.010	0.0011	<.010		0.018	0.018
Lead	<.010	0.00016	<.002		0.082*	0.082*
Nickel	<.010	0.0023	<.02		1.4*	1.4*
Zinc	<.010	0.0191	0.0267		0.12*	0.12*
E. Coli	4 MPN / 100ml	37 MPN / 100ml	99 MPN / 100ml	192 MPN / 100ml	460 Col/100ml	460 Col/100ml
Ammonia Nitrogen	<0.05	0.01	0.01		?	?
Nitrate	3.75	3.96	4.19		none	none
Orthophosphate	0.12	0.09	0.07		none	none
Total Phosphate	0.14	0.1	0.1		Tualatin: .07	Tualatin: .07
Oil & Grease	<5.0	<5.0	12.7		?	?
COD	<5.0	<5.0	<5.0		none	none
Hardness	89	93	46		none	none
Alkalinity					none	none

**Field Test**

Temp	18.4	14	10.6		12.8	17.8
ph	7.21	6.49	6.87		6.5 - 8.5	6.5 - 8.5
DO-mg/l	6.03	7.6	8.07		11	8
DO-%	64.2	71	72.9			

**S>E** = Time period between spawning to emergence of fry.

**N.M.** = No Measurable Amount

**Else** = Time period other than S>E.

? = Parameters not set at this time

\* Hardness Dependent

#### 4.3. Discussion of water quality improvements or degradations

The purpose of participating a coordinated monitoring effort with Clackamas County and other co-permittees is to distribute resources widely and produce data that will provide comprehensive information for the County as a whole. Analyzing the limited number of samples collected by the City of Milwaukie would not allow for assessment of water quality improvements or degradation, as there are not enough samples to report results with any statistical significance. In addition, for the City of Milwaukie, samples were not specifically collected during storm events, which does not allow for analysis regarding the impacts of stormwater runoff on receiving waters.

For the data collected as a result of the coordinated monitoring effort, some analyses would be conducted annually and submitted with the annual compliance reports while other analyses would be conducted after several years of data have been collected (e.g., the five year permit period) so that the data are more statistically robust in terms of providing information. Data and discussion regarding water quality improvements and degradation would be provided in annual reports following several years of implementation of the coordinated monitoring plan.

## Appendix A            Outfall Inventory for Use in Illicit Discharge Inspections

<b>ID #</b>	<b>Address</b>				
25019	2700 SE	BOYD	ST	MILWAUKIE	
25233	9000 SE	MCBROD	AV	MILWAUKIE	
25235	9200 SE	MCBROD	AV	MILWAUKIE	
25236	9097 SE	MCCLOUGHLIN	BV	MILWAUKIE	
25237	2211 SE	OCHOCO	ST	MILWAUKIE	
25238	2211 SE	OCHOCO	ST	MILWAUKIE	
25245	8810 SE	ROCKVORST	ST	MILWAUKIE	
25246	9097 SE	MCCLOUGHLIN	BV	MILWAUKIE	
25273	9079 SE	MCCLOUGHLIN	BV	MILWAUKIE	
25283	2381 SE	CLATSOP	ST	MILWAUKIE	
25225	9800 SE	MCBROD	AV	MILWAUKIE	
25226	9501 SE	MCCLOUGHLIN	BV	MILWAUKIE	
25227	9501 SE	MCCLOUGHLIN	BV	MILWAUKIE	
25228	9701 SE	MCCLOUGHLIN	BV	MILWAUKIE	
25232	2808 SE	BALFOUR	ST	MILWAUKIE	
25210	10505 SE	17 <sup>TH</sup>	AV	MILWAUKIE	
25213	10700 SE	MCCLOUGHLIN	BV	MILWAUKIE	
25214	10282 SE	MAIN	ST	MILWAUKIE	
25219	10500 SE	26 <sup>TH</sup>	AV	MILWAUKIE	
25221	10501 SE	MAIN	ST	MILWAUKIE	
45006	12374 SE	OATFIELD	RD	MILWAUKIE	
45007	12368 SE	OATFIELD	RD	MILWAUKIE	
45008	12511 SE	GUILFORD	DR	MILWAUKIE	
45009	3606 SE	LAKE	RD	MILWAUKIE	
45010	3600 SE	LICYNTRA	LN	MILWAUKIE	
45011	3926 SE	LICYNTRA	LN	MILWAUKIE	
45013	4206 SE	SOMEWHERE	DR	MILWAUKIE	
45014	4296 SE	BRAE	ST	MILWAUKIE	

45015	4586 SE RYAN	CT	MILWAUKIE
15001	12201 SE 19 <sup>TH</sup>	AV	MILWAUKIE
45016	11100 SE MCLOUGHLIN	BV	MILWAUKIE
45017	11222 SE MAIN	ST	MILWAUKIE
65007	12515 SE 70 <sup>TH</sup>	AV	MILWAUKIE
65008	12515 SE 70 <sup>TH</sup>	AV	MILWAUKIE
65015	6201 SE HARMONY	RD	MILWAUKIE
65016	12582 SE LINWOOD	AV	MILWAUKIE
65017	12515 SE 70 <sup>TH</sup>	AV	MILWAUKIE
65027	13001 SE RUSK	RD	MILWAUKIE
65001	10890 SE OAK	ST	MILWAUKIE
65002	10890 SE OAK	ST	MILWAUKIE
65003	10890 SE OAK	ST	MILWAUKIE
65004	11400 SE 37 <sup>TH</sup>	AV	MILWAUKIE
65005	4141 SE RAILROAD	AV	MILWAUKIE
65019	4243 SE INTERNATIONAL	WY	MILWAUKIE
65029	4700 SE INTERNATIONAL	WY	MILWAUKIE
65031	4700 SE INTERNATIONAL	WY	MILWAUKIE
65032	4700 SE INTERNATIONAL	WY	MILWAUKIE
65011	12045 SE STANLEY	AV	MILWAUKIE
65012	12396 SE MAPLE	CT	MILWAUKIE
65013	12425 SE ASH	CT	MILWAUKIE
65014	12476 SE GROVE	CT	MILWAUKIE
65020	5124 SE APPENINE	WY	MILWAUKIE
65021	11880 SE HOME	AV	MILWAUKIE
65022	12015 SE VIVALDI	CR	MILWAUKIE
65023	12172 SE BECKMAN	AV	MILWAUKIE
65028	12045 SE STANLEY	AV	MILWAUKIE
25244	9301 SE WICHITA	AV	MILWAUKIE
25261	5015 SE BROOKSIDE	DR	MILWAUKIE
25262	4539 SE BROOKSIDE	DR	MILWAUKIE

25264	5110 SE	JOHNSON CREEK BV		MILWAUKIE
25266	5543 SE	TAMBARA	CT	MILWAUKIE
25267	5249 SE	BROOKSIDE	DR	MILWAUKIE
25274	4708 SE	JOHNSON CREEK BV		MILWAUKIE
25275	5145 SE	BROOKSIDE	DR	MILWAUKIE

## Appendix B Summary of Milwaukie 1200-Z Permits

<u>WQFileNbr</u>	<u>SIC</u>	<u>LegalName</u>	<u>City</u>	<u>County</u>	<u>PmtType</u>	<u>IsActive</u>
<a href="#">63545</a>	<a href="#">3425</a>	BLOUNT, INC.	MILWAUKIE	CLACKAMAS	GEN12Z	True
<a href="#">107733</a>	<a href="#">3561</a>	Harder Mechanical Contractors Inc	MILWAUKIE	CLACKAMAS	GEN12Z	True
<a href="#">101867</a>	<a href="#">3612</a>	OECO CORPORATION	MILWAUKIE	CLACKAMAS	GEN12Z	True
<a href="#">113693</a>	<a href="#">4225</a>	OREGON TRANSFER CO.	MILWAUKIE	CLACKAMAS	GEN12Z	True
<a href="#">115817</a>	<a href="#">3369</a>	PCC STRUCTURALS, INC.	MILWAUKIE	CLACKAMAS	GEN12Z	True

Table generated per DEQ's website, accessed 10/12/06, and modified per discussion with the City of Milwaukie:

<http://www.deq.state.or.us/wq/SISData/FacilityCriterionew.asp>

**Appendix C**

**Comprehensive Clackamas County Stormwater Monitoring  
Plan**

# Comprehensive Clackamas County Stormwater Monitoring Plan

*Prepared for:*

Clackamas County (CCSD #1 & SWMACC)

City of Gladstone

City of Happy Valley

City of Milwaukie

City of Oregon City

City of Rivergrove

City of West Linn



*Prepared by:*

**URS**

October 13, 2006

**Comprehensive NPDES MS4  
Stormwater Monitoring Plan For:**

**Clackamas County Service District #1 (CCSD#1)  
Surface Water Management Agency of Clackamas  
County (SWMACC)  
City of Gladstone  
City of Milwaukie  
City of Oregon City  
City of West Linn  
City of Happy Valley  
City of Rivergrove**

**Prepared by:  
URS Corporation**

**October 13, 2006**

## TABLE OF CONTENTS

Section	Page No
1.0 Introduction.....	1
2.0 Objectives .....	2
3.0 Existing Monitoring Program Review .....	2
4.0 Data Gathering Strategies .....	3
5.0 Proposed Monitoring Activities .....	4
5.1 Instream Monitoring Efforts .....	5
5.1.1 Existing Instream Monitoring Efforts.....	5
5.1.2 Observations Related to Existing Instream Monitoring Efforts .....	11
5.1.3 Modified Instream Monitoring Efforts .....	12
5.2 Outfall Monitoring Efforts .....	19
5.2.1 Existing Outfall Monitoring Efforts.....	19
5.2.2 Observations Related to Existing Outfall Monitoring Efforts .....	23
5.2.3 Recommendations for Outfall Monitoring Efforts .....	24
5.3 Best Management Practice Monitoring Efforts .....	28
5.3.1 Existing BMP Monitoring Efforts .....	28
5.3.2 Observations Related to Existing BMP Monitoring Efforts .....	29
5.3.3 Recommendations for BMP Monitoring Efforts .....	29
5.4 Field Screening and Dry Weather Outfall Monitoring .....	31
5.4.1 Existing Field Screening Monitoring Efforts.....	31
6.0 Sampling Parameters and Procedures Including QA/QC .....	31
7.0 Data Analysis and Interpretation .....	35

### List of Tables

1 Summary of Clackamas County TMDL and 303(d) Listed Streams.....	6
2 Details of the Clackamas County Co-permittee Existing Instream Monitoring Efforts .....	7
3 Summary of the Clackamas County Co-permittee Existing Instream Monitoring Efforts .....	9
4 Modifications to the Clackamas County Co-permittee Existing Instream Monitoring Efforts .....	15

5	Summary of the Modified Clackamas County Instream Monitoring Efforts .....	17
6	Detailed Summary of the Existing Outfall Monitoring Locations.....	20
7	Overall Summary of Existing Outfall Monitoring Locations .....	21
8	Detailed Summary of Modified Outfall Monitoring Locations .....	25
9	Outfall Monitoring Recommendations Compared to Existing Monitoring.....	26
10	Summary of Analytical Cost Estimates by Jurisdiction .....	32
11	Instream and Outfall Parameters for Clackamas County Stormwater Quality Monitoring .....	33

List of Figures

1	Instream Monitoring Locations: Existing Sites .....	10
2	Instream Monitoring Locations: Revised Sites.....	18
3	Outfall Monitoring Locations: Existing Sites .....	22
4	Outfall Monitoring Locations: Revised Sites .....	27

Attachment #1 – Standard Operating Procedures for Sampling

## 1.0 INTRODUCTION

As part of the National Pollutant Discharge Elimination System (NPDES) Municipal Separate Storm Sewer System (MS4) permit requirement, Clackamas County co-permittees are required to develop and implement a stormwater monitoring program. Specific stormwater monitoring requirements and objectives are defined in Schedule B of the Clackamas County NPDES MS4 permit (number 101348).

The NPDES stormwater monitoring programs require two components. The first component is program monitoring, which involves the tracking and assessment of programmatic activities, as described in the individual permittees Stormwater Management Plans (SWMP), through the use of performance indicators or metrics. The second component is environmental monitoring which includes the actual collection and analysis of samples. The purpose of this monitoring plan is to address the environmental monitoring component of the requirements. As a result, this Stormwater Monitoring Plan includes the following elements as required by Schedule B of the NPDES MS4 permit:

- a list of monitoring sites,
- a list of parameters to be analyzed,
- the media sampled,
- sample collection frequencies,
- targeted conditions (e.g., weather conditions), and
- protocols for quality assurance/quality control.

Due to the inherent wide ranging variability in stormwater data, collecting and analyzing data that will be sufficient to address the permit environmental monitoring requirements will require significant resources in order to obtain data that are sufficiently robust to be statistically valid. DEQ itself acknowledged this issue and provided the following clause in the permit:

*“If representative of the entire area subject to these permit requirements, the co-permittees may develop a cooperative MS4 discharge and in-stream monitoring strategy that assigns monitoring responsibilities to selected co-permittees.”*

Therefore, given the magnitude of effort associated with implementing an effective monitoring program that will adequately meet permit requirements and objectives, eight Clackamas County co-permittees have agreed to consolidate efforts and prepare one comprehensive stormwater monitoring plan. The co-permittees include CCSD#1, SWMACC, and the cities of Gladstone, Milwaukie, Oregon City, West Linn, Happy Valley and Rivergrove. **This plan was prepared for submittal with the November 1, 2006 NPDES Permit Annual Compliance Reports. Based on approval from DEQ, the plan is intended for implementation beginning July 1, 2007.**

The following Stormwater Monitoring Plan is organized into the following sections:

Section 2 summarizes the objectives of the plan, specifically related to the six objectives listed in Schedule B of the NPDES MS4 permit.

Section 3 describes how existing monitoring efforts conducted by Clackamas County and its co-permittees were assessed and evaluated with respect to meeting new permit requirements.

Section 4 outlines various data gathering strategies that will be utilized in implementing the new proposed program.

Section 5 describes the proposed monitoring activities including frequency, locations, and parameters.

Section 6 provides a summary of sampling parameters and procedures.

Section 7 summarizes the data analysis and data interpretation activities that will be used to assess the monitoring data gathered.

Section 8 provides an overall and condensed summary of all of the monitoring recommendations described in section 5.0.

## **2.0 OBJECTIVES**

Schedule B of the NPDES MS4 permit lists six specific monitoring objectives that should be addressed with the revised monitoring program. The six objectives are:

1. Determine the status of implementing the components of the SWMP;
2. Evaluate the effectiveness of BMPs for specific source controls;
3. Evaluate the source of specific pollutants;
4. Assess the chemical, biological, and physical effects of MS4 runoff on receiving waters;
5. Characterize MS4 discharges; and
6. Evaluate long-term trends in receiving water quality associated with stormwater discharges.

Each of the monitoring activities listed in Section 5 includes a narrative describing how the above monitoring objectives will be met through implementation of each of the proposed monitoring plan components.

## **3.0 EXISTING MONITORING PROGRAM REVIEW**

Prior to developing the comprehensive monitoring program for CCSD#1, SWMACC, and the cities of Gladstone, Milwaukie, Oregon City, West Linn, Happy Valley and Rivergrove, a review was conducted of each jurisdiction's existing individual monitoring efforts. Per Tables B-1 in the current NPDES MS4 permit, each jurisdiction is responsible for conducting specified environmental monitoring and sampling efforts. A revised monitoring plan was to be submitted in May 2006 to address new permit monitoring objectives. A draft of this document was submitted at that time with a commitment to complete the final plan for submittal with the November 1, 2006 annual compliance report.

The monitoring requirements that are listed in Table B-1 of the permit vary between jurisdiction, ranging from large-scale instream and outfall monitoring efforts to a single storm grab sample at an outfall location. As mentioned previously, given the variability in individual monitoring efforts, smaller jurisdictions with limited environmental monitoring requirements listed in Table B-1 would not be able to meet the six new permit monitoring objectives without substantial additional effort, and costs would be beyond what would be considered to be the “maximum extent practicable” for those communities.

Each of the jurisdictions annual reports from 2004-2005 were initially reviewed to summarize current monitoring efforts. Generally, jurisdictions either met or exceeded their requirements described in Table B-1. If a jurisdiction changed monitoring activities from those specified in Table B-1, the annual reports typically discussed and described why such changes occurred. In addition to the annual reports, individual monitoring plans (e.g., those from Clackamas County Service District #1 (CCSD#1) and the Stormwater Management Agency of Clackamas County (SWMACC)) were reviewed if available. Tables were prepared to outline the various instream, outfall, and BMP monitoring activities being conducted by all jurisdictions. The summary tables included information such as the watershed/water body location, the jurisdiction conducting the sampling, the sampling frequency, the method of sampling (field or laboratory; dry or wet-weather), and whether the sampling location was included within the MS4 permit boundary.

Following compilation of the existing monitoring activities, a meeting was held with all participating jurisdictions to review the tables that outline existing monitoring efforts. Any discrepancies between activities reported in the tables and activities most recently conducted were discussed, and the tables were modified as necessary.

Following the meeting, the tables of existing efforts were reorganized and compared to new permit monitoring requirements in order to identify potential gaps in the data and constraints of the jurisdiction’s existing monitoring activities with respect to addressing the new requirements. Section 5.0 includes the tables that summarize existing efforts. General monitoring recommendations were then developed to address potential data gaps, to minimize duplication of monitoring efforts, and to ensure data collected contained information that was sufficiently comprehensive to meet the six new permit monitoring objectives. Additional meetings were held with each jurisdiction individually to further refine details with respect to monitoring recommendations and commitments (e.g., specific monitoring site locations, sample frequencies, etc.). Several additional meetings were also held to refine and finalize the plan. The proposed modified monitoring activities are provided in Sections 5.1 (instream monitoring), 5.2 (outfall monitoring), 5.3 (BMP monitoring), and 5.4 (field screening).

#### **4.0 DATA GATHERING STRATEGIES**

There are three primary strategies that are proposed in this new monitoring plan to obtain data and information necessary to meet the six monitoring objectives of the permit. These strategies include the following:

- 1) Take a detailed look at historic water quality data and other information collected by the co-permittees to see how it already answers questions related to permit objectives and to use it to help refine future monitoring efforts.
- 2) Collect new water quality data to complement the existing data and address specific objectives that have not been examined previously.
- 3) Conduct literature reviews to review and track relevant technical information related to stormwater quality that is collected by others.

With respect to item 1) above, a significant amount of stormwater-related data have already been collected by the co-permittees. However, these data have not always been evaluated with respect to addressing the questions in the permit objectives. For example, significant amounts of instream data have been collected on a regular basis (e.g., monthly), but they have not been reviewed with respect to how the dry weather instream data are comparing with the wet weather instream data. Therefore, one of the data gathering strategies will be to get more value out of the significant amounts of data that have already been gathered. Taking a good look at this data will also help to refine future monitoring efforts.

With respect to item 2) above, most of the data that have been collected by Clackamas co-permittees have been instream or in-pipe data. These data may need to be supplemented with analyses for additional parameters (i.e., TMDL or 303(d) parameters) that have not been analyzed in the past. In addition, sample frequencies may need to be adjusted to make the data more statistically robust. And, new types of monitoring may need to be added to the program.

With respect to item 3) above, the scientific community, public agencies, and private organizations interested in stormwater management continue to conduct research related to stormwater characterization and treatment. This research is costly and it is often beyond the means of any one co-permittee to conduct a significant study. Organizations such as the Oregon Association of Clean Water Agencies (ACWA), the Bay Area Stormwater Management Association (BASMA), the Water Environment Research Foundation (WERF), state transportation departments, vendors of proprietary stormwater treatment systems, and others conduct research and examine complex stormwater-related issues that individual permittees could not accomplish on their own. By participating in these groups and following current research, co-permittees can realize greater benefits from labor and capital investment than if they were to attempt such studies on their own. As such, the co-permittees will take advantage of information garnered by these groups to meet some of the more complex and costly objectives of the permit.

## **5.0 PROPOSED MONITORING ACTIVITIES**

This Section describes the existing monitoring efforts being conducted by Clackamas County co-permittees and describes the recommended modifications (including locations, parameters, sampling methods, and sampling frequencies) to the efforts in order to ensure the required objectives of the monitoring program will be effectively met. This Section is organized according to:

- Instream monitoring efforts,
- Outfall monitoring efforts,
- BMP monitoring efforts, and
- Field screening efforts.

The permit monitoring objectives that are met by the specific monitoring component are listed at the beginning of each subsection.

## **5.1 INSTREAM MONITORING EFFORTS**

Instream sampling throughout the Clackamas MS4 permit area will be conducted to address NPDES MS4 objectives 1, 4, 5, and 6 when conducted during both wet and dry weather conditions for comparison.

1. Determine the status of implementing the components of the SWMP;
4. Assess the chemical, biological, and physical effects of MS4 runoff on receiving waters;
5. Characterize MS4 discharges; and
6. Evaluate long-term trends in receiving water quality associated with stormwater discharges.

The following text describes existing instream monitoring efforts (5.1.1), observations related to existing instream monitoring efforts (5.1.2), and modified instream monitoring efforts (5.1.3).

### **5.1.1 Existing Instream Monitoring Efforts**

For purposes of re-evaluating the existing monitoring sites, waterbodies that are considered water quality impaired and currently have either a TMDL in place or are 303(d) listed for a specific parameter were considered to be high priority. Within the Clackamas County area, the TMDL and 303(d) streams are listed in Table 1 below. Instream monitoring activities are currently being conducted on a number of water bodies throughout the Clackamas County MS4 NPDES permit area. Table 2 includes a summary of the existing instream monitoring organized by jurisdiction. To provide a more comprehensive and condensed summary of the total number and type of samples that are currently collected by jurisdiction, Table 3 is also provided. These sites are also shown on Figure 1.

**Table 1 – Summary of Clackamas County TMDL and 303(d) Listed Streams**

Creek	Bacteria	Temp.	DO	Phosphorus	Mercury	PCBs	PAHs	DDT	Dieldrin
<b>TMDLs</b>									
Draft for Willamette	X	X			X				
Tualatin River	X	X	X	X					
<b>303(d) Listed Streams</b>									
Clackamas R.	X	X							
Johnson	X					X	X	X	X
Kellogg	X								
Mt. Scott	X								
Phillips	X								
Spring Brook	X								
Tryon		X							
Cow	X	X							
North Fork Deep	X								
Rock	X								
Sieben	X								
Abernathy		X							

**Table 2 - Details of the Clackamas County Co-permittee Existing Instream Monitoring Efforts**

Monitored Waterbody	Responsible Party	Number of Locations	Type of Sample	Sampling Frequency	Parameters Monitored (Field/Lab)*	Storm Event Monitoring (Y/N)**	Specifically Listed as 303(d) Waterbody
Carli Creek	CCSD#1	1	Grab	6-12/year	Field and Lab	N	
Clackamas River	CCSD#1	2	Grab	6-12/year	Field and Lab	N	X
		1	Automated	Continuous	Field	Y	
Cow Creek	CCSD#1	1	Grab	6-12/year	Field and Lab	N	X
		1	Automated	Continuous	Field	Y	
Dean Creek	CCSD#1	1	Grab	12/year	Field and Lab	N	
Kellogg Creek	CCSD#1	2	Grab	6-12/year	Field and Lab	N	X
Mt Scott Creek	CCSD#1	2	Grab	6-12/year	Field and Lab	N	X
		2	Automated	Continuous	Field at one location, flow at the other	Y	
Phillips Creek	CCSD#1	1	Grab	6-12/year	Field and Lab	N	X
		1	Automated	Continuous	Field	Y	
Rock Creek	CCSD#1	2	Grab	6-12/year	Field and Lab	N	X
		2	Automated	Continuous	Field at one location, flow at the other	Y	
Sieben Creek	CCSD#1	2	Grab	6-12/year	Field and Lab	N	X
		1	Automated	Continuous	Field	Y	
Ball Creek	Lake Oswego	1	Grab	12/year	Field and Lab	N	
Boones Ferry Creek	Lake Oswego	2	Grab	12/year	Field and Lab	N	
Carter Creek	Lake Oswego	1	Grab	12/year	Field and Lab	N	
Lost Dog Creek	Lake Oswego	1	Grab	12/year	Field and Lab	N	
Springbrook Creek	Lake Oswego	1	Grab	12/year	Field and Lab	N	X
Tryon Creek	Lake Oswego	1	Grab	12/year	Field and Lab	N	X
Minthorn Creek	Milwaukie	1	Grab	4/year	Field and Lab	N	
Johnson Creek	Milwaukie	1	Automated	Continuous	Field and Lab	Y	X
Abernathy Creek	Oregon City	1	Grab	4/year	Field	N	X
Caufield Creek	Oregon City	1	Grab	4/year	Field	N	
Coffee Creek	Oregon City	1	Grab	4/year	Field	N	

Monitored Waterbody	Responsible Party	Number of Locations	Type of Sample	Sampling Frequency	Parameters Monitored (Field/Lab)*	Storm Event Monitoring (Y/N)**	Specifically Listed as 303(d) Waterbody
High School Creek	Oregon City	1	Grab	4/year	Field	N	
Livesay Creek	Oregon City	1	Grab	4/year	Field	N	
Mud Creek	Oregon City	1	Grab	4/year	Field	N	
Newell Creek	Oregon City	1	Grab	4/year	Field	N	
Park Place Creek	Oregon City	1	Grab	4/year	Field	N	
Singer Creek	Oregon City	2	Grab	4/year	Field	N	
South End Creek	Oregon City	1	Grab	4/year	Field	N	
Athey Creek	SWMACC	1	Grab	12/year	Field and Lab	N	
Field Creek	SWMACC	1	Grab	12/year	Field and Lab	N	
Pecan Creek	SWMACC	1	Grab	12/year	Field and Lab	N	
Rock Creek (South)	SWMACC	1	Grab	12/year	Field and Lab	N	X
Saum Creek	SWMACC	1	Grab	12/year	Field and Lab	N	
Shiplee Creek	SWMACC	1	Grab	12/year	Field and Lab	N	
Tualatin River	SWMACC	1	Automated	Continuous	Field	Y	X
Unnamed Creek at Riberia Ln.	SWMACC	1	Grab	12/year	Field and Lab	N	
Wilson Creek	SWMACC	1	Grab	12/year	Field and Lab	N	
Tanner Creek	West Linn	1	Grab	5/year	Field and Lab	Y – 3/year N - 2/year	
Trillium Creek	West Linn	1	Grab	5/year	Field and Lab	Y – 3/year N - 2/year	
Summerlinn Creek – tributary to Tualatin River	West Linn	1	Grab	5/year	Field and Lab	Y – 3/year N - 2/year	

\* The term “Field” indicates samples that are analyzed using meters in the field – typically for temperature, conductivity, dissolved oxygen, total dissolved solids, and pH.

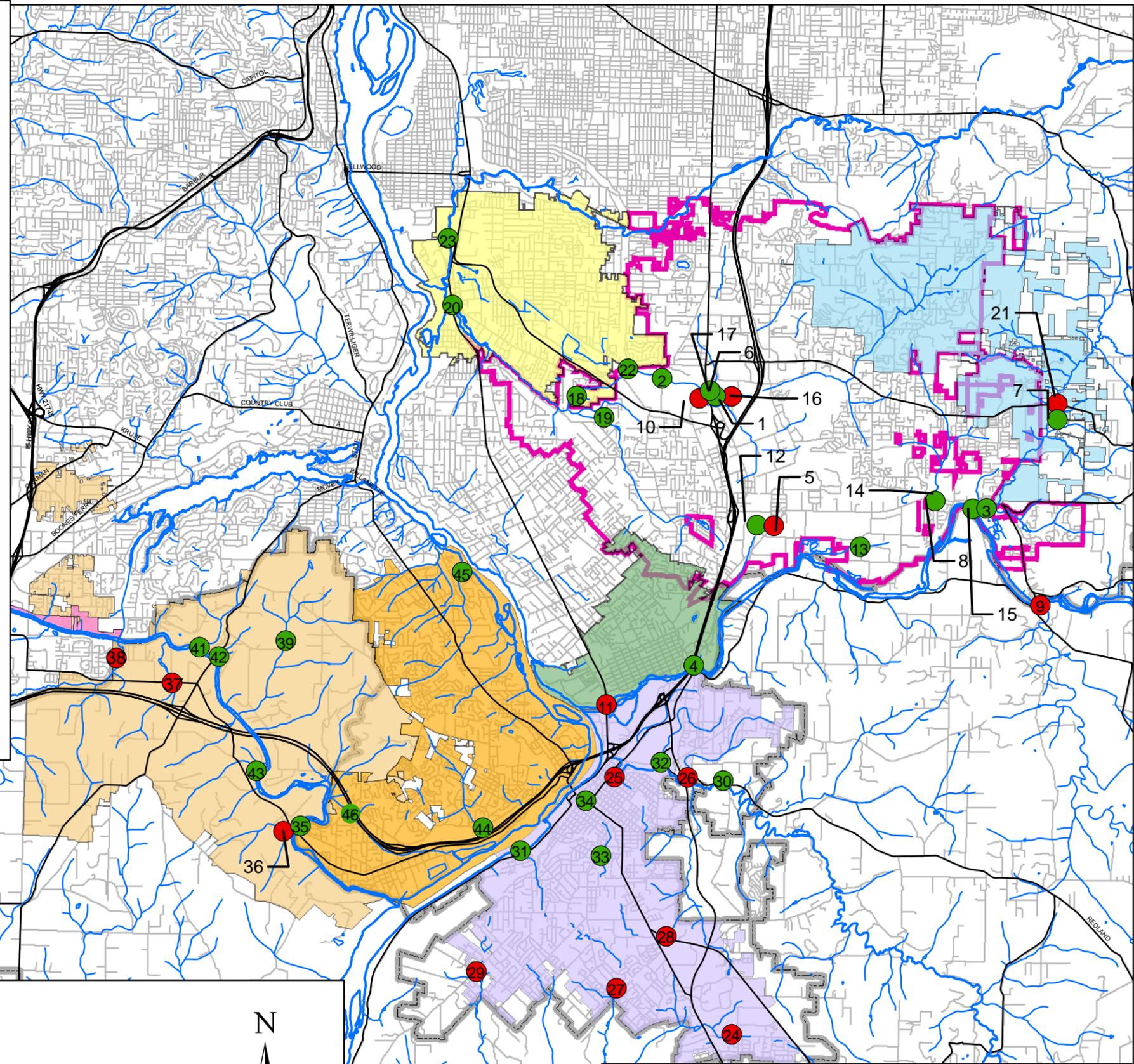
\*\* A “N” or no in this column indicates that samples are collected on a regular schedule such as monthly and may or may not include storm events. Specific weather conditions are not targeted.

**Table 3 - Summary of the Clackamas County Co-permittee Existing Instream Monitoring Efforts**

<b>Jurisdiction</b>	<b>Total # of Grab Sampling Sites</b>	<b>Total # of Grab Samples Collected Per Year*</b>	<b>Automated Continuous Sampling Sites</b>	<b>Total # of Sampling Sites</b>
CCSD#1	13	120	8	21
SWMACC	8	96	1	9
Gladstone	0	0	0	0
Milwaukie	1	4	1	2
Oregon City	11	44	0	11
West Linn	3	15	0	3
<b>TOTAL:</b>	<b>36</b>	<b>279</b>	<b>10</b>	<b>46</b>

\* - For samples listed as being collected 6 – 12 times per year, an average of 9 times per year was used to provide annual totals for this table.

Number	Jurisdiction	Sampling Method	Site Description	Stream Name
1	CCSD #1	Automated	SE Ambler Rd & 84th Ave	Mt Scott Creek
2	CCSD #1	Automated	Flood Control Facility at SE Pheasant Ct	Mt Scott Creek
3	CCSD #1	Automated	Between Hwy 212 and 224	Rock Creek
4	CCSD #1	Automated	S. Fork Water Intake	Clackamas River
5	CCSD #1	Automated	SE Last Rd	Cow Creek
6	CCSD #1	Automated	Phillips Creek	Phillips Creek
7	CCSD #1	Automated	At Sunnyside Rd	Rock Creek
8	CCSD #1	Automated	At Hwy 212 / 224	Sieben Creek
9	CCSD #1	Grab	Carver Boat Ramp	Clackamas River
10	CCSD #1	Grab	Near Confluence w/ Mt Scott Cr	Dean Creek
11	CCSD #1	Grab	Clackamette Park	Clackamas River
12	CCSD #1	Grab	SE Last Rd	Cow Creek
13	CCSD #1	Grab	120th and Carpenter	Carl Creek
14	CCSD #1	Grab	Hwy 212 and 135th	Sieben Creek
15	CCSD #1	Grab	Hwy 212	Rock Creek
16	CCSD #1	Grab	SE Oaks Bluff Blvd	Mt. Scott Creek
17	CCSD #1	Grab	84th and Sunnybrook	Phillips Creek
18	CCSD #1	Grab	North Clackamas Park	Mt. Scott Creek
19	CCSD #1	Grab	Rusk & Aldercrest	Kellogg Creek
20	CCSD #1	Grab	Kellogg Ck at Hwy 99E	Kellogg Creek
21	CCSD #1	Grab	Rock Creek at Sunnyside Rd	Rock Creek
22	Milwaukie	Grab	Minthorn Creek	Minthorn Creek
23	Milwaukie / USGS	Automated	Johnson Creek	Johnson Creek
24	Oregon City	Grab	At 14490 Glen Oak Rd	Caufield Creek
25	Oregon City	Grab	John Adams	High School Cr
26	Oregon City	Grab	At Livesay Rd	Livesay Creek
27	Oregon City	Grab	Stream Xing at Meyers Rd	Mud Creek
28	Oregon City	Grab	At Mollala Avenue	Newell Creek
29	Oregon City	Grab	South End Cr / Salmonberry Cr	South End Creek
30	Oregon City	Grab	At Holly Lane Bridge	Abernathy Creek
31	Oregon City	Grab	Outfall at Willamette	Coffee Creek
32	Oregon City	Grab	Behind 13530 Redland Rd	Park Place Creek
33	Oregon City	Grab	At N. end of Singer Cr Park	Singer Creek
34	Oregon City	Grab	Singer Cr Baseline Site	Singer Creek
35	SWMACC	Automated	Tualatin River	Tualatin River
36	SWMACC	Grab	SW Elderberry Lane	Fields Creek
37	SWMACC	Grab	SW Boreland Rd	Athey Creek
38	SWMACC	Grab	SW Halcyon Rd	Saum Creek
39	SWMACC	Grab	SW Long farm Rd	Wilson Creek
40	SWMACC	Grab	SW Morgan Rd	Rock Creek
41	SWMACC	Grab	SW Mossy Brae Rd	Pecan Creek
42	SWMACC	Grab	SW Shadow Wood Drive	Shipley Creek
43	SWMACC	Grab	SW Ribera Lane	Unnamed Tributary
44	West Linn	Grab	At Imperial Drive	Tanner Creek
45	West Linn	Grab	At Caloroga Rd	Trillium Creek
46	West Linn	Grab	Tributary to Tualatin River	Summerlinn Creek



**Legend**

- Gladstone
- Happy Valley
- Milwaukie
- SWMACC
- Oregon City
- Rivergrove
- West Linn
- Urban Growth Boundary
- Existing Sites
- Existing Sites Proposed for Removal or Relocation

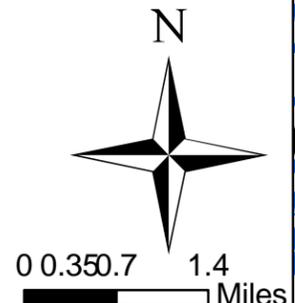


Figure 1  
 Instream Monitoring Locations: Existing Sites  
 CCSD #1, Gladstone, Milwaukie, Oregon City, SWMACC,  
 West Linn, Happy Valley, River Grove  
 September 2006



## 5.1.2 Observations Related to Existing Instream Monitoring

The following text provides observations related to the existing instream monitoring efforts that led to recommendations for improvements and modifications in order to meet new permit monitoring requirements.

Limited Number of Storm Event Samples: Based on the initial assessment of instream monitoring sites, it appears that there is sufficient geographic coverage of local rivers, creeks, and streams, and a significant number of samples are being collected. The main issue with the existing instream sampling is that for the most part, samples are collected at regular intervals and specific weather conditions are not targeted. Collecting samples at regular intervals is likely to result in samples collected during storm events, however, it would be desirable to target a minimum number of events. CCSD#1 reviewed the last four and a half years of monthly data (53 months) to determine how many of those monthly samples were collected during rain events. The result was 10 events or approximately 19%. As the quality of water during storms is likely to be more variable than the quality of water during ambient conditions, collecting more than 19% (i.e., at least one third) of the samples during storms is recommended.

Limited Number of Parameters Analyzed: For a number of streams monitored, only field data (temperature, conductivity, total dissolved solids, pH, dissolved oxygen) are being collected. In order to address permit objectives when evaluating instream sites for impacts due to stormwater runoff, the parameters of concern should be consistent with water quality constituents relevant to TMDLs and source identification efforts. Therefore, a more representative or informative list of parameters should be analyzed. Parameters of concern in waterbodies throughout the Willamette Valley include parameters such as nutrients, heavy metals, organics, and bacteria, which require laboratory analysis.

Samples are Not Representative of the Entire Hydrograph: With the exception of some continuous field monitors, all samples collected are grab samples. Grabs represent a point in time. Depending on resource limitations, it would be worthwhile to collect composite samples that represent a larger portion of the entire hydrograph. Fluctuations of pollutant concentrations typically vary widely throughout an event and a composite sample would better represent those variations.

Further Data Evaluation is Needed: A significant amount of data has been collected over the past years. It would be very useful and informative to separate the dry weather from the wet weather data and to evaluate the concentrations that are typical during these conditions. This evaluation would likely provide insights into the relative contribution of various pollutants that are associated with runoff. It would also likely lead to additional questions, which would help provide information to further refine the monitoring plan. Section 7 of this document includes recommendations regarding data evaluations.

### 5.1.3 Modified Instream Monitoring Efforts

In order to gain the most benefit from the instream monitoring activities currently being conducted and to gather information that more directly relates to the permit monitoring objectives at hand, adjustments were made to the existing instream activities. The final changes were made after draft changes were initially proposed to the participating jurisdictions and then further refined in individual meetings with each jurisdiction. The resulting modifications are described below.

#### Locations for Instream Monitoring

As shown in Tables 2 and 3, there are currently 46 sampling sites representing 33 water bodies. Tables 4 and 5 include the list of existing sampling sites with proposed changes noted in the table and a description of the rationale for those changes. The modified sampling sites are also shown on Figure 2. The modifications include a total of 32 sampling sites representing 22 water bodies. While the reduction of monitoring sites may appear on the surface to represent a reduction in resources, this is not the case. The resources are being shifted and re-allocated towards capturing more storm specific data, collecting composite samples as opposed to grabs, analyzing additional parameters considered necessary, and more thoroughly evaluating data as discussed below. These changes will result in data that are more useful in meeting permit monitoring objectives and in supporting stormwater management decisions. As an example, currently, approximately 279 grab samples are collected instream per year (Table 3). However, approximately 59 of those samples are collected during storms; the samples are collected as grabs; and the grabs are analyzed for a limited number of parameters. Under the modified program, approximately 151 samples will be collected instream per year (Table 5). Approximately 59 of these samples will be collected during targeted storm events. This is the same number of storm samples that were previously collected. However, these samples will be composites as opposed to grabs and they will be analyzed for a much longer list of constituents.

#### Water Quality Sampling and Frequency

URS recommended that instream water quality samples should be collected bi-monthly during both the dry and wet weather seasons (3-dry season and 3-wet season), at a minimum. The three wet-season instream samples should be collected during storm events. Samples should be collected as composite grab samples, which will require samples to be collected at a defined frequency and combined prior to analysis for most parameters. Both field-testing and laboratory testing (of the composite samples) is recommended for the parameters listed in Section 6 of this document. In addition, a data evaluation is recommended to begin to take a look at previously collected instream data with respect to the impact that runoff is having on instream water quality (see Section 7.0). The sample frequencies that are proposed by each jurisdiction vary somewhat based on what is considered to be the “maximum extent practicable” for that jurisdiction. Resulting changes to sample frequencies are provided in Table 4.

**NOTE:** The most resource-intensive element of water quality monitoring is sampling of storms. Because of the difficulty of identifying suitable storms, and then mobilizing in a timely manner to allow for characterizing the storm, storm sampling requires a large time commitment. Staff

are assigned other responsibilities in addition to monitoring. To ensure that monitoring doesn't consume inordinate resources at the expense of activities that reduce pollution, the following limitations apply to the commitments made in this plan related to storm sampling.

- In a given year, in order to obtain samples from three storms, staff from CCSD#1 will track an unlimited number of storms via weather forecasts. If a storm is forecasted that looks like it may be sufficient for sampling, CCSD#1 will notify all other participating co-permittees. Co-permittees will then clear work and/or personal schedules up to ten times to allow for mobilization. Actual mobilize for a storm will occur up to five times. Once this level of effort has been made, co-permittees will consider the storm monitoring commitment for the year to have been met.
- Storms will not be sampled on major holidays, including Thanksgiving, Christmas, New Year's, President's Day and Easter.
- The criteria for determining whether a storm is appropriate for sampling will be based on the climate of the Pacific Northwest. Storms should be of a size that once a crew is mobilized, runoff is anticipated to occur for a minimum of two hours. Antecedent dry periods are not specified but will be noted when data are reported.
- Finally, the duration of time between the collection of individual samples will be varied as necessary to meet the goal of obtaining at least three samples per storm (these three samples will then be composited into one sample at the lab into for analyses). Samples will not be taken more frequently than once each hour. In some cases a storm may not last long enough to collect three time-weighted samples. In these cases, the samples that are collected will be composited and analyzed; no minimum number of samples is specified.

### **Flow and Temperature Monitoring**

Accurate assessment of flow is beneficial to pollutant loads assessments and analysis. Continuous flow data, collected as part of the instream monitoring effort, is available for nine of the instream monitoring sites. Generally, water quality data collected at these sites includes temperature and pH, although some sites are also be sampled for dissolved oxygen. The primary benefit of these continuous monitoring sites is the ability to gage the increase in flow due to a storm event and apply concentration data (whether instream or runoff specific) to calculate instream pollutant loading. Clackamas County co-permittees should continue to maintain the continuous monitoring locations on these instream monitoring sites. Additional flow monitoring sites are not recommended as flow monitoring is resource intensive and those resources would be better spent on collecting water quality data given that flows may be estimated using standard engineering calculations.

### **Other Regional Instream Monitoring Efforts**

It is worth noting that other regional jurisdictions are conducting instream monitoring activities that would be relevant to some of the streams that flow through the Clackamas County NPDES permit area. One example of this would be monitoring currently conducted on Johnson Creek.

A small part of the Johnson Creek watershed lies within CCSD#1 and the City of Milwaukie. Given the minimal proportion of watershed within the Clackamas County NPDES permit area (e.g., only about 2%, or 727.5 acres, of the entire Johnson Creek watershed, which is 55 square miles, lies within CCSD#1 and/or the City of Happy Valley), WES and the City of Milwaukie have elected to participate in interjurisdictional water quality and flow monitoring efforts to produce high-quality data in a coordinated, cost-effective manner. Coordinated monitoring projects during the 2005-2006 reporting period include, but aren't limited to:

- **Turbidity, Total Suspended Solids, and Pesticide Measurements in the Waters of Johnson Creek:** Water Environment Services, in partnership with the cities of Gresham, Happy Valley, Milwaukie, and Portland, the Johnson Creek Watershed Council, and Multnomah County, provided in-kind contributions (i.e., labor) towards a study that is exploring the relationship between DDT, turbidity, total suspended solids (TSS), and dieldrin. Section 319 grant funds from DEQ supported a portion of this study. Creek water samples are being analyzed in an effort to determine which levels of TSS and turbidity can be expected to correlate with certain levels of these pesticides. Lab analysis for these pesticides is very expensive and it is hoped that TSS or turbidity can be found to be a reliable surrogate. As of October 2006, the study is incomplete and ongoing. Additional information regarding this study is not included in this report. Please contact Andrew Swanson of WES at 503-353-4598 for more information about this study.
- **USGS' Continuous Monitoring Stations in the Johnson Creek Watershed:** Water Environment Services, in partnership with the cities of Gresham, Happy Valley, Milwaukie, Portland, Multnomah County and the USGS, contributed funds towards the operation of five continuous monitoring stations in the Johnson Creek watershed during the 2005-2006 reporting period. These stations collect data 24 hours/day, seven days/week. Data was collected at all stations for the following parameters: water temperature and water flow. In addition, turbidity was collected at two stations, Gresham's and Milwaukie's, during this time period. Additional information regarding these USGS stations is not included in this report, but it can be viewed on this USGS webpage: <http://waterdata.usgs.gov/or/nwis/current/?type=quality>. Please contact the USGS or Andrew Swanson of WES at 503-353-4598 for more information about these stations.

**Table 4 - Modifications to the Clackamas County Co-permittee's Existing Instream Monitoring Efforts**

Monitored Waterbody	Responsible Party	Number of Locations	Type of Sample	Sampling Frequency	Parameters Monitored (Field/Lab)*	Storm Event Monitoring (Y/N)**	Summary of Changes
Carli Creek	CCSD#1	1	Grabs and Composites	9/year	Field and Lab	Y (3 of 9)	CCSD#1 reduced the number of sites by 6 in order to free up additional resources to collect composites and to target storm events. The sites that were eliminated were considered to be lower priority based on location within the UGB and based upon 303(d) listings.
Clackamas River	CCSD#1	2	Grab	6-12/year	Field and Lab	N	
		1	Automated	Continuous	Field	Y	
Cow Creek	CCSD#1	1	Grabs and Composites	9/year	Field and Lab	Y (3 of 9)	
Cow Creek***	CCSD#1	1	Automated	Continuous	Field	Y	
Dean Creek	CCSD#1	1	Grab	12/year	Field and Lab	N	
Kellogg Creek	CCSD#1	2	Grabs and Composites	9/year	Field and Lab	Y (3 of 9)	
Mt Scott Creek	CCSD#1	1	Grabs and Composites	9/year	Field and Lab	Y (3 of 9)	
Mt Scott Creek	CCSD#1	2	Automated	Continuous	Field at one	Y	
Phillips Creek	CCSD#1	1	Grabs and Composites	9/year	Field and Lab	Y (3 of 9)	
Phillips Creek	CCSD#1	1	Automated	Continuous	Field	Y	
Rock Creek	CCSD#1	1	Grabs and Composites	9/year	Field and Lab	Y (3 of 9)	
Rock Creek	CCSD#1	2	Automated	Continuous	Field at one	Y	
Sieben Creek	CCSD#1	1	Grabs and Composites	9/year	Field and Lab	Y (3 of 9)	
Sieben Creek	CCSD#1	1	Automated	Continuous	Field	Y	
Ball Creek	Lake Oswego	1	Grabs and Composites	9/year	Field and Lab	Y (3 of 9)	Lake Oswego had recently updated their monitoring plan so the sites were considered to be appropriate. The sample frequency was reduced from 12/year to 9/year in order to free up resources to collect composites and target storm events.
Boones Ferry Creek	Lake Oswego	2	Grabs and Composites	9/year	Field and Lab	Y (3 of 9)	
Carter Creek	Lake Oswego	1	Grabs and Composites	9/year	Field and Lab	Y (3 of 9)	
Lost Dog Creek	Lake Oswego	1	Grabs and Composites	9/year	Field and Lab	Y (3 of 9)	
Springbrook Creek	Lake Oswego	1	Grabs and Composites	9/year	Field and Lab	Y (3 of 9)	
Tryon Creek	Lake Oswego	1	Grabs and Composites	9/year	Field and Lab	Y (3 of 12)	
Minthorn Creek	Milwaukie	1	Grabs and Composites	4/year	Field and Lab	Y (2 of 4)	No changes were considered necessary except to specifically target storm events.
Johnson Creek	Milwaukie (via USGS)	1	Automated	Continuous	Field and Lab	Y	

Monitored Waterbody	Responsible Party	Number of Locations	Type of Sample	Sampling Frequency	Parameters Monitored (Field/Lab)*	Storm Event Monitoring (Y/N)**	Summary of Changes
Abernathy Creek	Oregon City	2	Grabs and Composites	4/year	Field and Lab	Y (2 of 4)	Added an additional site on Abernathy so that there will be one site upstream and one site downstream of City impacts. Also reduced sites to free up resources for conducting additional analyses, collecting composites and targeting storm events. Duplication of land use representation was considered when eliminating sites.
Caufield Creek	Oregon City	1	Grab	4/year	Field	N	
Coffee Creek	Oregon City	1	Grabs and Composites	4/year	Field and Lab	Y (2 of 4)	
High School Creek	Oregon City	1	Grab	4/year	Field	N	
Livesay Creek	Oregon City	1	Grab	4/year	Field	N	
Mud Creek	Oregon City	1	Grab	4/year	Field	N	
Newell Creek	Oregon City	1	Grab	4/year	Field	N	
Park Place Creek	Oregon City	1	Grabs and Composites	4/year	Field and Lab	Y (2 of 4)	
Singer Creek	Oregon City	2	Grabs and Composites	4/year	Field and Lab	Y (2 of 4)	
South End Creek	Oregon City	1	Grab	4/year	Field	N	
Athey Creek	SWMACC	1	Grab	12/year	Field and Lab	N	Many of these sites were located in rural areas with very similar land use and some sites were eliminated to free up resources for conducting additional analyses, collecting composites and targeting storm events.
Field Creek	SWMACC	1	Grab	12/year	Field and Lab	N	
Pecan Creek	SWMACC	1	Grabs and Composites	9/year	Field and Lab	Y (3 of 9)	
Rock Creek (South)	SWMACC	1	Grab	12/year	Field and Lab	N	
Saum Creek	SWMACC	1	Grab	12/year	Field and Lab	N	
Shipley Creek	SWMACC	1	Grabs and Composites	9/year	Field and Lab	Y (3 of 9)	
Tualatin River	SWMACC	1	Automated	Continuous	Field	Y	
Unnamed Creek at	SWMACC	1	Grabs and Composites	9/year	Field and Lab	Y (3 of 9)	
Wilson Creek	SWMACC	1	Grabs and Composites	9/year	Field and Lab	Y (3 of 9)	
Summerlinn– tributary	West Linn	1	Grabs and Composites	5/year	Field and Lab	Y (3 of 5)	Sites were considered appropriate and only minor changes were made to the parameter list.
Tanner Creek	West Linn	1	Grabs and Composites	5/year	Field and Lab	Y (3 of 5)	
Trillium Creek	West Linn	1	Grabs and Composites	5/year	Field and Lab	Y (3 of 5)	

Shading indicates where sample locations have changed

\* The term “Field” indicates samples that are analyzed using meters in the field – typically for temperature, conductivity, dissolved oxygen, total dissolved solids, and pH.

\*\* A “N” or no in this column indicates that samples are collected on a regular schedule such as monthly and may or may not include storm events. Specific weather conditions are not targeted.

\*\*\* The Cow Creek grab sampling location was relocated from the existing location.

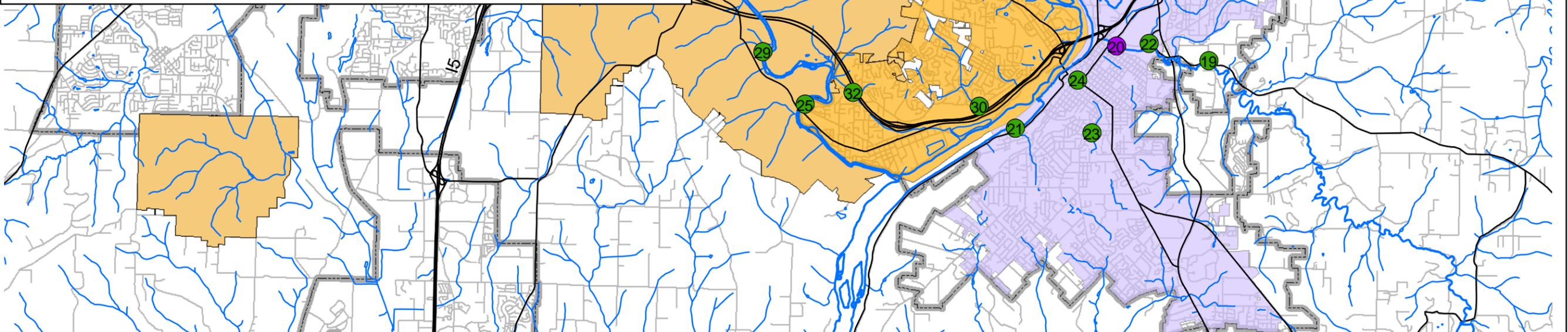
**Table 5 - Summary of the Modified Clackamas County Co-permittee Instream Monitoring Efforts**

Jurisdiction	Modified Total # of Composite Sampling Sites	Previous Total # of Storm Event <u>Grab</u> Samples Collected Per Year	Modified Total # of <u>Composite</u> Samples Collected Per Year (# of those which are storm samples is in parenthesis)	Automated Continuous Sampling Sites	Modified Total # of Sampling Sites
CCSD#1	8	23*	72 (24)	8	16
SWMACC	4	18*	36 (12)	1	5
Gladstone	0	0	0 (0)	0	0
Milwaukie	1	1*	4 (2)	1	2
Oregon City	6	8*	24 (12)	0	6
West Linn	3	9	15(9)	0	3
<b>TOTAL:</b>	<b>22</b>	<b>59</b>	<b>151 (59)</b>	<b>10</b>	<b>32</b>

\* For instream monitoring at these sites, storm events were not targeted. To estimate the number of storm samples collected, the total number of samples collected was multiplied by 0.19 (or 19%) as Clackamas County reviewed previously collected data and estimated that 19% of the instream samples were collected when runoff was occurring.

**Shading** = this column shows the previous number of samples collected for comparison to the modified program.

Number	Jurisdiction	Sampling Method	Site Description	Stream Name
1	CCSD #1	Automated	SE Ambler Rd & 84th Ave	Mt Scott Creek
2	CCSD #1	Automated	Flood Control Facility at SE Pheasant Ct	Mt Scott Creek
3	CCSD #1	Automated	Between Hwy 212 and 224	Rock Creek
4	CCSD #1	Automated	S. Fork Water Intake	Clackamas River
5	CCSD #1	Automated	SE Last Rd	Cow Creek
6	CCSD #1	Automated	Phillips Creek	Phillips Creek
7	CCSD #1	Automated	At Sunnyside Rd	Rock Creek
8	CCSD #1	Automated	At Hwy 212 / 224	Sieben Creek
9	CCSD #1	Grab and Composite	120th and Carpenter	Carli Creek
10	CCSD #1	Grab and Composite	Hwy 212 and 135th	Sieben Creek
11	CCSD #1	Grab and Composite	Hwy 212	Rock Creek
12	CCSD #1	Grab and Composite	84th and Sunnybrook	Phillips Creek
13	CCSD #1	Grab and Composite	North Clackamas Park	Mt. Scott Creek
14	CCSD #1	Grab and Composite	Rusk & Aldercrest	Kellogg Creek
15	CCSD #1	Grab and Composite	Kellogg Ck at Hwy 99E	Kellogg Creek
16	CCSD #1	Grab and Composite	RR Culvert - Fish Hatchery Rd	Cow Creek
17	Milwaukie	Grab and Composite	Minthorn Creek	Minthorn Creek
18	Milwaukie / USGS	Automated	Johnson Creek	Johnson Creek
19	Oregon City	Grab and Composite	At Holly Lane Bridge	Abernathy Creek
20	Oregon City	Grab and Composite	Abernathy Creek - Downstream	Abernathy Creek
21	Oregon City	Grab and Composite	Outfall at Willamette	Coffee Creek
22	Oregon City	Grab and Composite	Behind 13530 Redland Rd	Park Place Creek
23	Oregon City	Grab and Composite	At N. end of Singer Cr Park	Singer Creek
24	Oregon City	Grab and Composite	Singer Cr Baseline Site	Singer Creek
25	SWMACC	Automated	Tualatin River	Tualatin River
26	SWMACC	Grab and Composite	SW Long farm Rd	Wilson Creek
27	SWMACC	Grab and Composite	SW Mossy Brae Rd	Pecan Creek
28	SWMACC	Grab and Composite	SW Shadow Wood Drive	Shipley Creek
29	SWMACC	Grab and Composite	SW Ribera Lane	Unnamed Tributary
30	West Linn	Grab and Composite	At Imperial Drive	Tanner Creek
31	West Linn	Grab and Composite	At Caloroga Rd	Trillium Creek
32	West Linn	Grab and Composite	Tributary to Tualatin River	Summerlinn Creek



**Legend**

Gladstone	Oregon City	Existing Sites
Happy Valley	Rivergrove	New or Relocated Sites
Milwaukie	West Linn	Urban Growth Boundary
SWMACC	CCSD #1	

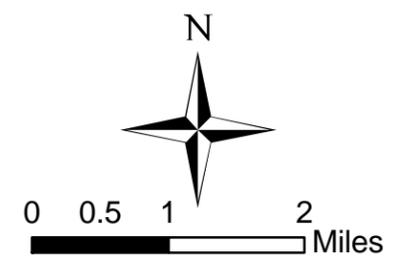


Figure 2  
 Instream Monitoring Locations: Revised Sites  
 CCSD #1, Gladstone, Milwaukie, Oregon City, SWMACC,  
 West Linn, Happy Valley, River Grove  
 September 2006

## 5.2 OUTFALL MONITORING EFFORTS

Collecting grab samples at outfall locations throughout the Clackamas MS4 permit area will be conducted to address NPDES MS4 objectives 1, 4, 5, and 6 when conducted during wet weather conditions.

1. Determine the status of implementing the components of the SWMP;
3. Evaluate the source of specific pollutants;
4. Assess the chemical, biological, and physical effects of MS4 runoff on receiving waters;  
and
5. Characterize MS4 discharges.

The following text describes existing outfall monitoring efforts (5.2.1), observations related to existing outfall monitoring efforts (5.2.2), and modified outfall monitoring efforts (5.2.3).

### 5.2.1 Existing Outfall Monitoring Efforts

Grab samples are collected at outfall locations throughout the Clackamas County MS4 area. Generally samples are collected during storm events, anywhere from one to four times per year. There is one location sampled by the City of Milwaukie, that is monitored at defined frequencies throughout the year (e.g., monthly), and sampling is not isolated to wet weather conditions. This location represents an area with baseflow and thus monitoring data would not be completely representative of MS4 runoff. A few other locations in Clackamas County are monitored at defined frequencies because the sites are behind locked gates and cannot be accessed after normal business hours.

Existing outfall monitoring locations were classified by land use, as an initial way to estimate and evaluate the sources of specific pollutants. Classification of stormwater quality based on land use can be used for pollutant load modeling efforts. It can also be used to target best management practices in land uses with the greatest loadings for specific parameters. Each current monitoring location is listed below in Table 6, along with a reference regarding the sampling frequency, general parameters monitored, and whether monitoring is conducted during storm events. A more condensed summary of outfall monitoring is provided in Table 7. The locations of existing outfall monitoring sites are also shown on Figure 3.

**Table 6 - Detailed Summary of Existing Outfall Monitoring Locations**

Upstream Land Use	Outfall Description	Responsible Party	Sampling Frequency	Parameters Monitored (Field/Lab)	Targeted Storm Event Monitoring (Y/N) <sup>(1)</sup>
Residential	Outfall #19 – SE Webster Rd. at Kellogg Creek	CCSD#1	1/year	Field and Lab	Y
Mixed Use (Industrial, highway, commercial, residential)	Outfall #12 – SE Pheasant Ct.		1/year	Field and Lab	Y
Mixed Use (Industrial, school, commercial, residential)	Outfall #26 – SE Tolbert Rd. and 94 <sup>th</sup> Ave.		1/year	Field and Lab	Y
Industrial	Riverside Park Storm Sewer Outfall		6-12/year	Field (all samples) and Lab (4x/year)	N
Industrial	106 <sup>th</sup> Ave. Storm Sewer Outfall		6-12/year	Field (all samples) and Lab (4x/year)	N
Residential	Outfall at Risley Rd.		Gladstone	1/year	Lab
Residential	Outfall #25262 to Johnson Creek	Milwaukie	4/year	Field and Lab	N
Commercial	Clackamas River outfall at Oregon City Shopping Center	Oregon City	3/year	Field and Lab	Y
Industrial	Clackamas River outfall at Clackamette Cove		3/year	Field and Lab	Y
Residential	12” Outfall – SW Terry Ave. and Childs Rd.	SWMACC	1/year	Field and Lab	Y
Rural	Outfall at SW Brookman Rd. near Sherwood.	SWMACC	1/year	Field and Lab	Y
Residential	Outfall to the Tualatin at River Heights Circle	West Linn	2/year	Field and Lab	Y

Notes:

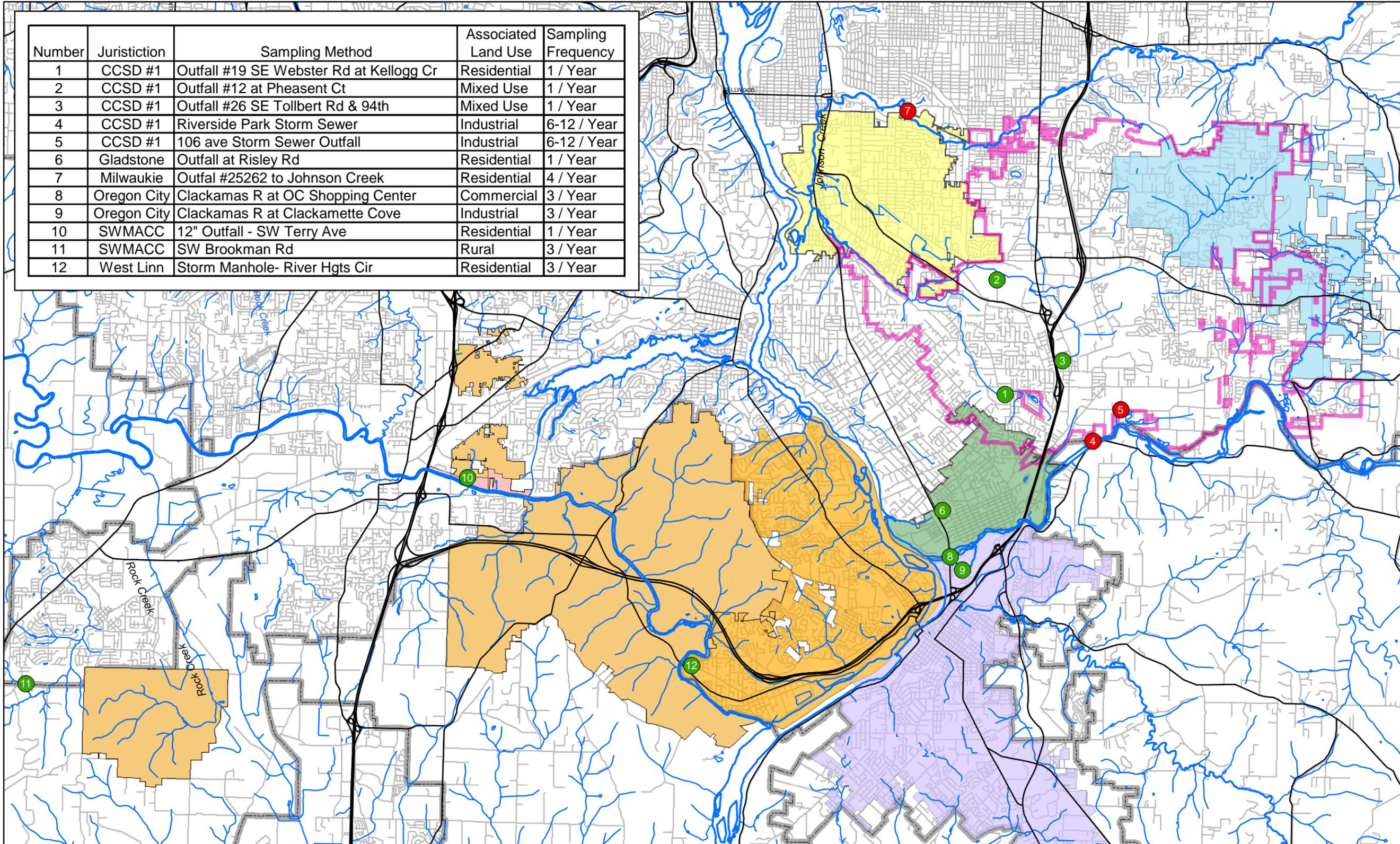
(1) A no indicates that sampling is conducted on a regular basis. It is possible that storms are occurring during these regular sampling events.

**Table 7 - Overall Summary of Existing Outfall Monitoring Locations**

Upstream Land Use	# of Outfalls Monitored	Responsible Party	Total # of Samples Collected Per Year	Parameters Monitored (Field/Lab)	Targeted Storm Event Monitoring (Y/N)
<b>Residential</b>					
	5	CCSD#1 (1) Gladstone (1) SWMACC (1) West Linn (1) Milwaukie (1)	9	Field and Lab	Y for 4 N for 1 - (Milwaukie)
<b>Commercial</b>					
	1	Oregon City	3	Field and Lab	Y
<b>Mixed Use</b>					
	2	CCSD#1	2	Field and Lab	Y
<b>Industrial</b>					
	3	CCSD#1 (2) Oregon City (1)	21*	Field and Lab	N for 2 - (CCSD#1) Y for 1
<b>Open Space</b>					
	0	NA	0	NA	NA
<b>Rural</b>					
	1	SWMACC	1	Field and Lab	Y
<b>Total:</b>	<b>12</b>		<b>36</b>		

\* For samples that were listed as being collected 6 to 12 times per year, an average of 9 times per year was used to provide the total number of samples collected per year.

Number	Jurisdiction	Sampling Method	Associated Land Use	Sampling Frequency
1	CCSD #1	Outfall #19 SE Webster Rd at Kellogg Cr	Residential	1 / Year
2	CCSD #1	Outfall #12 at Pheasant Ct	Mixed Use	1 / Year
3	CCSD #1	Outfall #26 SE Tollbert Rd & 94th	Mixed Use	1 / Year
4	CCSD #1	Riverside Park Storm Sewer	Industrial	6-12 / Year
5	CCSD #1	106 ave Storm Sewer Outfall	Industrial	6-12 / Year
6	Gladstone	Outfall at Risley Rd	Residential	1 / Year
7	Milwaukie	Outfal #25262 to Johnson Creek	Residential	4 / Year
8	Oregon City	Clackamas R at OC Shopping Center	Commercial	3 / Year
9	Oregon City	Clackamas R at Clackamette Cove	Industrial	3 / Year
10	SWMACC	12" Outfall - SW Terry Ave	Residential	1 / Year
11	SWMACC	SW Brookman Rd	Rural	3 / Year
12	West Linn	Storm Manhole- River Hgts Cir	Residential	3 / Year



**Legend**

- Gladstone
- Happy Valley
- Milwaukie
- SWMACC
- Oregon City
- Rivergrove
- West Linn
- CCSD #1
- Urban Growth Boundary
- Existing Sites
- Existing Sites Proposed for Removal or Relocation

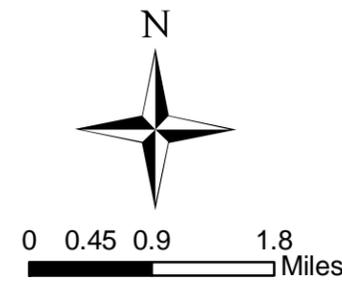


Figure 3  
 Outfall Monitoring Locations: Existing Sites  
 CCSD #1, Gladstone, Milwaukie, Oregon City, SWMACC,  
 West Linn, Happy Valley, River Grove

September 2006

## 5.2.2 Observations Related to Existing Outfall Monitoring Efforts

The following text provides observations related to the existing outfall monitoring efforts that lead to recommendations for improvements in order to meet new permit requirements.

Limited Representation of Some Land Uses: Based on the assessment of existing outfall monitoring efforts, and considering the distribution of land uses in the permit area, it appears that significant activity is occurring throughout the residential and industrial land use categories, but there is limited monitoring occurring for commercial and open space areas.

Some Sample Locations Include Dry Weather Flows: There is one location currently being monitored on a regularly scheduled basis during both dry and wet weather events. A stormwater outfall can only be monitored during dry weather if a continuous baseflow exists. Outfalls with continual flow during dry weather conditions are not representative locations for observing specific land use based stormwater runoff quality and quantity conditions, rather they can be used to indicate the effect of stormwater runoff on receiving waters, if samples are taken during dry and wet weather conditions and compared as if they were instream samples. Depending upon the magnitude of baseflow observed at this location, monitoring of this site would be better classified as instream monitoring instead of outfall monitoring. If this site is removed from the table above, it reduces the number of residential sites from 5 to 4. In addition, two sites are located behind locked gates and access is restricted to normal business hours. In terms of monitoring storm events, this restriction is very limiting as monitoring may need to occur during evenings and weekends. If you remove these two sites from the table above, it reduces the number of industrial sites from 3 to 1.

Further Data Evaluation is Needed: Significant amounts of land use based stormwater runoff data were collected during the first MS4 NPDES Phase I permit term. Through ACWA, these data were compiled as a whole and evaluated in 1996. Due to the size of the data set and the inherent variability in the data, the results showed that collecting additional data at the time would not provide much value in the way of further refining the data. Therefore, many of the NPDES Phase I jurisdictions got permission from DEQ to redirect their monitoring efforts away from land use based monitoring and instead focused on BMP and instream monitoring. However, it has been 10 years since that report was produced and significant effort has gone into implementing stormwater management BMPs since that time. It would be worthwhile to take another look at the land use data now that additional time has passed to determine whether there have been changes that are statistically verifiable. The results of this evaluation may also generate additional questions that would help to guide future monitoring decisions. This recommendation is included in Section 7.0.

Limited Number of Parameters Analyzed: The parameters of concern, when evaluating outfall sites for impacts due to stormwater runoff, should be consistent with water quality constituents relevant to TMDLs and source identification efforts. Therefore, laboratory testing for a more representative list of parameters should be conducted. The recommended list of analytes is provided in Section 6.0.

Samples are Not Representative of the Entire Hydrograph: The existing storm samples are typically collected as grab samples. Grabs represent a point in time. Composite samples that are

more representative of the entire hydrograph are recommended. Fluctuations of pollutant concentrations typically vary widely throughout an event and a composite sample will better represent those variations.

### **5.2.3 Modified Outfall Monitoring Efforts**

In order to ensure that outfall sampling is conducted to meet the objectives of the monitoring program, it is recommended that some of the locations and the frequency and methods of sampling be modified to ensure representative stormwater samples of each land use are collected.

#### **Locations for Outfall Monitoring**

Based on the initial analysis of outfall monitoring sites, there are limited sites where runoff conditions are representative of either a commercial or an open space land use category. Therefore, Clackamas County co-permittees have considered reallocating current efforts towards selecting outfalls sites representative of commercial and open space land uses. As a result, CCSD#1 added one commercial site. In addition, monitoring sites that included flow during dry weather were removed from the outfall monitoring list as they are not completely representative of urban runoff. Table 8 includes a summary of the modifications that were made to the existing sampling sites. Table 9 includes a more condensed summary of the modified sites. The modified site locations are also shown on Figure 4.

#### **Outfall Water Quality Sampling and Frequency**

Outfall samples will be collected during three storm events per year as a composite of 3 timed-weighted samples collected throughout the event. See the **Note** on page 12 regarding limitations on the commitments for storm sampling. Both field and laboratory testing is recommended for the parameters listed in Section 6.0. In addition, a data evaluation is recommended to compare recent data to the ACWA 1996 data. This comparison may lead to questions that would result in refinements to the monitoring plan (see Section 7.0). A more detailed summary of the resulting changes to jurisdictional sampling programs is provided in Table 8.

Again, as stated for the instream sampling, it may appear that with the reduction of one sampling site, that this modified plan represents a reduction in resources. This is not the case. The resources are being re-allocated to collecting composite as opposed to grab samples and to analyzing the samples for a longer list of constituents. See Table 9 for a comparison of the previous sampling to the modified sampling. The modifications are expected to result in data that are more useful and more robust.

**Table 8 - Detailed Summary of Modified Outfall Monitoring Locations**

Upstream Land Use	Outfall Description	Responsible Party	Sampling Frequency	Parameters Monitored (Field/Lab)	Targeted Storm Event Monitoring (Y/N) <sup>(1)</sup>	Summary and Rationale for Changes
Residential	Outfall #19 – SE Webster Rd. at Kellogg Creek	CCSD#1	3/year	Field and Lab	Y	
Mixed Use (Industrial, highway, commercial, residential)	Outfall #12 – SE Pheasant Ct.	CCSD#1	3/year	Field and Lab	Y	
Mixed Use (Industrial, school, commercial, residential)	Outfall #26 – SE Tolbert Rd. and 94 <sup>th</sup> Ave.	CCSD#1	3/year	Field and Lab	Y	
<b>Commercial</b>	<b>SE Oregon Trail Dr. near SE Sieben Park Way</b>	<b>CCSD#1</b>	<b>3/year</b>	<b>Field and Lab</b>	<b>Y</b>	<b>Needed additional representation of commercial land use.</b>
<del>Industrial</del>	<del>Riverside Park Storm Sewer Outfall</del>	<del>CCSD#1</del>	<del>6-12/year</del>	<del>Field (all samples) and Lab (4x/year)</del>	<del>N</del>	These sites are behind locked gates after normal business hours and access would be too limited.
<del>Industrial</del>	<del>106<sup>th</sup> Ave. Storm Sewer Outfall</del>	<del>CCSD#1</del>	<del>6-12/year</del>	<del>Field (all samples) and Lab (4x/year)</del>	<del>N</del>	
Residential	Outfall at Risley Rd.	Gladstone	3/year	Field and Lab	Y	
<del>Residential</del>	<del>Outfall #25262 to Johnson Creek</del>	<del>Milwaukie</del>	<del>4/year</del>	<del>Field and Lab</del>	<del>N</del>	<del>Not 100% representative of runoff as these sites have flow during dry weather.</del>
<b>Residential</b>	<b>Outfall #23003 to Johnson Creek at Roswell Street</b>	<b>Milwaukie</b>	<b>3/year</b>	<b>Field and Lab</b>	<b>Y</b>	<b>New site added to replace the previous site that had dry weather flows.</b>
Commercial	Clackamas River outfall at Oregon City Shopping Center	Oregon City	3/year	Field and Lab	Y	
Industrial	Clackamas River outfall at Clackamette Cove	Oregon City	3/year	Field and Lab	Y	

Upstream Land Use	Outfall Description	Responsible Party	Sampling Frequency	Parameters Monitored (Field/Lab)	Targeted Storm Event Monitoring (Y/N) <sup>(1)</sup>	Summary and Rationale for Changes
Residential	12" Outfall – SW Terry Ave. and Childs Rd.	SWMACC	3/year	Field and Lab	Y	
Rural	Outfall at SW Brookman Rd. near Sherwood.	SWMACC	3/year	Field and Lab	Y	
Residential	Outfall to the Tualatin at River Heights Circle	West Linn	3/year	Field and Lab	Y	

Notes:

Shading = eliminate this site from further monitoring.

Bold Text = site added.

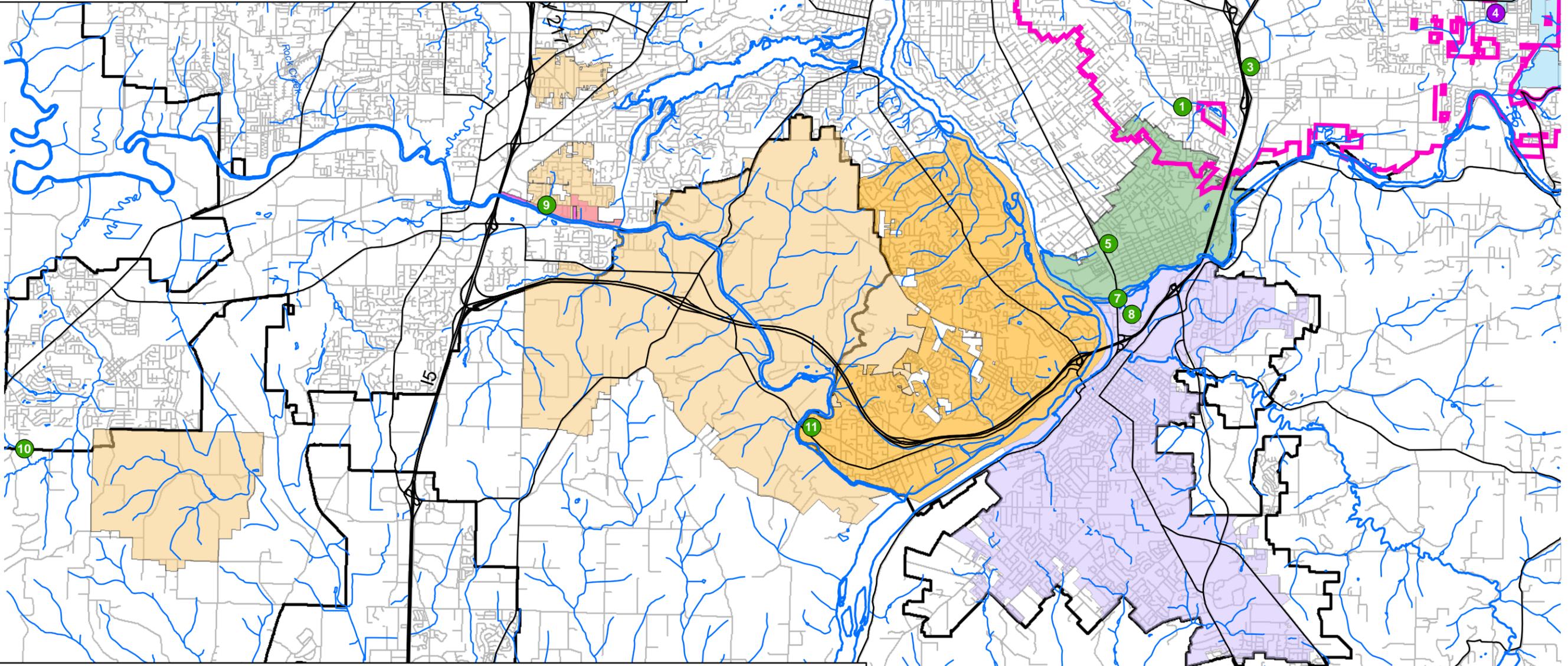
(1) A no indicates that sampling is conducted on a regular basis. It is possible that storms are occurring during these regular sampling events.

**Table 9 - Outfall Monitoring Recommendations Compared to Existing Monitoring**

Upstream Land Use	Previous Monitoring			Modified Monitoring	
	# of Outfalls Currently Monitored	Total # of Samples Collected Per Year	Total # of Targeted Storm Samples Collected Per Year	# of Outfalls Recommended for Monitoring	Total # of Samples Recommended for Collection Per Year
<b>Residential</b>					
	5	5	5	5	15
<b>Commercial</b>					
	1	3	3	2	6
<b>Mixed Use</b>					
	2	2	2	2	6
<b>Industrial</b>					
	3	21*	3	1	3
<b>Rural</b>					
	1	1	1	1	3
<b>Total:</b>	<b>12</b>	<b>36</b>	<b>14</b>	<b>11</b>	<b>33</b>

\* Where 6 to 12 samples per year were listed as the sampling frequency, an average of 9 samples per year was used to come up with a total number of samples collected per year.

Number	Jurisdiction	Sampling Method	Site Description	Associated Land Use	Sampling Frequency
1	CCSD #1	Outfall	Outfall #19 SE Webster Rd at Kellogg Cr	Residential	1 / Year
2	CCSD #1	Outfall	Outfall #12 at Pheasant Ct	Mixed Use	1 / Year
3	CCSD #1	Outfall	Outfall #26 SE Tollbert Rd & 94th	Mixed Use	1 / Year
4	CCSD #1	Outfall	Near 147 Ave and Sunnyside Rd	Commercial	3 / Year
5	Gladstone	Outfall	Outfall at Risley Rd	Industrial	1 / Year
6	Milwaukie	Outfall	Outfall #23003 at Roswell Street	Residential	3 / Year
7	Oregon City	Outfall	Clackamas R at OC Shopping Center	Commercial	3 / Year
8	Oregon City	Outfall	Clackamas R at Clackamette Cove	Industrial	3 / Year
9	SWMACC	Outfall	12" Outfall - SW Terry Ave	Residential	1 / Year
10	SWMACC	Outfall	SW Brookman Rd	Rural	3 / Year
11	West Linn	Outfall	Storm Manhole- River Hgts Cir	Residential	3 / Year



**Legend**

Gladstone	Oregon City	Existing Sites
Happy Valley	Rivergrove	New or Relocated Sites
Milwaukie	West Linn	Urban Growth Boundary
SWMACC	CCSD #1	

N

0 0.5 1 2 Miles

Figure 4  
 Outfall Monitoring Locations: Revised Sites  
 CCSD #1, Gladstone, Milwaukie, Oregon City, SWMACC,  
 West Linn, Happy Valley, River Grove

September 2006

## **5.3 BEST MANAGEMENT PRACTICE (BMP) MONITORING EFFORTS**

Monitoring to analyze the effectiveness of BMPs will be conducted to address NPDES MS4 objectives 1 and 2.

1. Determine the status of implementing the components of the SWMP;
2. Evaluate the effectiveness of BMPs for specific source controls.

Best Management Practices (BMPs) is a broad term that can be used to describe practices ranging from structural water quality facilities to source control/programmatic activities (as reported in the co-permittees Stormwater Management Plans) that are implemented to achieve a net water quality benefit. The monitoring of a structural BMP facility (detention and retention ponds, swales, constructed wetlands, proprietary systems) would represent an environmental monitoring effort, while monitoring of source control/ programmatic activities or BMPs (erosion and sediment control, stormwater conveyance system cleaning and maintenance, industrial and business inspection programs and public education and outreach) would represent a program monitoring effort. Although this monitoring plan is intended to focus on environmental monitoring efforts, programmatic monitoring of source control activities would also help to meet select monitoring objectives and is discussed where relevant in this section.

The following text describes existing BMP monitoring efforts (5.3.1), observations related to existing BMP monitoring efforts (5.3.2), and modified BMP monitoring efforts (5.3.3).

### **5.3.1 Existing BMP Monitoring Efforts**

Clackamas County co-permittees currently conduct a variety of program monitoring efforts, generally related to implementation of their SWMPs. There is currently limited environmental monitoring occurring that is associated with performance of structural BMPs. A general description of the existing BMP monitoring efforts is provided below.

#### **Structural BMPs**

Currently, CCSD#1, SWMACC, and the City of Milwaukie are involved in an ongoing monitoring program related to underground injection controls (UIC). Coordination of this program is the result of UIC permit requirements, not MS4 permit requirements, and the monitoring program is expected to continue on an annual basis. UICs are not considered to be part of the MS4 system, as they convey stormwater to the subsurface rather than through an MS4 conveyance system into surface water bodies. However, results of the UIC monitoring program will be beneficial to the MS4 program because the monitoring that is being conducted for this program is evaluating the effluent from structural BMPs prior to its discharge into a UIC. There are seven BMPs that are currently being evaluated including sedimentation manholes, catchbasin inserts, a Stormceptor, an oil-water separator, a StormFilter, and sumped catchbasins. To date four years of samples have been collected from each site and the fifth year of sampling (2006/2007) has been initiated. Sampling of these sites is conducted on a storm basis only. One of the sites is located within Clackamas County.

## **Erosion and Sediment Control**

Through various ordinances, Clackamas County co-permittees are required to implement erosion and sediment control measures for earth disturbing activities within the various cities. Clackamas County co-permittees have erosion control related BMPs included in their SWMPs. Each jurisdiction, whether individually or through an intergovernmental agreement with another jurisdiction, reviews erosion control plans for appropriate structural and non-structural BMPs and conducts periodic inspections of erosion control facilities. During inspections, City or County inspectors may observe how various facilities and practices are influencing construction related pollutant discharges from entering the stormwater conveyance system and gage how the erosion control process and procedures, as outlined in the SWMP, are being implemented. This process has been providing subjective but valuable information related to the effectiveness of construction site BMPs.

## **Source Control**

As mentioned previously, Clackamas County co-permittees have each completed revised SWMPs for this permit which outline source control/ programmatic BMPs to minimize water quality impacts related to stormwater runoff. Such BMPs include operation and maintenance activities, implementation of planning and development standards, industrial controls, and public education. These activities provide a net water quality benefit, yet effectiveness of these activities cannot practically be measured or quantified. Program monitoring is described in each of the co-permittees SWMPs and involves the use of performance indicators to evaluate how implementation of these SWMP components benefits water quality. Performance indicators include tracking the volume of debris removed during maintenance activities, tracking the number of sites inspected for various activities, and tracking programmatic modifications to various program components. Program monitoring of these source control/ programmatic BMPs is discussed here because it will help to meet the permit monitoring objectives related to BMP effectiveness as listed above.

### **5.3.2 Observations Related to Existing BMP Monitoring Efforts**

Clackamas County co-permittees generally conduct program monitoring individually, to fulfill SWMP requirements. Therefore, until quantitative data exists that can verify and validate the effectiveness of these various source control/ programmatic BMPs, there are no recommended modifications related to the jurisdictions program monitoring activities. Other than the UIC BMP-related monitoring that is currently being conducted, there are no other significant structural BMP monitoring efforts (i.e., environmental monitoring) being conducted.

### **5.3.3 Recommendations for BMP Monitoring**

As stormwater management and stormwater treatment are continually changing and evolving fields, extensive existing and new literature regarding the monitoring of various treatment technologies (structural BMPs) is being generated by researchers, public entities, and private companies to meet both regulatory and non-regulatory needs. Regionally, there are a number of local jurisdictions that are actively collecting effectiveness information for various structural

controls. There are also ongoing efforts to gather information related to source control effectiveness as well, but such information is currently limited.

The primary recommendation regarding this monitoring component is related to the collection and tracking of literature. By collecting literature and tracking local monitoring efforts, Clackamas County co-permittees will gain information that will aid their individual stormwater management efforts and possibly influence future decision-making regarding appropriate levels of treatment technology to require for new and redevelopment. Specifically, Clackamas County co-permittees will track available data related to the performance and cost effectiveness of both structural and source control BMPs. Actively tracking and reviewing literature will also allow the co-permittees to effectively keep up with current inventions and technological advances.

A number of Clackamas County co-permittees are actively involved in ACWA, which provides an open forum for stormwater management discussions and provides additional educational opportunities for local officials regarding stormwater quality and treatment. Recently, select co-permittees contributed to the development of a BMP effectiveness database that ACWA commissioned. Participation in ACWA will continue to support literature tracking efforts.

Potential current literature sources include the following:

- ACWA BMP Effectiveness Database 2005.
- ACWA UIC Monitoring Study.
- ASCE and USEPA (2004). International Stormwater Best Management Practices (BMP) Database. [online] <http://www.bmpdatabase.org>
- WERF and NCHRP Stormwater Research Efforts. Both organizations are active in preparing research documents on stormwater runoff and best management practices performance.
- Federal Highway Administration (FHWA) (2000). Stormwater Best Management Practices in an Ultra-Urban Setting: Selection and Monitoring. Prepared by Tetra-Tech, Inc. and Hagler Bailly Services, Inc. FHWA-EP-00-002, Washington, DC.
- Green, D., Grizzard, T., Randall, C. (1994). "Monitoring of Wetlands, Wet ponds, and Grassed Swales." Proc Eng Found Conf Stormwater NPDES Related Monitoring Needs, p 487-513
- Heyvaert, A.C., Reuter, J.E. and E.W. Strecker, Selected Results from Monitoring Relevant to the Design and Performance of Stormwater BMPs in the Tahoe Basin, Draft Report Prepared for California Tahoe Conservancy, South Lake Tahoe, California, 2003
- Pitt, R.E. (2002a). "Emerging Stormwater Controls for Source Areas." In Management of Wet Weather Flows in Watershed. Sullivan, D. and Field, R., eds., CRC Press, Boca Raton.
- Pitt, R.E., Maestre, A. and Morquecho, R. (2004). "The National Stormwater Quality Database (NSQD, version 1.1)." Proc. Of the World Water and Environmental Resources Congress, Salt Lake City, UT. June 2004, ASCE, Reston, VA, CD-ROM. (Online at : <http://unix.eng.ua.edu/~rpitt/Research/ms4/Paper/recentpaper.htm>)
- Schueler, T. (1987). Controlling Urban Runoff- A Practical Manual for Planning and Designing Urban Best Management Practices. Metropolitan Washington Council of Governments. Washington, DC, 240 pp

## **5.4 FIELD SCREENING AND DRY WEATHER OUTFALL MONITORING**

Field screening activities and dry weather outfall monitoring are conducted to detect and eliminate illicit discharges and pollutants associated with illicit discharges that are entering the MS4 system. Illicit discharges are typically defined as non-stormwater discharges that occur due to an individual's activities. Field screening and dry weather outfall monitoring involves the inspection of select outfalls during dry weather conditions to determine if any discharge is occurring. If a discharge is occurring, the next step is to determine the source of the discharge and whether the discharge is preventable and whether it is adding pollutants into the MS4. If the discharge is considered to be problematic efforts are made to eliminate it.

Field screening and dry weather outfall monitoring activities are generally conducted by individual jurisdictions annually, and the methodology and procedures are described and/or referenced in their SWMPs. Field screening and dry weather outfall monitoring activities meet the following three monitoring objectives:

1. Determine the status of implementing the components of the SWMP;
2. Evaluate the effectiveness of BMPs for specific source controls;
3. Evaluate the source of specific pollutants.

### **5.4.1 Existing Field Screening Monitoring Efforts**

Each jurisdiction has included field screening programs that are described in their SWMPs. They developed these programs to be "maximum extent practicable" for their jurisdiction. This monitoring plan does not include a review of those field screening efforts or recommendations for modifications. These programs are only mentioned here because they will assist in addressing the three permit monitoring objectives listed above.

## **6.0 SAMPLING PARAMETERS AND PROCEDURES INCLUDING QA/QC**

The recommended parameter list was established by comparing the current field sampling and laboratory analysis parameters monitored by the co-permittees with the parameter lists used by CCSD#1 and SWMACC, the City of Portland, and Clean Water Services for their MS4 sampling programs. The purpose of this comparison was to maximize consistency on a regional basis. Projected TMDLs were also considered when establishing the final parameter list. As the purpose of both the instream and stormwater outfall monitoring efforts is to assess the degree to which ambient water quality is impacted by stormwater runoff, the same parameters were chosen for both the instream and outfall monitoring.

Field grab sampling and analysis is recommended for both instream (dry and wet weather) and outfall (wet weather) monitoring locations. Field grab sampling is necessary for parameters that have short holding times. Composite sampling and laboratory analyses are also recommended at both instream and outfall locations. Composite samples will include a composite of three samples collected at regularly timed intervals throughout the event. As mentioned in the **Note** on page 12, in some cases a storm may not last long enough to collect three time-weighted samples.

In this case, the samples that are collected will be composited and analyzed. A summary of the recommended parameters for analyses is included in Table 11. The estimated analytical cost for one site is \$411/event. This does not include mercury or Johnson Creek 303(d) listed toxics which are outlined in bold in Table 11. In summary, the following table (Table 10) provides an estimate of annual analytical costs by jurisdiction.

**Table 10 – Summary of Annual Analytical Cost Estimates by Jurisdiction**

Jurisdiction	# of Instream Sites*	# of Outfall Sites	Total # of Instream Samples/Year	Total # of Outfall Samples/Year	Total # of Samples	Annual Analytical Costs	Analytical Costs Plus 10% for QA/QC
CCSD#1	8	4	72	12	84	\$34,524	<b>\$37,976</b>
SWMACC	4	2	36	6	42	\$17,262	<b>\$18,988</b>
Gladstone	0	1	0	3	3	\$1,233	<b>\$1,356</b>
Milwaukie	1	1	4	3	7	\$2,877	<b>\$3,165</b>
Oregon City	6	2	24	6	30	\$12,330	<b>\$13,563</b>
West Linn	3	1	15	3	18	\$7,398	<b>\$8,138</b>
<b>Total</b>	<b>22</b>	<b>11</b>	<b>151</b>	<b>33</b>	<b>184</b>	<b>\$75,624</b>	<b>\$83,186</b>

\* This column does not include the automated instream sites or analyses of mercury, PAHs, dieldrin, PCBs, DDT/DDE. These parameters may be added at a later date based on direction from DEQ associated with upcoming implementation of the Willamette River and Johnson Creek TMDLs.

ACWA developed detailed QA/QC procedures for stormwater data collection and analysis as part of the ACWA UIC Monitoring Study. Attachment 1 provides Standard Operating Procedures (SOPs) for tasks associated with surface water quality monitoring extracted from this document. Co-permittees will use laboratories that have comprehensive Quality Assurance Programs and are approved by both ODEQ and EPA for permit compliance water quality analysis.

**Table 11 - Instream and Outfall Parameters for Clackamas County Stormwater Quality Monitoring**

Type (Field or Laboratory)	Analyte	Sample Type (Grab or Time- weighted Composite)	Unit	Analytical Method	MDL	Notes	Analyzed In-House vs Send-Out
Field	Specific Conductivity	Grab	µmhos/cm	SM 2510 B	1		
Field	PH	Grab	Std units	SM-4500-H B	0.1		
Field	Temperature	Grab	Deg Celsius	SM 2550-B	0.1		
Field	Flow	Grab	NA	NA	NA	Measure if possible. May use velocity and depth measurements.	
Field	Dissolved Oxygen	Grab	mg/L	EPA 360.1	0.1	Method assumes use of probe.	
Field	Chlorophyll a	Grab	mg/m <sup>3</sup>	SM 10200 H	2	Only pertinent if draining to the Tualatin River. Reporting limit from Portland was 0.2 micrograms/L.	
Lab	Copper, Total*	Composite	µg/L	EPA 200.8*	0.03		Send-Out
Lab	Copper, Dissolved*	Composite	µg/L	EPA 200.8*	0.03		Send-Out
Lab	E. coli*	Grab	MPN/ 100mL	SM 9223 B*	1		In-House
Lab	Total Hardness*	Composite	Mg CaCO <sub>3</sub> /L	EPA 130.2*	1		In-House
Lab	Lead, Total*	Composite	µg/L	EPA 200.8*	0.008		Send-Out
Lab	Lead, Dissolved*	Composite	µg/L	EPA 200.8*	0.008		Send-Out
Lab	Nitrogen – Ammonia*	Composite	mg/L	EPA 130-A*	0.02		In-House
Lab	Nitrogen – Nitrate*	Composite	mg/L	EPA 126-A*	0.1		In-House
Lab	Phosphorus, Total*	Composite	mg/L	EPA 135-A*	0.03		In-House

Type (Field or Laboratory)	Analyte	Sample Type (Grab or Time- weighted Composite)	Unit	Analytical Method	MDL	Notes	Analyzed In-House vs Send-Out
Lab	Phosphorus, Ortho- phosphate*	Composite	mg/L	EPA 118-A*	0.02		In-House
Lab	Solids - Total	Composite	mg/L	SM 2540 B	2		In-House
Lab	Solids – Total suspended*	Composite	mg/L	SM 2540 D*	0.2		In-House
Lab	Solids – Total dissolved*	Composite	mg/L	SM 2540 C*	2		In-House
Lab	Solids – Total volatile	Composite	mg/L	SM 2540 B	2	Only applies if discharging to the Tualatin.	In-House
Lab	Zinc, Total*	Composite	µg/L	EPA 200.8*	0.3		Send-Out
Lab	Zinc, Dissolved*	Composite	µg/L	EPA 200.8*	0.3		Send-Out
Lab	PAHs	Composite	µg/L	EPA 608/624		Need to verify procedures. Only applies for tributaries to Johnson Creek.	
Lab	Dieldrin	Composite	µg/L	EPA 608/624			
Lab	PCBs	Composite	µg/L	EPA 625			
Lab	DDE/DDT	Composite	µg/L	EPA 625			
Lab	Mercury (Total)	Composite	µg/L	EPA 245.1, 245.7	0.1		
Lab	Mercury (Methyl)	Composite	µg/L	SM 1630	0.01		

\* = analytes for which we had the Clackamas County analytical method.

Note: Mercury and other toxics may be added to the list of analytes based on direction from DEQ associated with the upcoming implementation of the Willamette River and Johnson Creek TMDLs.

## 7.0 DATA ANALYSIS AND INTERPRETATION

The purpose of preparing a coordinated monitoring plan is to distribute resources widely and produce data that will provide comprehensive information for the County as a whole. Therefore, it is recommended that the data analyses and interpretations be conducted as a whole and not as individual jurisdictions.

Prior to conducting analyses on any new data that are collected as a result of this report, an analysis of previously collected data is recommended. Although most of the data have been analyzed, the existing wet weather and dry weather data have not been segregated. Comparing dry weather to wet weather data may provide further insights into the extent to which runoff is impacting streams for various parameters.

For the data collected as a result of this proposed monitoring plan, some analyses would be conducted annually and submitted with the annual compliance reports while other analyses would be conducted after several years of data have been collected (e.g., the five year permit period) so that the data are more statistically robust in terms of providing information. The following general recommendations are made with respect to the data analyses for both instream and outfall monitoring.

### Instream Monitoring:

Annual Reporting would include the following:

- A summary table that presents the monitoring results from each station for each parameter for each event monitored.
- Descriptive statistics for each station for each parameter including the minimum, maximum, and mean values. Data would be segregated by wet vs. dry weather and compiled and presented in tabular format.
- A comparison of the data to water quality standards that may be of interest.

End of Permit Cycle Reporting (i.e., after at least 5 years of data have been collected) would include the following:

- A comparison of descriptive statistics between the upstream and downstream stations (where applicable) to look for statistically significant differences.
- Where sufficient data exist, newer data can be compared to previously collected data to determine whether water quality conditions are improving over time.
- A comparison of results to applicable water quality standards.

### Outfall Monitoring:

Annual Reporting would include the following:

- A summary table that presents the results from each station for each parameter for each event monitored organized by land use.

- Descriptive statistics for each station and each land use for each parameter including the minimum, maximum, and mean values.
- A comparison of the data to water quality standards or other water quality indicators (e.g., industrial permit benchmarks, etc.) that may be of interest.

End of Permit Cycle Reporting (i.e., after at least five years of data have been collected) would include the following:

- A statistical summary of the results from the storm events monitored at each outfall for each parameter examined including mean, median, standard deviation, and number of samples analyzed will be prepared. A comparison of descriptive statistics between the land use stations will be conducted for monitored parameters to determine whether or not a significant difference in land uses is apparent.
- A comparison of the results to previous results reported in the ACWA database (1996) in order to determine whether statistically significant water quality changes have occurred.

As a part of the data reports that are produced, information that has been gathered and interpreted from literature reviews should also be included, as well as insightful results from field screening programs and any program monitoring that is conducted so that the information can be reviewed and interpreted as a whole.

**Attachment 1:  
Standard Operating Procedures  
From the WES Sampling Program  
(prepared by Water Quality Laboratory)**

SOP A-1: Grab Sampling.....2  
SOP A-2: Chain of Custody Records.....3  
SOP A-3: Transporting, Packaging, and Shipping Samples from Field to Lab.....4

# SOP A-1: Grab Sampling

Set up a safety zone, if appropriate (this may include the placement of traffic cones, etc.). Then provide access to the sample collection point. Take notes regarding site conditions and sampling notes in the notebook.

## **Grab Sampling**

The grab sampling technique is described as follows:

- Place the sample bottle in the middle of the flow stream. If the sample collection location is deep, a long-handled sample collection pole or rope w/bailer will be needed. One can also “zip tie” the bottle onto the pole and collect the sample in the bottle. E.coli samples must be collected directly into the bottle.
- Once the bottle is filled to the proper level, replace the lid on the sample bottle, fill out the label (or write directly on the bottle with a sharpie pen) and place it in the cooler with ice.
- Write the sample collection time and other relevant information in the notebook.

## **SOP A-2: Chain of Custody Records**

A chain of custody record (COC) is a legal document designed to track samples and persons who are responsible for them during preparation of the sample container, sample collection, sample delivery, and sample analysis. These forms are supplied by the WQL. The procedures for filling out these forms are as follows:

### **Prior to sampling**

After bottles are labeled and placed in iced coolers, and you're in the field, fill out the general information on the COC form including:

- Source/Location
- LIMS ID
- Persons sampling
- Type of sample (composite or grab)
- Parameters desired for analysis

Place COC in a Ziploc bag in the cooler or in another secure location.

### **After sampling is complete**

After sampling has been completed, fill out remainder of the COC including:

- Time and date that sampling was initiated

### **At Laboratory or upon transfer to another person**

Whenever custody of the samples is relinquished:

- Provide signature, date, time, and job title
- Relay special instructions, if any

## **SOP A-3: Transporting, Packaging, and Shipping Samples from Field to Lab**

- Keep the chain of custody record form with the samples.
- Pack samples well within ice chest to prevent breakage or leakage.
- As was stated previously, samples should be packed in ice or an ice substitute to maintain a sample temperature of four degrees Celsius during transport. Acquire more ice at a convenience store, if necessary.
- Samples must be delivered to the WQL within 6 hours of bacteria sample collection.
- Samples will be preserved by laboratory personnel upon arrival.



**URS**

111 SW Columbia Street  
Suite 1500  
Portland, OR 97201